Engineering and Mining Journal

INDEX TO VOLUME CX

July 1 to December 31, 1920

McGRAW-HILL COMPANY, INC.
10TH AVENUE AT 36TH STREET
NEW YORK

Engineering and Mining Journal

INDEX TO VOLUME CX

July 1 to December 31, 1920

EXPLANATORY NOTE

Illustrated articles are denoted by an asterisk (*); book notices by a dagger (†).

This index is made comprehensive but concise. Pains are taken to bring together matter belonging to the same subject so that when a reader looks up an article he will be cited to related data. Series of simple page numbers following names of mines or companies usually refer to news notes. With a major entry or series of entries may be placed several minor ones relating to the same subject in order that its history may be followed. If the author's name be known it is the simplest means of reference. Productions are indexed under names of metals and countries or states. The mere juxtaposition of a mineral and geographical name usually signifies an output but may cover other statistical or news matter. Not all news are indexed but a liberal selection of news items is made.

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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Volume 110 New York, July 3, 1920 *Number* 1

Finding Fault With the Pittman Act

THE metropolitan newspapers, and we refer particularly to the *New York Tribune* and the *New York Evening Post*, attack the Pittman Silver Act, the former asking that it be repealed at the next session of Congress. Says the *Tribune* editorially: "The Pittman law contained a curious 'joker.' This required the Treasury to purchase for every dollar melted up an equivalent amount of bullion at the fixed price of $1 an ounce. The Treasury has begun to make such purchases, with the result that American-produced bullion now commands 99½c. an ounce, while foreign bullion is selling for only 91½. The Pittman law is thus operating as the Bland-Allison and Sherman acts operated, to put a fictitious value on silver bullion—if mined in the United States. The error made in 1878 and 1890 is being repeated. Silver is not needed as a basis for currency, especially when purchased at more than market value. The 'joker' in the Pittman measure should be eliminated at the next session of Congress."

The inference which the ordinary reader would gain from the editorial mentioned is that the naughty silver producers, by a piece of sharp legislation fathered by the Senator from Nevada, are now mulcting the people, as represented by the Government, of 8c. an ounce on all silver produced. Should this price differential be maintained until the entire 207,000,000 ounces is purchased, the total amount would be close to $17,000,000.

However, as most of our readers know, the Government is not losing one cent on the transaction. The price of silver began to skyrocket in 1918. India, a producer of wheat, jute, and other articles necessary for the prosecution of the war, demanded that she be paid in this metal, a large amount of which was lying dead in the Treasury vaults. By the Pittman Act, which was passed by the Senate on April 18, 1918, 207,000,000 ounces of silver was sent to the Far East to settle trade balances, for which the Government received an equivalent to $1 per ounce. This increase in the supply acted as a stabilizing influence on the market, and without doubt prevented silver producers from reaping as great profits as would have been the case otherwise. Now, with the rapid decline in the price of this metal, the act again exerts a stabilizing influence, the silver producers now being protected from incurring possible losses, just as they were checked in taking inordinate profits from a rapid rise, two years ago. The Government buys back at the same price at which it sold.

To say that the bill contained a "joker" is unfair. This so-called "joker" was introduced by Senator Fall, of New Mexico, and its probable effect fully pointed out in the Senate discussion. The fixed $1 price was forecast by Senator Owen, chairman of the Committee on Banking and Currency, who said, "When the Government fixes a definite price for silver the miners can make their plans accordingly, and, seeing for several years ahead a fixed market at $1 an ounce, it will stimulate the production of silver in this country and replace the idle silver which is now in the Treasury merely in storage."

Senator Lodge, whose opposition to price-fixing is well known, studied the bill very carefully and said, "The bill is safe as framed," later voting for it. In fact, the bill was passed without the formality of a roll-call, so insignificant was the opposition. It is interesting to note that one of the opponents of the act was Senator Thomas, of Colorado, one of the big silver producing states.

The Pittman Act has apparently been confused by the press with various price-fixing legislative enactments, which have been generally condemned. Any one with a knowledge of the bill will understand that it is radically different in principle. It also has nothing to do with the schemes for free coinage with which it has been unjustly linked.

This country will need all the stabilizing influences which it can muster in the next few years, to prevent disastrous panics. The silver producers have made their plans, which include extensive and expensive mining development, predicated on a price of $1 for silver for several years to come. To repeal the act would be unjust, the Government profiting at the expense of legitimate industry. One dollar an ounce is not an exorbitant price for silver. The yearly average has never fallen below 50c., and the present quotation is much less than the advances over 1914 prices in many other commodities. Since the Civil War, the price of silver has averaged over $1 per ounce during twenty-two years, but of recent years has been under that figure.

We believe that when the conditions are understood, the movement for the repeal of the Pittman Act will disappear. American mining interests must, however, not be caught asleep and must see that the fullest publicity is secured, in order to protect their rights.

Cornwall's Tin Troubles

THE vagaries of the metal markets and the unusual economic conditions existing in the world today have severely chastised many mining industries. The most conspicuous recipient of this punishment is the gold-mining industry, owing to the unvarying price of gold; but almost every one of the metals has suffered from its unsettled future prospects—as the pronounced fluctuations in the metal markets testify. The latest addition to the list of affected mining industries is tin mining in England.

The recent pronounced drop in tin prices has seriously affected the old and stable tin-mining district in Cornwall, and has placed many of the producing properties in a precarious position as regards present and future

operating possibilities. Tin is a metal that admits of wide speculation. Last February the London price was around £420 per ton, whereas early June quotations have dropped to around £225, chiefly the result of frenzied finance.

Considering the present cost of production, the latest quotations are too low for profitable operation of these mines. Normally, a price of £200 per ton would have represented a fair return to the mining companies, but with today's high cost of labor and materials a price of £350 per ton would be none too adequate.

In commenting upon this situation, which has disturbed one of the world's historically interesting mining centers, and an important tin-producing area, the *Financial Times* states that "if the government temporarily held out a hand to the most deserving mines to tide them over the present crisis they would doubtless be able to carry on by themselves, once trade conditions all over the world have become stabilized."

The help referred to, financial assistance, would enable the mines to undertake further exploration, development, and experimental work to improve their properties, something which was not sufficiently attended to during the stress of the war. This is a logical method of attack to such a problem. Instead of speculating as to when the price of tin will become normal, an adjustment to the existing conditions through an attempt to lower production costs is not only more philosophical and sensible but more likely to achieve quicker results.

The McFadden Gold Bill

THE failure of Congress to pass the McFadden Act leaves the question of gold production where it was —in the hands of chance. The gold miners are the chief "goats," who must expiate the economic sins of a world that has found out how to live on credit instead of cash. The plan of the bill had certain defects, but it appeared the best that could be devised. Although it was generally supported, cold water was thrown on it by Frank A. Vanderlip, just before his departure for Japan. He told its supporters that the possession of more gold in this country would only be an excuse for more inflation. No remark could be more thoughtless and untrue; but from a financier of Vanderlip's standing it doubtless had a deterrent effect upon the great majority who shrink at innovations in any case.

The current financial happenings, the fluctuations of exchange dependent upon the transfer of gold from one country to another, show beyond doubt that the basis for the world's currency is metal, and the more substantial the basis the less the relative inflation. National financial systems that have been obliged to expand their paper currency have done so despite an insufficient gold reserve, as in the case of Europe. Experience has shown that when a nation —even the United States —must have a certain amount of money, it goes ahead and prints it, and considers the metal basis later. Increase of gold production would hasten deflation by meeting it part way.

We hope the matter will not be allowed to rest. The people who buy gold jewelry in this country so recklessly will only enjoy paying a little more for it, as a tax to partially compensate the gold miner so that it will pay him to keep on digging; and the general condition of the country will unquestionably be made healthier thereby.

Miami Copper and Minerals Separation

WHETHER the Miami Copper Co. is now infringing Minerals Separation patents is still an open question. The motion for the reopening of the old case to admit additional testimony was denied by the U. S. Circuit Court of Appeals at Philadelphia on June 17. However, the court stated that the denial was made without any expression of opinion which would preclude the use of such of the newly found matter as may prove to be pertinent in questions arising in the accounting now going on. The case was sent to the master for accounting without any determination as to whether the present operations of the Miami company are of an infringing nature, so it would appear that this new evidence may now be presented in the accounting proceedings at Wilmington.

We can hardly blame the court for "passing the buck," as with a Philadelphia summer coming on, even lawyers are sufficiently human to wish to avoid going through with the intricacies of this case once more. We sympathize with the "master," and do not envy him his job.

The Contract System in Mining

OUR news columns recently announced that a plan of having underground work performed by contract had been placed in effect in the Bingham, Utah, district with good success. Contract systems are by no means new, for the practice dates back to the earliest days of mining and includes practically all of the features embodied in the mine contract of today. Briefly, the contract system as applied to underground mining covers the principle that a certain price per foot or per car is paid for the work. The price may, or may not, include the cost of supplies. The establishment of a rate or price per foot, per car, or whatever unit is decided upon, is usually based on actual company account performance for a period of time which is sufficient to determine a compensation that will be fair and equitable. Different heights of stope, varying conditions of ground, length of tram, accessibility of working place, and other considerations are also determining factors in the rating of the contract.

Advantages that may be claimed for the contract system are: The efficient men are enabled to make a wage in proportion to their ability—in other words, a premium is paid for efficiency; the difficulty of adequate supervision of the work covering a large area in underground operations is obviated, as the men are placed on their own initiative; if a charge is made for supplies, which are paid for at a nominal rate by the contractor, there is a tendency on the part of the men to be more conservative in their use, the actual production costs are lowered, and the men who are good workers and have a thorough knowledge of the work receive the benefit. A further consideration, and one which will particularly appeal to the younger men, who naturally seek up-to-date methods for the performance of their tasks, is the fact that the contract plan enables the worker to apply his originality and ingenuity to his own advantage.

Among the reasons given for shortages of labor in underground operations is the fact that many young men formerly available for mining operations are turning to other pursuits. By the adoption of an equitable contract system not only is the opportunity offered for the full development of the miner's earning capacity,

but methods which conform to modern business practices and are applicable in all lines of endeavor are introduced. The result is that there is less tendency on the part of men primarily inclined toward mining to enter other fields.

Combining Business With Vacation Pleasures

TWO of the national engineering societies are adopting a sensible course in combining the maximum amount of pleasure with their general meetings this summer. The A. I. M. E. will enjoy a boat trip on the Great Lakes and a visit to one of the most attractive mining districts in the world. The Chemical Engineers will go north into Canada, visiting many interesting plants in Ontario and Quebec, and taking such attractive side trips as the one up the Saguenay River to Chicoutimi. These trips will take the place of vacations for many of those who are going, and, as planned, should prove more enjoyable than the average holiday intended for pleasure only.

The principal reason for the ordinary kind of annual meetings is that they provide an opportunity to become acquainted with our fellows, and to exchange ideas which, for one reason or another, we do not care to make public in the *Transactions*. How much better we can do this under the conditions which will prevail on the trips already mentioned!

The Divining Rod

BELIEF in the divining rod dies hard. The frequency with which requests are made for information regarding this and similar devices for detecting the presence of minerals underground is astonishing. We had supposed that these devices were fast going the way of the gold brick, used in the past for separating the foolish from their money. We were coming to think that all were so well versed in the tricks of swindlers and fakers, thanks to the liberal course afforded in the J. Rufus Wallingford stories, that comparatively few could be victimized or deceived except by something new. The foolish, of course, would still be with us to the end, but none so simple as to try to divine the presence of minerals by other than legitimate prospecting methods based on principles of geology.

The magnetic needle will detect the presence of iron, of which all are well aware, and this is the only device of which we know that can be used successfully for such purposes. Columbus sought a short-cut to India, and all of us would like to find the quick road to wealth. So it is not strange that some means of disclosing earth's hidden treasure without cost or effort should dance in the imagination along with the fairies of one's childhood. One rub of the lamp placed all things at Aladdin's disposal. But lamps are old-fashioned now, and science reigns.

Traditions linger, and it is half-baked education, in our opinion, that is largely responsible for the seemingly widespread belief concerning divining rods. A short course in physics and courses in perhaps a dozen other subjects have their place in the curriculum of every high school throughout the country, and here in the metropolitan district have invaded even that of some of the grammar schools. These may be well enough as stepping stones to something higher, but, if study end with them, the student is in the proverbial dangerous position of the possessor of a little knowledge. Dangerous it is, he will agree, after spending his money for the latest thing in divining rods and failing to get results.

The man with money that is burning a hole in his pocket and who desires to lay bare the mineral secrets of the district in which he lives can better invest his capital in the good old-fashioned way of grub-staking a prospector or by putting it into an exploration or a development company.

The airplane, radio, and a dozen other inventions invite the optimistic to believe that all things are possible, and thus it is that swindlers having new devices are treated with greater tolerance than they deserve. The U. S. Geological Survey, in *Water-Supply Paper 416*, issued in 1917, has already undertaken to educate the uninformed as to the foolishness of attempting to discover oil or other mineral deposits by waving, as it were, a magician's wand. This paper, entitled "The Divining Rod," by Arthur J. Ellis, may be had for the asking, unless by chance it be out of print. In an introductory note, by O. E. Meinzer, it is said: "It is difficult to see how, for practical purposes, the entire matter could be more thoroughly discredited." But, nevertheless, the superstition persists.

Sign on the Dotted Line

WE HAVE before us a ballot from the Harvard Engineering Society, to vote for officers. There is to be elected a president, a first and second vice-president, a secretary, a treasurer, and five governors. In the case of all but the governors, we are instructed to "vote for one." There is in each instance only one to vote for. In voting for the board of governors we are instructed to "vote for five." Only five candidates are given. We can go through the formality of voting the excellent ticket, which has been carefully selected by someone for us, or of throwing the documents in the wastebasket. In the interests of efficiency we shall do the latter.

According to the way of looking at it, this sending out of ballots, with no choice of candidates, to free and independent Americans, to ascertain their choice, is a meaningless courtesy of the Spanish type, a piece of stupidity, or an impertinence. What a waste of costly paper, perfectly good stamps, and clerical work there is here!

Engineers should stand for efficiency. If they get a Department of Public Works they are going to show the folks what efficiency is. Also, they should stand for honesty. Cut out, then, such meaningless ballots. If the form of your society (we are speaking to all engineers) is oligarchic—if a small group selects the officers and decides what the society shall do—simply advise those of us who are too busy to indulge in false motions who the officers are to be, and do not insult our intelligence as engineers and Yankees by asking which is our choice of one.

We do not intend to criticise the oligarchic system as practiced by preference by engineers and scientists—although we should like each society some day to experiment with democracy. We are speaking now only from the standpoint of conservation of energy, and of efficiency. In the organizations in which we hold membership, we hereby appoint the secretary of each society which follows this system to cast our vote by proxy for all the candidates who will be appointed (elected) anyhow; and this proxy is permanent.

WHAT OTHERS THINK

Why Hoover Was Not Nominated

Now that the Republican convention is over, and Mr. Hoover was not nominated, his friends have been explaining what was the matter. One or two of the engineering magazines have said that the trouble lay in the stupidity of the politicians and the rabble that they represent; that the intellectuals or prematurely bald young men who amateurishly advocated Mr. Hoover underestimated the power of political machinery and "the bosses." The *New York World*, which was one of the strongest supporters of Mr. Hoover, suggests that he made a mistake in entering the primaries in California, and that, just when he was beginning to worry the "Old Guard," he injured his own chances by committing himself where he had not time for a real test of strength.

My own opinion is that possibly Mr. Hoover was a bit too gloomy and heavy in his speeches. He is a serious-looking man, anyway, and after the strain of war people prefer not to be depressed too much. Mr. Hoover realizes the tremendous questions facing the nation and understands how to solve them as probably no one else does; but perhaps he was a little too lugubrious in his attitude. For instance, I recently talked with an engineer who said that he was enthusiastic for Hoover until he came to New York for the dinner of the Institute at which Mr. Hoover made an address. Although this engineer is not lacking in nerve, he said that he was somewhat alarmed by the gloom in the new president's expressions.

However, one of the chief considerations for Mr. Hoover's lack of strength at Chicago was undoubtedly his disinclination to wage a bitter fight for the nomination and resort to all the tricks of the self-seeking politician. He chooses to give his efforts to the nation as they are asked for, and to retain his own sincerity and decency, rather than flare up and campaign eagerly for office.

P. B. McDONALD.

New York City.

The Troubles of a Cyanider

In your issue of May 29 Mr. Carpenter misinterprets my statements in a former issue of the *Engineering and Mining Journal*, in an effort on my part to help the, to me unknown, unfortunate cyanider, who set forth his woes in the issue of March 20. Therefore, I desire to further elaborate my statements.

First, let me refer the interested reader to my article entitled "Effect of Air in Cyanidation," printed in the issue of *Engineering and Mining Journal* dated March 22, 1919. That shows two of the absolutely essential conditions of the art, namely, that air (meaning its oxygen constituent) must be present in the cyanide-solvent for efficient dissolution of the gold and silver contents of the ore so treated, and that it must be absent from the pregnant solvent for efficient precipitation by means of zinc, in the form of either shavings or dust.

The troubled cyanider notes conditions under which the zinc shavings had ceased to act as a precipitant, and the inflowing solution was re-dissolving the precipitated gold, so that the outflowing solution had more gold per unit. That is to say, the tailings assayed higher per unit than did the feed. The additions of cyanide, alkali, and of lead acetate failed to remedy the bad conditions beyond a short time, and after that complicated the perplexing problems.

The fact that gold was being re-dissolved shows that it could all be re-dissolved by a cyanide-solvent, and thus separated from the coated zinc. Because it is not practicable to continue to run pregnant solution through the precipitation vat for that purpose, I advised that the metallic contents of the vat be removed to a proper receptacle for treatment with a newly prepared non-pregnant, aërified cyanide solution to remove completely the gold from the zinc. Obviously, the zinc may be restored to commercial form if such restoration be profitable. The siur about running the solution from this treatment is sufficiently answered as follows: The aërified solvent might as well be run through the freshly supplied zinc precipitation vat with the, also more or less, aërified mill solution, "to meet again the conditions complained of," as I stated.

The troubled cyanider removed the coated zinc shavings from numbers 1 and 2 of the compartments of the precipitation vat, the contents of the other compartments were moved up toward the head, and compartments 4 and 5 were filled with new lead-coated shavings. There was a temporary improvement in precipitation, probably due to this addition, and then precipitation ceased. He did not say what he did with the inactive shavings, though they undoubtedly had gold on them.

The usual treatment is to wash them thoroughly and return the "longs" to the vat. The "shorts" are variously treated to separate the zinc from the gold, either by acids, by smelting, or by both. Mr. Carpenter advises the use of hydrochloric acid to clean the "longs," and to dissolve the zinc from the "shorts." Troubled cyaniders know the amount of labor, time, space, expense, and loss of zinc, gold, silver, acids, and other chemicals that are chargeable to such manipulation. I do not here calculate the money value of the losses, but they are serious.

The detached gold and undissolved loosened coatings have to be washed from the zinc as effectively as may be, and the washings filtered to secure the precious metals for smelting, but these are not all recovered in this way from the "longs," which are returned to the vat. If the acid be not thoroughly washed away, or neutralized by an alkaline wash, they should not be returned. In any event, this treatment is ineffective for securing untarnished zinc shavings, owing to oxidation resulting from exposure to corrosive liquids and air. Certainly they are not as effective as are freshly cut zinc shavings.

Mr. Carpenter's remarks as to possible pre-conditions and their remedies are useful as far as they go, and if they can be put in practice.

For bag-filtration, a sufficient number of doubled bags of proper size, each unit consisting of a bag of light, twilled muslin, inclosed in an outer one of heavier and stronger canvas, are securely connected to the main pipe carrying a de-aërified pregnant solution, into which is fed, continuously, the zinc dust in requisite quantity, while forced under, say, ten pounds pressure into the bags. The bags are hung from the main pipe in close order, above one or more launders which conduct the filtrate back to the mill stock-solution tank. The precipitates and the surplus of zinc dust are caught by the inner bags.

The double bags are removed when enough precipitate has been collected, one at a time, after closing a cock in the branch pipe connecting the bag with the main pipe. They are allowed to drain and then the double bag is removed and another empty couple are substituted. Or the bag may be moved, without draining in place, to a position above another launder having a like discharge to the stock-solution tank. The bags are allowed to drain until their contents assume a consistency which permits the removal of the inner bag. Then a new inner bag is fitted within the outer, thus made ready to take its place in the routine of operations.

The contents of an inner bag are not directly removed, but bag and all are submitted to acid for removal of surplus zinc, if the latter be necessary, or directly dried, calcined (which removes the bag material by combustion), then mixed with fluxes, and melted to obtain the bullion. The cost of the inner bags is only a fraction of what would otherwise be expended if attempts were made to clean the bags of adhering precipitates, so that they might be used again.

The method of precipitating gold and silver from pregnant cyanide solutions which consists in de-aërifying the solutions and precipitating the values by zinc dust as they pass to the filters, either press or bag, saves more than one-half of the zinc, cyanide, other chemicals, labor, and wastes, which are incident to precipitation by zinc shavings. The cost of suitable vacuum and solution pumps and of accessory apparatus is small when the advantages of the above-outlined methods are considered.

Theft can be the more easily prevented by isolation of the housing of the precipitation department, locks, and safe. N. S. KEITH.

Philadelphia, Pa.

Foreign Oil Fields Closed to Americans

Under this caption, in the *Engineering and Mining Journal* of May 29, 1920, appears what is reported to be a comprehensive summary, from the New York *Times*, of the Presidential message regarding the restrictions imposed by foreign countries in connection with the acquisition of oil lands. In this article, referring to Canada, the following paragraph occurs:

> In Canada, by Order of the Council of Jan. 29, 1920, any company acquiring a lease for oil development must be registered or licensed in the dominion and have its principal place of business there. Under leases on crown lands companies acquiring oil and gas rights must be British, and if a company ceases to be British its lease is subject to cancellation.

This is not a correct interpretation of the Order in Council referred to and leaves a wrong impression on the public mind. To remove this impression and the stigma cast upon Canada, allow me to quote *verbatim et literatim* a portion of the Order in Council referred to, a part of it which evidently has not been carefully read by the compiler:

> Thursday, the 29th day of January, 1920.
>
> And whereas by Order in Council dated the 19th of January, 1914, the regulations for the disposal of petroleum and natural gas rights then in force were rescinded, and new regulations substituted therefor, Section 40 of which regulations contains the following provision:
>
> "Any company acquiring by assignment or otherwise a lease under the provisions of these regulations, shall at all times be and remain a British company, registered in Great Britain or Canada and having its principal place of business within His Majesty's Dominions, and the chairman of the said company and a majority of the directors shall at all times be British subjects, and the company shall not at any time be or become, directly or indirectly controlled by foreigners or by a foreign corporation.
>
> "Any alteration in the memorandum of articles of association, or in the constitution of the company, or in the bylaws of the company, shall be reported to the Minister, provided that two months' previous notice of the intention to make any alteration which might conceivably affect the British character of the company shall be given in writing to the Minister, and if, in the opinion of the Minister, the said alteration shall be contrary to the cardinal principle that the lessee company shall be and remain a British company under British control, the Minister may refuse his consent to such alteration.
>
> "If the company which may acquire a location under these regulations shall at any time cease to be a British company, or shall become a corporation under foreign control, or shall assign any of the rights acquired under the lease without the consent in writing of the Minister being first had and obtained, the lease shall be subject to immediate cancellation in the discretion of the Minister."
>
> And whereas the Minister of the Interior reports that it is now apparent that the insertion in the regulations of the above restriction does not give to the government of Canada any more effective control over the oil which may be produced from locations acquired under these regulations than if the provision had not been so inserted, and as there would appear to be no doubt that this restriction has had the effect of discouraging the introduction of foreign capital so essential to the exploration and testing of vacant Dominion lands thought to contain oil,
>
> Therefore His Excellency the Governor General in Council, on the recommendation of the Minister of the Interior, is further pleased to order that Section 40 of the petroleum and natural gas regulations, as above quoted, approved by Order in Council dated the 19th of January, 1914, be and the same is hereby rescinded, and the following is substituted therefor, viz:
>
> "Any company acquiring by assignment, or otherwise, a lease under the provisions of these regulations shall be a company registered or licensed in Canada and having its principal place of business within His Majesty's Dominion."

The above is self-explanatory, and further comment is unnecessary. I might add, however, for the benefit of those whose education regarding Canada has been somewhat neglected, that any Order in Council of the dominion government, referring to mineral rights, affects only the newer provinces and territories. The original, or confederation, provinces control their own mineral resources and make their own laws and regulations regarding them. W. F. JENNISON.

Truro, Nova Scotia.

PANORAMIC VIEW OF LA LUZ AND LOS ANGELES PROPERTY IN NICARAGUA. AT THE LEFT IS THE OPEN-

The La Luz and Los Angeles Mine, in Nicaragua

Ore, Which Occurs in One Body, Mined From Surface Benches—Present Milling Includes Stamps, Ball Mills, and Classifier, Amalgamation and Cyanidation Having Been Found the Best Practice—Flotation Not Suitable

By Jesse Scobey
Written for *Engineering and Mining Journal*

RELATIVELY little definite working data have been printed on the few established properties of the east coast of Nicaragua. No large-scale operations claim particular outside attention, but a mine that is merging into the second generation becomes interesting. After twenty-three years of continuous production, the La Luz and Los Angeles ownership is permitting, for the first time, the publication of its experience, in the belief that this may be of help to other pioneers, and may benefit a new and promising country.

With the discovery of gold at grass roots, one 3½-ft. Huntington mill was started at the La Luz and Los Angeles mine in July, 1897, by local Spanish prospectors. It was provided with inside amalgamation, and the usual outside plates, to treat the hillside dirt, which was found to pan free gold in paying quantity. There was no outstanding ledge and no defined vein or quartz cropping, with the normal trappings of hanging and foot wall on which to measure the strike and dip, so essential to well-trained mines. According to the technique of the profession, it was not even a prospect, except that gold was there in the tangled jungle.

By December, 1898, about 4,800 tons of material had been shoveled through the one Huntington, producing $38,400. To December, 1900, the dirt was worked with one arrastre and one Huntington mill at the rate of twenty-two tons per day. Through 1901 to October, 1904, two Huntingtons were used, and from October, 1904, to February, 1905, three Huntingtons were running on ore of about $10 per ton.

A party of Pittsburgh men, headed by the late Thomas B. Riter, purchased the property in July, 1905, from the Nicaraguan owners, of whom the chief stockholder was the late Senor José Aramburu, of Bluefields, Nicaragua. The latter, a discoverer, had incorporated the Compañia Minera La Luz y Los Angeles in 1896, under the laws of the Republic of Nicaragua. The present La Luz & Los Angeles Mining Co. was incorporated Feb. 8, 1916, under the laws of the State of Delaware, by the same original holders of stock, with J. Gilmore Fletcher, of New York City, as the company's president.

Record Justifies Early Estimates

When purchased in 1905, the valuation was made by engineers, and was based on their judgment of a prospect. No positive, possible, or probable ore was in sight, except as might be interpreted from a fairly comprehensive plan of surface trenches and pits. It was then estimated that the pay-orebody would be 750 ft. long by 400 ft. wide, and could reasonably be anticipated to extend to a depth of 100 ft., and would approximate a grade of $10 per ton. The record of the property sustains the early prospectus fairly well. The ore mined over the nineteen-year period from 1901 to 1920 amounts to 540,145 tons broken, of an average grade of $8.15 per ton, amounting to total gross value of $4,399,334.

It is unusual to be able to report the record of a mine with continuous mint certificates, month by month, over a period of nineteen years on bullion from mine workings in one body wholly on the surface and at no point over 60 ft. in depth. An open quarry is now

CUT WORKING OF THE MINE AND AT THE RIGHT CAN BE SEEN THE MILL ON THE SHORE OF THE LAKE

exposed about 1,000 ft. long, with a maximum width of 300 ft., with the floor all in ore.

TABLE I. MINT BULLION RETURNS BY YEARS.

Year	Oz. Bullion	Average Value per Oz.	Mint Returns
1901	716.10	$17.12	$12,283.39
1902	2,159.50	17.10	36,944.60
1903	2,796.97	16.85	47,015.93
1904	3,813.40	16.90	64,466.22
1905	4,136.61	17.35	71,657.18
1906	6,584.62	17.48	114,125.55
1907	6,304.91	16.90	106,292.44
1908	6,351.54	17.12	108,942.86
1909	8,929.67	16.10	143,614.37
1910	11,323.84	17.15	194,425.41
1911	15,926.25	17.50	278,572.78
1912	15,888.07	17.60	278,886.60
1913	15,178.75	17.60	267,022.32
1914	10,360.08	17.61	182,732.01
1915	11,845.43	16.95	200,854.47
1916	7,578.27	17.30	131,132.17
1917	6,364.17	17.55	111,703.39
1918	13,782.35	17.45	240,233.65

In the process of milling, the grinding units graduated from Huntington mills to stamps and tube mills, due to the change of material treated, from soft surface dirt to hard, unoxidized rock. In this transition period a considerable part of mine-dump rock was sorted out as being too hard for the Huntingtons, and this, with the normal mine waste of low grade, amounts to about 25 per cent of the total ore broken.

The mill-head value is determined by adding the average tailing assay to the monthly bullion return. The average grade of ore sent to the mill over a period of nineteen years is $9.20 per ton, of which, by amalgamation, the average extraction has been about 66 per cent. A total of 440,145 tons of ore has been milled, from which precious metals to the value of $6.07 per ton have been extracted, a total of $2,671,259.29.

TABLE II. SUMMARY OF ELEVEN YEARS, MILL REPORTS, AMALGAMATION.

Year	Tons of Ore Treated	Assay per Ton	Extraction	
1909	26,423	$7.92	68.6	Five Huntington mills.
1910	34,312	8.13	69.8	Five Huntington mills.
1911	38,742	9.68	74.5	Six Huntington mills.
1912	44,518	8.12	77.2	Six Huntington mills.
1913	43,223	9.09	68.0	Six Huntington mills.
1914	49,933	5.80	63.0	Six Huntingtons and five stamps.
1915	35,131	9.25	62.0	Ten stamps and old Huntingtons.
1916	26,459	7.90	61.5	Ten stamps and one 8-ft. Hardinge. (Reconstruction)
1917	32,957	5.65	60.0	Ten stamps, one ball mill, one pebble.
1918	57,947	6.90	60.6	Ten stamps, one ball mill, two pebble.
1919	11,235	10.33	69.0	Ten stamps only (no power) (Hard ore).

The average of ore milled for the last eleven years has been $7.11 per ton.

No attempt was made to keep detailed mill records previous to 1909; or, if so, they were lost. The work then outlined was to carry the mill-level tramway into the hill, following the surface excavations and thereby providing mill holes from which the "manta" (covering) could be drawn off in cars. Prospect pits were dug in front of the trend of the most highly mineralized area, but in the main the operations were directed by the foreman in charge panning his dirt daily, and guiding his laborers into anything assaying more than $5, and away from anything less. In the strict sense of the word, miners were not employed nor needed. All ore to the mill was from open surface benches, from which the dirt was barred down and shoveled into cars to the mill holes. At times 25 per cent dynamite was used in 1¼-in. holes churned to 10- or 12-ft. depths to break up the benches.

High Cost of Power vs. Low Labor Costs

The pay dirt made up by the oxidation of the surface rock to a depth of about 20 ft. was easily broken in Huntington mills. The greatest difficulty was experienced in attempting to pass the always wet dirt or mud through grizzlies, to eliminate any hard oversize not suitable to the Huntingtons. Labor was cheap, and there was a merited aversion to mechanical equipment, particularly because of limited and expensive power. Furthermore, it was recognized that an entirely different mill would be required for the harder unoxidized ore, and plans were under way for a modern plant of stamps and tube mills. Accordingly, there was little attempt at refinements or betterments. The additions made were all for the purpose of testing the comparative merits of stamps and ball mills, and trying out pebble mills under different conditions.

The extraction secured by amalgamation has doubtless been uniform throughout the period of operations. The results reported in Table II are complicated by the difficulty of obtaining consistent assays, and by the variable personal factor of four different superintendents. Taken day by day, the tailing assay will vary

by 100 per cent, but by the end of the month the average will settle down to normal. On oxidized surface ores the extraction ranges from 60 to 70 per cent, and in 1920, on hard unaltered ore—and similarly for the whole of 1919—the average extraction is taken at 70 per cent.

A serious effort was made in 1914 and 1915 to reach a satisfactory determination of extraction, with the following result, the "apparent" extraction being calculated from head and tailing assays, and the "actual" extraction made up from tailings assay and bullion returns:

TABLE III. TABULATION OF MILL EXTRACTION BY AMALGAMATION

1914	Extraction—Apparent	Extraction—Actual	1915	Extraction—Apparent	Extraction—Actual
Jan.	69 70	65 38	Jan.	63 54	64 43
Feb.	62 20	65 50	Feb	54 54	57 63
Mar.	63 67	68 27	Mar.	66 66	60.00
Apr.	68 13	63 80	Apr	51 75	57 55
May.	51 02	57 96	May.	68 03	63 98
June	63 01	64 42	June	40 12	62 28
July	54 54	58 73	July	66 02	66.58
Aug.	51 78	54 69	Aug.	55 55	59 04
Sept.	60 71	60.00	Sept.	46 55	54 78
Oct.	58.93	57.64	Oct.	63 97	62 82
Nov.	55 53	63 91	Nov.	63 29	57 54
Dec.	72 97	67 06	Dec.	46 80	62.20
	Average for year, 63 per cent.			Average for year, 62 per cent	

In 1912, a serious attempt was made thoroughly to groove the exposed open cut and to sample regularly over 5-ft. sections. So much has been said and written about sampling gold mines, and of the propriety of resampling when erratic neighboring assays are returned, that Table IV is submitted as interesting. The management is convinced that a resampling and reassaying of the same territory would not check any one particular 5-ft. section, and that there would be individual variations of over 100 per cent, but that, in the final averaging of five hundred assays, the results might check satisfactorily.

Actual mill tests with ten stamps over a period of thirty days' running have been found to be the only reliable method of ascertaining mass valuations. Of the complex results reported in Table IV, the average of exposed ore assayed was $6.50 per ton. Taking the final result of eleven years' milling throughout this same territory, and adding the tailing assays to the mint returns, the feed to the mill shows a value of $7.11 per ton, which is an apparent variation in favor of actual results, over those obtained by mine sampling, of 10 per cent.

TRANSPORTATION METHODS AT LA LUZ AND LOS ANGELES ARE PRIMITIVE ALTHOUGH EFFECTIVE

All that can be said of the results indicated, and of the value of deductions from monthly returns, is that the record is a remarkable demonstration of the law of averages, and that over a period of time the figure will be approximately 60 per cent. The average of all data over nineteen years is 66 per cent. It has been impossible to obtain evidence that the oxidized ore yielded a higher extraction than does the unoxidized part.

The deduction is drawn that the gold is metallic, and that surface oxidation only alters the mass rock, without affecting the gold.

To determine a satisfactory mill-head assay, or a basis for the valuation of the ore in place, has been difficult. With metallic gold erratically distributed in any single cubic yard, it has never been possible to make the final subdivisions sufficiently accurate to check assays, even on the same general sample.

Pyrites Free From Gold

The ore occurs in a highly fractured contact-metamorphic limestone with intrusions of basic porphyry and monzonite porphyry, the mass highly altered and having been subjected to repeated crushing. It is unusually low in sulphides. The most highly iron-stained gossan at one edge of the open cut contains no pay gold, and pyrite in the ore mass is not welcomed, as it indicates absence of valuable minerals.

TABLE IV. TABULATION OF GROOVE SAMPLING OPEN-CUT IN 1912

(Each sample over five feet)
Assays in Dollars per Ton

Groove No.		Average
	Block 1	
1	$0.80–tr.–1.60–2.40	$1 20
2	$1.60–1.20–20.40–2.00–0.40–2.00	4 60
3	Tr.–2.40–4.00–5.20–6.00–4.80–4.00–5.20–6.80–9.20	4 76
4	$2.80–4.80–3.20–2.00–0.80–8.80–4.00–12.80	4 90
5	$1.20–4.40–8.40–6.00–12.00–7.20–4 80–5.60–2.80	5 82
6	$3.60–6.40–4.00–7.60–8.00–2.00–0.40–4.00	4 50
7	$8.40–2.40–1.20–5.20–2.00–7.20–5.60–6.00–4.60–3.20–2.00–6.40–7.20–4.00	4 67
8	$4.80 2.80–18 00–38.40–13 60–2.40 2.00–2.40–3.20–14 40–6 80–5 60	9 53
9	$2.40–10.40–2.40–2.40–5.60–5 26 4 40–3.20–1.60–6.00–5.60–0.40	4 14
	Block 2	
1	$3.20–0.80–0.80–2.00	$1 36
2	$1.20–3.60–5.60–4.80–2.80	3.60
3	$0.80–3.20–0.40–0.40–3.60	1.68
4	$0.40–18 40–0.40–0.40–tr	3 92
5	$0.40–0.80–2.00–0.40	90
6	$2.40–2.00–4.00	2 80
	Block 3	
1	$8.80–4.00–2.40	$5.06
2	$16.00–7.20–8.80	10.66
3	$2.80–4.00	3.40
	Block 4	
1	$5.20–5.60–4.80–4.80–3.20–0.80–2.40	$3 83
2	$6.40–13.60–tr.–1.60–8.00–4.00–2.00–4.00	4 95
3	$2.40–0.80–14.40–3.20–1.60–2.80–3.20	3 95
4	$2.40–1.60–8.40–8.80–2.00–3.20–3.60–1.20	3 65
5	$1.60–2.80–3.60–6.40–0.80–6.40–3.20–1 60–5.20	3 51
6	$0.80–1.60–2.00–6.00–5.60–12.00–0 40	4.06
7	$4.80–1.60–3.60–5.20–3.20–2.40–3.20	3.43
8	$10.80–3.20–16.00	10.00
9	$4.00–2.80	3 40
10	$4.00–2.80	3.40
11	$2.00	2.00

Block 5

Groove No.		
1	$5.20-4.00-12.00-20.00	$10 30
2	$3.60-4.40-12.00-tr.-6.00	5 20
3	$8.00-8.00-6.00-12.80-14.00	9 76
4	$4.40-6.00-1.60-11.60-4.00-10.40-13.20-10.00-2.40-16.40-3.20-5.60-7.20-5.20-3.60-2.00-2.40-2.40	6.10
5	$4.40-8.00-17.60-6.40-8.80-17.60-7.20-3.60-3.20-6.40-7.20	8.44
6	$0.80-14.40-6.80-6.40-9.20-8.00-5.60-12.00-22.80-3.20-6.80-4.00-2.80-1.60-0.80	7.01
7	Tr.-18.80-12.00-2.40-4.40-3.20-4.80-2.00-0.80	5.38
8	Tr.-10.40-8.00-14.80-7.20-0.80-4.80-1.60-0.80	5 38
9	$8.80-11.20-7.60-2.80-19.20-13.60-6.80-4.00-3.60-1.60	7.92
10	$4.80-21.60-14.00-2.40-2.80-9.60-4.00-1.60	7.60
11	$9.60-9.60-24.00-26.00-10.40-7.20-3.60-0.80	11 40
12	$0.40-0.80-12.00-13.60-12.40-11.20-2.00-20.00-48.00	13 38
13	$20.00-4.00-1.60-2.00-2.40-11.60-2.40	6 28
14	$12.00-24.80-5.20-4.00-2.40-5.20-1.20-3.20-0.40	6.50
15	$12.80-26.80-16.00-32.00-6.40-4.80-3.60-8.80-28.00	15 47
16	$8.00-4.00-13.60-15.20-34.80-9.20-8.00-18.40	13.90
17	$8.00-1.60-5.60-7.60-10.00-41.20-15.60-38.40-14.40	15.82

Block 6

Groove No.		
1	$0.20-1.60-1.20-16.00-2.00-18.00-4.00-4.00-12.40-4.40-4.80-12.40	$6 75
2	$8.00-8.80-5.60-6.40-20.80-6.40-5.60-1.20-6.00-1.60-0.80-2.00-6.40-6.00-1.60-10.00-3.20-1.60-4.00-5.60	5.38
3	$7.60-3.20-4.80-4.40-2.40-3.20-4.00-4.80-5.60-5.20-3.60-6.40-2.00-0.80-3.60-4.00-3.60-4.80-1.20-14.40	4.26
4	$4.80-12.00-1.60-2.40-2.00-tr.-tr.-10.40-2.80-3.20-3.20-1.60-9.60-0.40-8.00-3.60-5.20-4.80-9.20	4.92

Block 7

Groove No.		
1	$20.00-3.60-4.00-3.20-8.00-4.00-2.40-2.80	$6.00
2	$6.80-4.00-3.60-4.00-2.60-11.20-6.80-3.20-12.00-7.20	6.24
3	$3.20-1.60-2.40-1.60-tr.-3.20-8.00-2.80-11.20-8.80-8.40	4.66
4	$3.40-6.00-2.40-2.00	3.45
5	$2.00-1.20-2.00-1.60	1.70
6	$4.40-4.00-1.60	3.32
7	$3.60-1.20	2.40
8	$4.40-2.40-0.80-3.20	2.70
9	$1.20-2.40-3.20	2.27
10	$4.00-9.60-1.20-2.40-2.00-4.40	3.93
11	$8.00-0.40-tr.-1.20-1.60-4.80	2.67
12	$1.60-6.00-tr.-3.20-1.60	2.48

Block 8

Groove No.		
1	$4.80-2.40-3.20-6.40	$4 20
2	$12.80-0.40-tr	4.40
3	$0.20-2.40-18.00	6.86
4	$6.60-2.80	4.40
5	$6.00-6.60	6.30
6	$2.40-3.20-2.00	2.53
7	$2.40	2.40
8	$6.20-2.00	4.10
9	$3.60-8.00-5.40	5.66
10	$5.60-4.20-3.60-8.80	5.50
11	$4.40-4.00-5.60-8.80	5.50
12	$4.20-5.20-10.60-9.60-5.80-4.00	6.56
13	$0.40-4.00-2.20-2.00-4.40-8.40	3.55
14	$8.00-4.40-2.20-3.40-2.00-8.40-9.60-3.00-5.00	5.10
15	$0.80-3.60-8.00-6.60-6.40-6.60-2.20-2.00-2.00	4.77
16	$0.20-2.00-3.20-3.40-2.80-1.20-2.00-8.20	2.88

Block 9

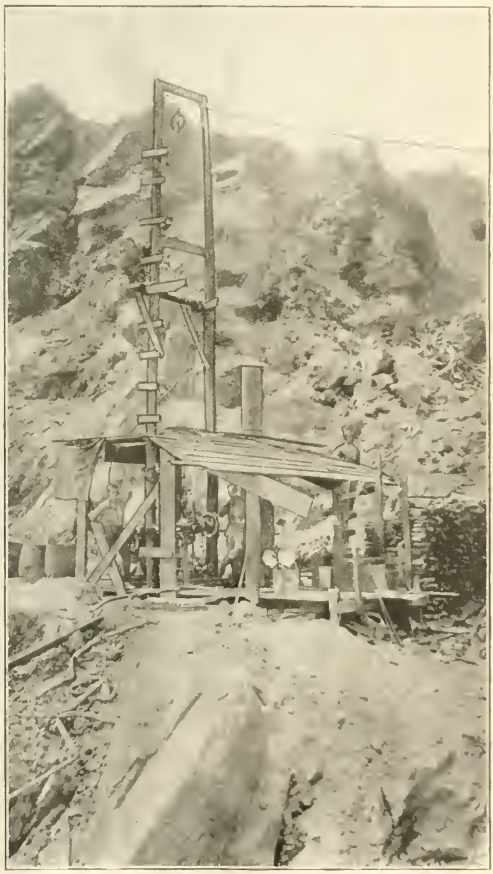
Groove No.		
1	$2.00-3.20-16.80-5.60-15.20	$8 56
2	$2.00-17.60-15.60-6.80-4.00-12.80-1.20-32.00	11.56
3	$60.00-5.20-2.40-3.20-11.20	15 00
4	$6.40-4.00-10.80-6.80-7.60-8.00	9 45
5	$19.20-32.80-9.60-7.20-2.80	14 32
6	$6.40-10.40-19.60-7.20-8.00-6.40	9 57
7	$24.80-16.80-8.00-6.00-2.80	9 73
8	$4.80-7.20-12.00-2.00-0.80	5 36
9	$6.40-8.40-28.80-8.00-4.00-1.20	9 47
10	$1.20-4.00-4.00-13.20-25.60	9.60
11	$16.80-8.80-8.00-6.00	9 90
12	$66.00-2.40-0.40	22 93

Final average of 592 assays—$6.50 per ton.

In the early operations little thought was given to developing ore in depth. The mine was extending in area, by natural growth, with a satisfactory monthly output. It was recognized in 1913 that a horizontal limit would soon be reached, and although some new tunnels have since been opened, the deposit is now practically defined in length and breadth. Three shafts were planned at 200-ft. intervals, and two were completed, but the third encountered more water than could be handled economically by windlass. This work established the impossibility of drifting at 100-ft. depth, or of sinking deeper without power for hoists, pumps, and air compressors.

The cost of steam and gasoline engines was prohibitive, as demonstrated by experience, and a proposed hydro-electric plant could not be built without a heavy investment. There seemed to be no alternative for determining ore in depth except to prospect with diamond drills. A No. 12 American hand drill was tried, and one vertical hole of 350-ft. depth proved the territory to be fair drilling rock, but with high diamond cost and slow progress. The information gained, however, was used as a basis for soliciting a contract to sink ten holes of 500 ft. each, and a bid was accepted at $3.50 per foot, the company paying the expenses of transportation and board of the men while at the mine.

The work was begun in February, 1916, and concluded in August, 1916, with about 6,000 ft. of drilling. The information gained settled many points, and demonstrated no change in the formation and a continuity of average grade of ore to the depth explored. The



PROSPECTING DRILL AT LA LUZ AND LOS ANGELES MINE

results cannot, of course, be considered conclusive, but when studied without bias they are all that could be desired.

Shattered Ground Shows Higher Mineralization

The maximum drilling progress for twenty-four hours was 88 ft. A fair average shift's work of ten hours was 20 ft. advance. In any one hole the best recovery of core amounted to 33 per cent, with the average considerably lower. The sludge samples were found to be consistently richer than the core, and in final summation were about 47 per cent higher. The

ALONG THE WATER TRAIL TO LA LUZ MINE

final cost to the company amounted to $5.26 per foot for all holes.

It is characteristic of the deposit to exhibit better gold values in the more shattered ground, and with a low percentage of core for assay in broken ground the core samples could not be free from doubt as being representative of the section. They will be accepted as a guide and justification for sinking the final working shaft.

Huntington Mills Give Good Service

Early milling operations on the decomposed surface rock were with six Huntington mills with 24-mesh screens, using approximately five horsepower each and treating, over monthly periods, an average of twenty tons per twenty-four hours. They were entirely satisfactory and well understood by native labor. On the La Luz and Los Angeles type of gold ore they are excellent inside amalgamators, and are the best possible prospecting machines for that country. When the machines became old, after service of three or four years, the repairs and renewals amounted to 16.8c. per ton, exclusive of labor and lost time.

The average of several years shows that, of the total amalgam collected, 64.8 per cent was taken from the mill wells and 35.2 per cent from the plates. Over a period of five years, the quicksilver loss has amounted to 0.0097 lb. per ton of ore milled. With Hardinge mills and plates the mercury loss has been 0.01187 lb. per ton of ore. The summation of quicksilver loss over eight and one-half years has been 0.01025 lb. per ton of ore, which amounts to 0.03324 lb. per ounce of bullion recovered.

Flotation tests are not encouraging, and flotation treatment cannot be applied to a metallic gold ore of this character. A representative sample of the unaltered sulphide ore was sent to the General Engineering Co., and it may be conclusive to give a digest of that company's report:

Test No. 1:

Ore crushed in ball mill to 100 mesh. Treated on Callow pneumatic flotation machine with an oil mixture of G.E. No. 1, 40 per cent; No. 2, 40 per cent; No. 8, 20 per cent (1¼ lb. per ton).

	Weight, per Cent	Au	Ag	Iron, per Cent	"Insol.," per Cent
Crude ore assay		0.286	0.3	6.0	44.6
Flotation concentrates	1.35	6.56	6.6	15.0	23.6
Recovery		31%	29.6%	....	...

Test No. 2:

Ore crushed in ball mill to 120 mesh. Treated on Callow pneumatic flotation machine with an oil mixture of G.E. No. 2, 50 per cent; No. 25, 50 per cent. (1 lb. per ton)

	Weight, per Cent	Au	Ag	Iron, per Cent	"Insol.," per Cent
Crude ore assay		0.286	0.3	6.0	44.6
Flotation concentrates	1.33	6.88	5.2	15.1	23.6
Recovery		32%	23.1%	....	...

Test No. 3—Amalgamation and Flotation:

Ore crushed to 40 mesh, treated direct to plates.

	Weight, per Cent	Au	Recovery, per Cent
Crude ore assay	100	0.283	
Amalgamation tailings	100	0.063	
Amalgamation extraction	...	0.22	77.76
Amalgamation tails crushed to 120 mesh in ball mill, treated in Callow pneumatic flotation machine, with oil G.E. No. 2, 50 per cent; No. 24, 50 pe. cent (1¼ lb. per ton).			
Flotation concentrates	2.28	1.26	10.15
Total recovery			87.91

(N.B.—Concentrate is not a shipping value.)

Test No. 4—Flotation and Concentration.

Ore crushed in ball mill to 80 mesh, treated in Callow pneumatic flotation machine, using sodium sulphide (2 lb. per ton), with an oil mixture of G.E. No. 1, 40 per cent; No. 2, 40 per cent; No. 8, 20 per cent. (1¼ lb. per ton).

	Weight, per Cent	Au	Ag	Iron, per Cent	"Insol.," per Cent
Crude ore assay		0.286	0.3	6.0	44.0
Flotation concentrates	3.59	2.24	4.4	14.6	28.6
Recovery		36.7%	45.1%		
Flotation tailings sent to table concentration					
Table concentrates	2.56	4.61	3.9	16.4	38.4
Recovery (table)		53.8	28.5		
Combined concentrates	6.15	3.2	4.2	15.3	32.0
Total recovery		90.5%	73.6%		

(N.B.—Concentration 16 to 1; product not a shipping value)

Test No. 5—Amalgamation, Flotation and Concentration:
Ore crushed to 80 mesh, treated direct to plates.

	Weight, per Cent	Au	Ag	Recovery, Au, per Cent
Crude ore assay	100	0.286	0.32	
Amalgamation tailings		0.137	0.16	
Amalgamation extraction		0.148		51.77
Amalgamation tailings emulsified with No. 2 Na_2CO_3, and No. 2 Na_2S and oil mixture of G.E. No. 8, 50 per cent; No. 132, 33 per cent; and G.E. No. 2, 17 per cent (1½ lb. per ton); treated in Callow pneumatic flotation machine.				
Flotation concentrate	5.86	1.19	1.9	24.38
Flotation tailings sent to Wilfley table				
Table concentrates	1.30	3.82	3.4	17.36
Total recovery				93.51%

(N.B.—Combined concentration 13.96 to 1; and product is nnt a shipping value)

The concentration and flotation tests are valuable only by elimination. Other mines near La Luz and Los Angeles would not necessarily have similar experience, but the record is published as a guide against anticipating merit in flotation on similar neighboring ores.

Cyanidation tests have been made and checked. In 1912 the Henry E. Wood Ore Testing Co. made a careful examination of ore and tailings sent to them, with the following conclusion:

(a) Treatment of actual mill tailings after amalgamation, which had passed Huntingtons with 24-mesh screens: As received, the tailings were separated into "sands" and "slime," and each subjected to normal percolation or air agitation, with a final combined recovery of 83.6 per cent.

(b) The same material reground in tube mill to pass mechanical classification, and treated in Pachuca tank with air agitation, gave (tailing assay, trace gold) plus 98 per cent recovery.

More modern tests were made in 1916 on true sulphide ores as then uncovered, with the result shown on the chart.

The ideal treatment for this ore is amalgamation and cyanidation, but considering the simplicity of direct cyaniding, and the greater security of the recovered metal, the decantation treatment in weak cyanide solution will probably be installed at the La Luz and Los Angeles mine.

When in 1916 it became necessary to break into the harder ore below the surface "manta," the original Huntington mills were found to be inadequate. The vibration, wear, and tear were so excessive that all Huntingtons were finally abandoned.

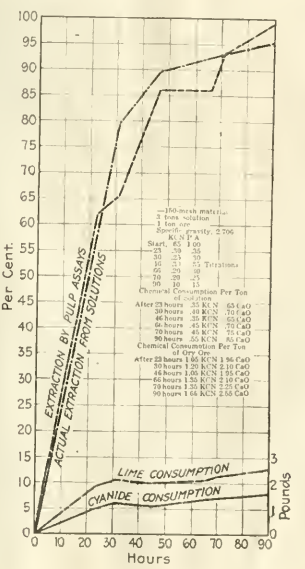
Production was never stopped, and the present half unit of a new milling plant was erected over the old mill. Five 1,050-lb. stamps on concrete foundation were first put in, crushing to 4 mesh and delivering to several Huntingtons, but the latter could not be adapted to the ore.

Stamps Retained, Because of Lack of Comparative Data

The stamps were increased from five to ten for fine crushing to minus No. 421 ton-cap screens, direct to plates. Inside mortar amalgamation was attempted, but was discontinued. With a larger milling plant in view, it was desirable to test the ore under working conditions with a Hardinge 6-ft. ball mill in competition with the ten stamps. Several factors could not be isolated to decide definitely the respective merits, and without substantiating figures it was decided to retain stamps. During the war period, a good supply of balls was not to be obtained, and the mill could not be operated with a fair full charge of metal. On a soft ore the Hardinge ball mill would take all the tonnage that could be delivered through a 6-in. feed scoop; but with no adjustment would it deliver a finished output under the conditions stated.

Using the ball mill in a closed circuit with an Akins classifier was tried, but with soft feed and sand return the ore charge did not offer sufficient resistance to the balls, with the result that the liner wear was excessive and renewals were abnormal. During a period when balls were not at hand, an attempt was made to use scrap iron of discarded Huntington mill roller heads, or pieces of 4-in. shafting, cut to 6-in. lengths, or the necks of stamp-mill shoes. With hard ore this material was not satisfactory, and there was a noticeable decline in the capacity of the mill when anything but round steel balls was used.

In this period one 8-ft. Hardinge pebble mill was installed to take the product of stamp mills at 4 mesh, together with the output of the ball mill in its office of a coarse crusher, using an Akins classifier ahead of the pebble mill. The 8-ft. Hardinge pebble mill delivered a finished product, without further classification, direct to the plates. Although not orthodox, the practice seemed to show the best results in this particular instance. Some slight oversize would show on the plates, but inasmuch as it was of low tailing assay, the mill could be crowded to a higher tonnage output per horsepower than could have been done in a closed circuit.



TESTS ON LA LUZ SULPHIDE ORES

The situation was complicated by power costing $750 per horsepower-year, with, moreover, not sufficient engine capacity to run a second 8-ft. Hardinge pebble mill to test a closed circuit. With ten 1,050-lb. stamps at 100 drops per minute, and one 6-ft. ball mill at 27 r.p.m., and two 8-ft. pebble mills at 26 r.p.m., the plant could not be run to speed with 200 hp. The driving pulleys on the two pebble mills were increased to reduce their speed to 20 r.p.m. each, and the advantage was at once apparent in reducing the power to less than 200 hp., and within easy limit of the engine capacity, with no apparent lessening of the mill tonnage. In net result the plant attained a maximum output of 250 tons per day, and an average, for thirty days, of 210 tons. The net mint production was raised from 1,200 oz. per month to an average of 1,500 oz., with a maximum thirty days' run of 1,700 oz. bullion output.

The 8-ft. x 36-in. pebble mills used mine rock in place of imported pebbles. In the mine are small patches of hard, close-grained flint or chert, which, when

sorted out, generally gave an assay of $3 to $4.50 per ton. This material was shot down and selected in blocky pieces of five to six inches, delivered to a special mill bin, and was charged out on the reports as ore. It was thrown into each pebble mill by hand from a car on a track above the mill. A rough four-side iron chute of ½-in. plate iron as a gooseneck was so secured as to project the stones directly into the pulp-discharge end of the Hardinge, and did not interfere with the free discharge of the finished pulp. It was the work of one man per shift to feed two mills, cobbing the irregular stones to size to enter the mill. Of the total mill tonnage the rock used to form pebbles amounted to 4.3 per cent, or 86 lb. of rock to the ton of ore treated.

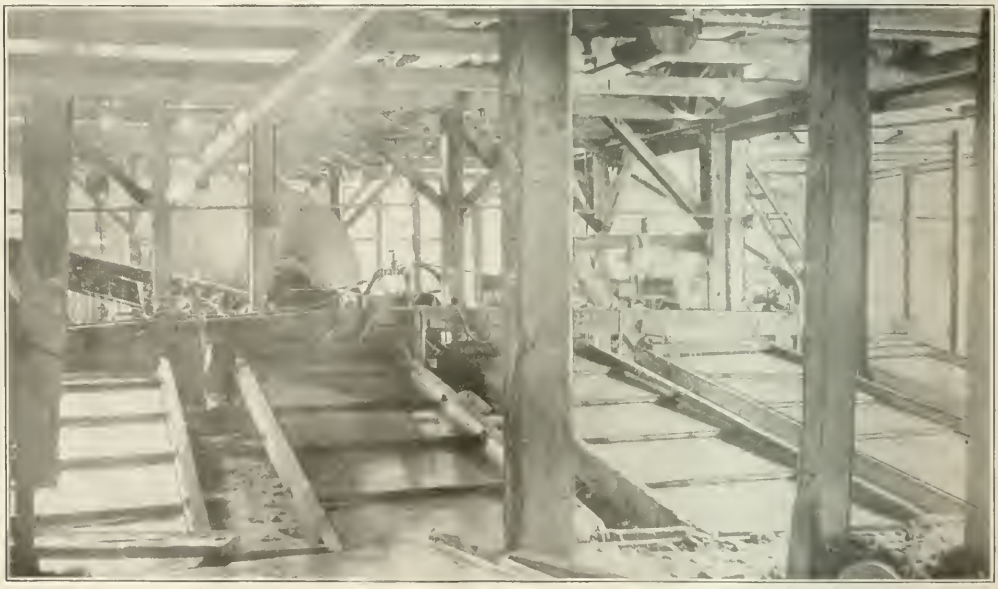
With the pebble mill running in open circuit, delivering a finished product, the practice developed of making a very wet discharge direct to the plates. An excess of water permitted a classification in the mill that held back the oversize.

The second 8-ft. Hardinge mill was installed in 1918 for either open or closed circuit. This unit takes 4-mesh product from the ten stamps, and, operating in closed circuit with a 48-in. Akins classifier, the work is done at about eighty to ninety tons per twenty-four hours on hard ore. At this point the stamps are operating about to capacity, unless the ore can be crushed finer than 2-in. to 2½-in. size; and the Akins classifier return to the Hardinge is about the limit of the classifier blades. Any greater tonnage would necessitate doubling the classifiers, and doubtless require the use of steel pebbles in the Hardinge, with, of course, more power consumption.

The mining districts of the east coast of Nicaragua are all in tropical jungle. Growth is phenomenal. A telephone line, built a few years ago, is now a continuous row of growing trees, starting from the original poles. Naturally, this wood is worthless as fuel or timber. In the older growth are scattered trees of superb hard wood and sufficient soft wood, as cedar and mahogany, for normal building purposes, but no new mine prospect can depend on wood fuel in quantity to maintain a boiler plant of over 25 hp. Also, for mining work, the hard grades cannot be excelled for underground timbering, for shafts or drifts, but it would be unwise to count on square-set stoping timbers, except as they might be brought in from the lower coast savanna pines.

Naturally, hydro-electric power is the only solution for mining work, and it can be developed for all the districts if capital is invested. No development in depth can be obtained to show mining stability without considerable power for hoisting, pumps, and compressors. A vicious circle is established, in that no company can be fully warranted in building an expensive first-cost power installation until the mines are developed to show stability.

With a receding wood supply at the La Luz and Los Angeles mine, a 25-hp. gasoline engine was first installed, which gave satisfaction but with high fuel costs. Gasoline was imported from New Orleans at a freight cost of 50c. a gallon. To combat the rising cost of gasoline, a 50-hp. Diesel engine for crude oil was tried out in 1915. The experience over a period of twelve months was costly. From day to day practically every casting in this engine was broken, until a decision was reached to meet the local conditions with an engine that the labor could understand. In 1917 a 150-hp. vertical three-cylinder engine, built to burn distillate, was successfully installed, and by using the light distillate fuel in the Diesel engine no further running trouble was experienced.



INTERIOR OF PRESENT MILL AT LA LUZ

With the swollen prices and freight rates during the war period, and to date, even these engines are impracticable except as expedients to develop the mines to a point where they will warrant hydro-electric plants. The table indicates the power source and the cost per horsepower-year:

POWER IN 1913.

	Per Cent Used	Cost per Hp. Year
Gasoline	22.99	$606.48
Steam	17.36	581.13
Water (Pelton wheel)	59.65	141.06

Wood, five cords per 25 hp. day—$5.20 per cord.
Gasoline, 50 gal. per 21 hp. day at $0.75

Power Costs in 1918

Using a 150-hp. Fairbanks Morse engine and a 50-hp. Diesel engine (distillate), to secure an average of 200 hp. per day, the combined consumption was 350 bbl. of distillate per month, at $0.74 per gallon. The cost per horsepower-year was $777. With the distillate engines the cost per ton of ore milled was $2.16, a most abnormal charge.

With a rainfall of about 120 in. per year concentrated in six months of the season, the trails and roads are bad. The mine freight is carried by river in pitpans for 175 miles, to within five miles of the mine. Mule-back haulage is used to some extent, but the more accepted method is by pack oxen, which, unshod, are better able to navigate the swampy roads. Loads were formerly limited to 150 lb., but with the development of mud sleds the largest piece yet handled was an engine base weighing 5,000 lb. Any necessary part of reasonable weight can be transported. Freighting may be variously estimated as follows:

	Per Ton Mile	Limit
Women carriers	$2.00	80 pounds.
Pack oxen	4.00	150 pounds.
River pitpans	0.25	5,000 pounds.
Coast schooners	0.07	5 tons.

Government control is excellent, and the officials are courteous and efficient. There is no record with this company of the oppression or graft so commonly charged against many of the struggling Central American republics. Strikes are unknown, and theft is rare. Revolutions have occurred in Nicaragua, but the La Luz and Los Angeles mines have not been molested or threatened.

There is a nominal tax of $0.40 gold per year per hectare mining claim. On timber and grazing land the tax is $0.16 gold per hectare. A separate and additional tax of $5 gold per $1,000 invested capital is collected on all property, stores, supplies, and accounts. Bullion exported is taxed at $17 per kilogram of pure gold, the assessment being made subject to final mint returns. On the La Luz and Los Angeles bullion, running about 830 fineness, the export duty amounts to approximately 3.12 per cent, or $0.53 per ounce of bullion.

Wild Tales From the Hills

Possibly the premier assay ever reported came from the old Black Warrior mine, in the Bradshaw Mountains of Arizona, back in the days when silver was worth just a bit above a dollar an ounce. It reported a silver value of $30,000 a ton, or a little more than the solid metal would have then been worth. On a par with this is the tale of the California pioneer who boasted that when he was express agent in one of the early camps he often shouldered and dumped into the daily stage a sack that contained $100,000 worth of gold dust—a load that a pack mule could not carry.

Hand vs. Machine Development

By G. L. Schmutz

Written for *Engineering and Mining Journal*

THE data here given in the tables covering comparisons between hand and machine development were obtained from one of the largest mines in the Southwest. The total amount of footage used in computing averages applies respectively to the years 1917 and 1918. The rock encountered in the development was principally latite, andesite, and monzonite. The average wage of labor per day was $2.

TABLE I. AVERAGE DEVELOPMENT COSTS PER FOOT OF ADVANCE

	Drives		Saving Hand Over Machine	Winzes		Saving Hand Over Machine
Year	Hand	Machine		Hand	Machine	
1917	6 93	9 71	2 78	8 31	11 22	2 91
1918	7 38	8 89	1 51	8 33	10 88	2 55

	Raises		Saving Hand Over Machine
Year	Hand	Mach.	
1917	6 96	7 55	0 59
1918	6 83	7 42	0 59

Estimated Saving for All Hand-Driven Development

Year	Footage of Machine Drives	Hand vs. Machine Saving	Savings in Drifts	Footage of Machine Winzes	Hand vs. Machine Saving
1917	10,982 50	$2 78	$30,531 35	1,445 0	$2 91
1918	11,332 50	1 51	17,112 07	165 5	2 55

Year	Saving in Winzes	Footage of Machine Raises	Hand vs. Machine Saving	Saving in Raises
1917	$4,204 95	9,893 5	$0 59	$5,837 16
1918	432 22	10,206 0	59	6,021 54

TABLE II. PERCENTAGE DISTRIBUTION OF FACTORS ENTERING INTO DEVELOPMENT COST

	Drives		Winzes		Raises	
	Hand, Per Cent	Machine, Per Cent	Hand, Per Cent	Machine, Per Cent	Hand, Per Cent	Machine, Per Cent
Labor	67	49	72	45	71	52
Explosives	27	38	24	40	24	35
Forge and drills	6	13	4	15	5	13
Totals	100	100	100	100	100	100

The figures given in Table I indicate that, at this mine, hand is considerably cheaper than machine development. However, there are instances wherein this difference in cost must be sacrificed for speed. Some of the advantages accruing from the practice of running development by hand rather than by machine are as follows: A smaller cost per ton of ore extracted chargeable to exploration and development; employment can be given to more men; less water is required for machines; less power is required for compresors; there is less dust.

[Cost comparisons of hand and machine drill work are not numerous, as, under the wages which have ruled in the Western states, there has been little inducement to employ all hand labor. Each increase in output per unit of labor has been won at additional expenses for power, lubricants, and overhead where mechanical equipment is employed. There is a point where the increased costs, when superimposed on a given labor wage, increase the unit cost of the work. Increased wage rate makes it possible to add such increased charges in greater proportion without increasing unit costs as compared with hand work. Mr. Schmutz's labor cost of $2 per day, and his comparative unit costs for development work, indicate that with labor at this wage, unit costs are increased by machine drilling. With labor at $4 per day, the unit costs would be lower in the case of machine mining than with hand labor with the same wage.—Editor.]

Investing in Mining Prospects

Chances for Success Are Gaged Largely by the Business Ability of the Personnel, Sufficient Finances, the Manner in Which the Property Is Operated, and the Presence of Ore in Paying Quantities

By Kirby Thomas
Written for *Engineering and Mining Journal*

THE risks of investing in any business enterprise at its inception, or in its first stages, are greater than in the later stages, when the undertaking is established and perhaps earning a profit. This is true with mining ventures to a greater degree than with most other commercial or industrial undertakings. There are, too, certain features in connection with all mining investments, increasing this risk, often not duly considered by the prospective investor, who, at the time of investing, is likely to be under the spell of the mine vender or the stock salesman and self-blinded by the promise of a large gain in the transaction.

It is seldom that mineral deposits are found which can be determined without much expensive labor to be of sufficient commercial value to justify a mining operation. A mineral deposit the extent and value of which are unproved is termed a "prospect"—an obvious designation. The value of a prospect is difficult to measure, and its profit possibilities, if there be any, are latent. It is in this prospect stage that much money is lost in mining, not only by investors but by skilled and experienced miners and engineers.

The Risk of Investing in a Mine Prospect

A prospect mining venture is essentially and inherently hazardous. The mining engineer and the mining man will not deny this; in fact, they recognize it by offering to the investor a large interest at a low figure, or by associating with others in the cost of the development, so as to divide the risk. This great risk is evidenced, also, in the low price of the shares in prospecting and developing companies. There is a chance either of a failure and total loss, or of a success which may mean a many-fold gain for all.

If the investor goes into prospect mining with his eyes open to the risks, which risks he takes for the chance of the great gain expected, no blame should be attached to anyone if a loss ensue. However, because of the great physical risks in a mining prospect, proper business precautions should be taken.

Securing a Clear Title Essential

The first consideration is the title. It should hardly be necessary to mention such an elementary matter, but the fact is that mining-stock investors often have no knowledge of and make no inquiry as to the title under which the company holds the property. Mining property in the Western United States and in Mexico may be held under "location" or "denouncement"—that is, the title is in process. Companies frequently offer stock when the title to their properties is in this stage. Ordinarily, this is reasonably safe, but there is a chance of the full title failing to issue on a technicality or an irregularity. Therefore, it is best for the investor to insist upon the protection of full fee title to the property, or upon a guarantee, or to hold a "string" on his money until the title is perfected—ordinarily a matter of a few months.

Many stocks are sold by companies which hold their properties under a form of contract, customary in the mining business, known as a "lease and bond." The owner gives to the company, or to the promoter, a lease with the right to develop and operate the property for a given period, usually one or two years, and an option to purchase for a stipulated price and terms during the period of the lease. The purpose of this negotiation is self-evident. The purchaser of the property has opportunity to prove to his satisfaction that it is worth the price.

Ordinarily, it is stipulated that development and exploration shall be done. This form of contract is sound, and is usually resorted to by experienced men in negotiations for undeveloped and unimproved properties. On the other hand, the mining investor is often unfamiliar with the business risks involved in a lease and bond proposition. The investor often does not know that the property, encouraging reports of which may be before him, does not belong to the company offering him its stock, and this fact is sometimes not impressed upon him unduly. He does not know that should the expensive work that is necessary, part of which he is to pay for, prove the property to be of value, the company must then pay many thousands, or a million or more, for the property; and he does not consider that if the prospect should prove to be very valuable, his associates in the transaction may not be financially able to complete the deal, or the conditions of the negotiation may be such that the money to purchase the property cannot be raised.

The investor who goes into a company which owns only a contract or a lease on a mine should recognize that, aside from taking the usual physical risks of mining, he is taking, also, great business risks in respect to the ability of his company, or of its backers, to carry out the terms of the contract and acquire the property for the company.

In the purchase of a stock interest in a property held under lease and bond it should, however, be borne in mind that if the company can raise enough money to prove up the property, and to give it a measurable value greater than the contract price, the transaction is reasonably safe within itself, for even though the first investors may not be able to raise the purchase price, there is always a market for developed and proved mining properties.

Usually, in a prospect mining proposition the owner takes a part of the stock of the company in exchange for his property, the remaining stock going mostly into the treasury of the company, to be sold for development purposes, and thus make all the stock valuable. The prospective investor should inquire as to the proportion of the issued stock which the owner receives, and

also what part certain intermediaries, called promoters or stock agents, acquire as their profit. There is no set rule or guide as to how much stock should be issued for the property, but the amount and all conditions should always be critically considered.

Other primary points in a prospect mining investment relate to capitalization of the company and the amount of stock in the treasury. If an investor purchases mining stock which is not from the treasury of the company, he is simply making a trade. If he purchases stock from the company's treasury, his money goes to his company and is, or should be, used in making his property more valuable. Consequently, other things being equal, it is more advantageous to buy treasury stock than individual stock, a matter often overlooked. The number of shares in the treasury is vitally important, for if there is only a small amount of treasury stock the company may have difficulty in raising the money needed for the development and purchase of the property, and to borrow on company notes or bonds is ordinarily, for evident business reasons, not practicable in the development or management of prospect companies.

Avoiding the "High Commission" Stock

Extravagant impositions in the form and guise of commissions to the stock salesman, brokers, and intermediaries for raising the funds often accompany mining flotations, and this point should be scrutinized carefully. Often the investor considers the stock on its own merits, without inquiring as to what part of the dollar which he pays is to go into his property. In some notorious instances the cost of raising money for mining enterprises has been from 50 to 90 per cent of the sum obtained—a condition obviously and glaringly wrong from a business standpoint, and a forerunner of failure of the enterprise saddled with such incompetency or dishonesty.

In financing a prospect mining company it is customary to pool the owner's and the promoter's stock. The stock investor should usually insist on such an arrangement, and should know of the details of the pool agreement. If the owner and the promoter cannot sell any of their stock until the mine is profitable, they are likely to have a lively and continued interest in the success of the undertaking, and such a plan makes them carry the full risk along with the man who furnishes the money. The pooled stock, too, is taken off the market, and thus the financing is easier and surer.

Carrying a "Padded" Directors' List

The mining-stock investor is often influenced by the eminent respectability and high financial standing of the board of directors, but he should bear in mind that sometimes bankers, lawyers, and others lend their names to mining corporations without first having thorough knowledge of the undertaking, and that they sometimes do not give the attention to the business which is morally, at least, incumbent upon company officers. Not infrequently fine-feathered directors have been given their stock free for the use of their names.

A mining-stock offering should always be accompanied by a report from a disinterested mining engineer or other competent expert. Statements by the owner or the agents should be designated as "venders' reports," as is the British practice. Mining reports are not infallible, either as to competency or integrity. The reputation and experience of the man making the report is always a wise and proper subject for inquiry. Most reports on prospects are opinions only, and should be taken as such. The prospective stock buyer should study the reports and weigh the facts and conclusions in all their bearings, for manipulation of reports by overzealous venders is one of the tricks of the business. If the technical parts of the report are beyond the knowledge or experience of the investor, he should consult some one with mining experience, or, better, seek directly the advice of a mining engineer in good standing, as he would consult a lawyer in any other business transaction.

Unscrupulous Promoters Prone to Exaggeration

Outward evidences generally indicate unsound companies to a wise and wary investor. Promises of immediate dividends from a prospect, extravagant claims and incomplete or misleading statements about the property, announcement of arbitrary stock advances, suggestions of philanthropy in the promotion, failure to present essential points, evidence of lax business methods or of financial incompetence, claims of the discovery of wonder-working ore processes, positive valuations of the undeveloped, and hence unknown, orebodies—these and other equally axiomatic indications of incompetency or dishonesty should automatically protect the public; but unfortunately they do not.

The purchase of stock in a mining prospect company is not an investment in the sense that the transaction may be expected to result in early regular dividends, but it may be, nevertheless, a good business speculation, and may become a source of profit. There is the chance for profits during the development period from the enhanced price of the stock as the prospect development progresses, and, of course, always the expectation that sooner or later the prospect will be a mine, and then the stock will have an intrinsic value many times greater than the price paid. Mining stocks are often bought solely on the chance that the price will rise or be raised, and that the holders can unload at a profit. This is a speculation, and is in the same class as speculation in stocks or with the markets.

Causes of Failure of Mining Investments

The chief cause of loss of investments in mining prospects is the failure to find valuable ore in commercial quantities. Not one in a hundred of the discoveries of outcrops or mineral indications which attract the prospector finally develops into a mine. Generally, the limited work of the prospector or of the owner determines this, and the "discoveries" die a-borning. Often a little work will give hope and encouragement and some definite facts as to the mineral conditions. The prospector comes to have faith in his property, the mining man thinks that it will make good, and the engineer makes a favorable report on it as a prospect. At this stage the proposition is likely to be offered to the investor, either in the form of an interest or as stock in a company, as usually much more money is needed than the owner has or can afford to risk.

Provision of sufficient funds for the company at this stage will not, however, insure success. The business must have honest and competent management, and probably, also, technical engineering guidance. The company must be financially able to carry out the necessary explorations and developments. These essential factors

for success being all favorable, there is reason to expect a profitable investment, barring, of course, the inherent physical risk of there not being enough valuable ore in the property to make a paying mine.

Mining Should Be Regarded as a Specialized Business

It should hardly be necessary to caution a business man as to the wisdom and necessity of skilled, competent management. Yet many mining companies, particularly those engaged in making mines from prospects, are woefully mismanaged, chiefly for the reason that many persons do not recognize the fact that mining in nearly all its phases is an intricate, specialized form of business activity, requiring special experience and technical training, as well as a high order of business ability and energy.

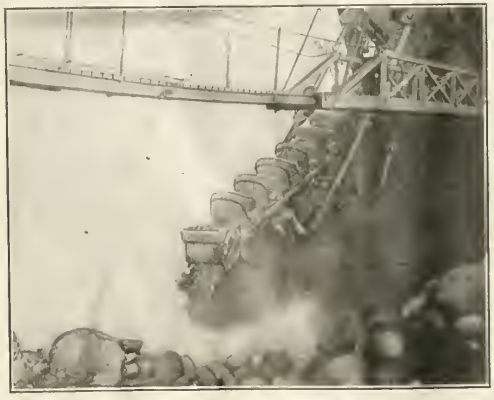
Most prospects require much more money to prove than the sanguine owner or promoter expects, or the stock buyer is led to believe. Lack of sufficient capital is the cause of many failures, for rarely can enough ore be taken from a prospect to pay for its development.

All of the rich mines now operating were once prospects, in most cases not many years ago, and each year many prospects are developed into mines, making many individuals and the community wealthy. Those who are prepared to take the money risks involved, who will use hard common sense and good business judgment, and who will study the business, will find as much interest and profit in investing in mining prospects as in most other business activities—especially if they are persistent.

Bucket-Line Troubles

Written for *Engineering and Mining Journal*

A not infrequent accident in dredge operation is for the bucket line to run off the lower tumbler. When the buckets ride up on the flange of the tumbler, the lower part of the bucket line slides out of its normal position on the rollers, and if operation is continued the buckets

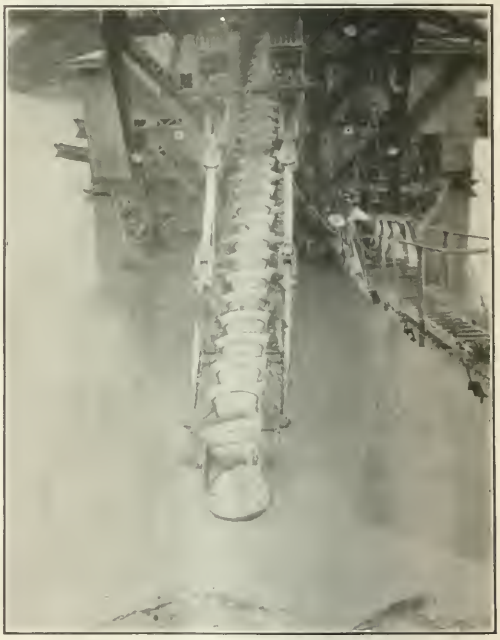


BUCKET LINE BEING SPRAGGED OVER

will ride off the lower tumbler completely. Usually the bucket line is stopped before this takes place. The ladder is raised, and the condition of the tumbler and buckets determined.

To get the bucket line back into position short sprags are inserted between the bow gantry post and the bucket line, and the buckets are started in the reverse or down direction. Sometimes spragging at the gantry will shove the bucket line over enough to get it back into the tumbler, but if the line is quite tight, spragging at the lower tumbler by placing a sprag reaching from the corner formed by the bottom of the tumbler flange and the tread up to the inside corner of the bucket bottom is an effective method of readjustment. In most cases several sprags of different length must be used before the bucket line reaches its position and the line of buckets is operated up or down, as conditions warrant.

In the illustration in this column the two lower buckets are riding the edge of the flange of the tumbler. The dredge-master is shown placing a steel bar, sprag, in the lowest position, as shown in the first illustration,



BUCKET LINE RIDING ON FLANGE OF LOWER TUMBLER

preparatory to finally throwing the buckets onto the tumbler. The sprag is secured to a rope which is made fast by the man on the bridge. Success attended this last maneuver, for, on the bucket line being slowly worked down, the buckets snapped into place with a great jar which shook the whole structure of the dredge.

The photos shown were taken of one of the dredges of the Yuba Consolidated Goldfields Co. at Hammonton, and were obtained through the courtesy of M. L. Summers, superintendent of the company.

Exportations of Iron Ore from Lorraine to Germany during 1919 amounted to 1,147,947 tons, according to *Commerce Reports*. The imports of coke into Lorraine from Germany amounted to 1,382,845 tons, and of coal 342,498 tons. These figures do not include the deliveries of coal and coke made in accordance with the application of the peace treaty.

The Salt Chuck Palladium-Copper Mine

A Unique Alaskan Copper Property Yielding Copper Concentrates Carrying Over 3 Per Cent Of Palladium per Ton—Unusual Local Geology Disclosed by Examination—Ore Concentrated by Flotation and Shipped

By J. B. Mertie, Jr.*
Written for *Engineering and Mining Journal*

THE Salt Chuck mine, formerly known as the Goodro, is about half a mile northeast of Lake Ellen and at an equal distance from the source of the Salt Chuck, at the head of Kasaan Bay, Prince of Wales Island, Alaska. Mining was begun originally on what was considered to be a low-grade copper deposit, but subsequently it was discovered that the ore was of more value for its content of platinum metals than for its copper, so that this mine is now more properly described at a palladium[1]-copper mine. It has been operated continuously since 1917, and in 1919 it employed about sixteen men.

The lode crops out at an elevation of 400 ft., upon a little knoll rising from one of the rounded ridges characteristic of this glaciated area. A few other surface outcrops have been found near by, but the general surficial configuration of the mineralized zone has not been determined, owing in part to the timber and dense vegetation of the surrounding area, but particularly to the irregular distribution of the mineralization, which gives no clew as a guide in prospecting. The ore zone however, or the zone within which the discovery of oreshoots may be expected, is believed to be at least 250 ft. wide and is thought to extend in a direction about N. 75 deg. W.

Unusual Local Geology Disclosed

This deposit, unlike most of the other commercial ore deposits of Kasaan Peninsula, occurs in an area of coarse-grained intrusive rock, which has been mapped by Wright[2] under the general designation granitic intrusives. Such intrusive rocks invade the Paleozoic sedimentary rocks of Kasaan Peninsula at many localities, occurring as small and large bodies of varying petrographic character. The normal type of these rocks is a diorite, low in quartz and orthoclase, but numerous other facies have been evolved by magmatic differentiation. In the acidic differentiates, low potassium and high soda content expresses itself through the formation of sodic granite and syenite, the chief feldspar of which is albite, in place of orthoclase, the normal type in such rocks.

Much diversification is apparent among the basic types of differentiated rocks, although few of these have been described in any detail. This differentiation is well illustrated at the Salt Chuck mine, where the country rock is in general a pyroxenite, with gabbroic and gabbro-pegmatic phases. Wright referred to the country rock at the Salt Chuck mine as a gabbro, but in his petrographic description he showed clearly that the plagioclase feldspar constitutes only from 5 to 10 per cent of the rock. It seems better, therefore, to designate the intrusive rock at the mine as pyroxenite, remembering, however, the gradual transition to the true gabbroic intrusives in this vicinity.

The chief rock-forming mineral is augite, and the subordinate constituents are biotite, iron oxides, plagioclase, apatite, and titanite, though not all of these are invariably present in any one specimen. Biotite in particular is variable in distribution, and much of it occurs as large splendent crystals. The pyroxene and plagioclase are in places much altered, the alteration resulting in the development of rocks rich in epidote and in chloritic and sericitic material.

Palladium and Platinum Found

The ore minerals consist of copper sulphides, distributed in grains and small patches as oreshoots in the pyroxenite. Bornite is the chief copper mineral, but a small proportion of chalcopyrite also occurs locally. Chalcocite and covellite are both present, as alteration products of the bornite and also of the chalcopyrite. Finely disseminated chalcocite and native copper have been reported by Knopf[3] as occurring in some drifts about half-way between the upper and lower tunnels, leading from a connecting winze. Practically no gangue minerals are found with the ore. In addition to copper, gold, silver, palladium, and platinum are recovered.

The metallic content of the Salt Chuck ores was shown in a table of analyses by Campbell[4], and this table, with the addition of three determinations of concentrates, is given herewith.

METALLIC CONTENT OF SALT CHUCK ORES

(Copper in per cent; other metals in ounces to the ton)

	Copper	Gold	Silver	Platinum: Platinum	Platinum: Palladium	Group: Palladium
Glory hole	1.92	0.07	0.17	....	0.41	.
150-ft. level	1.08	0.07	0.24	....	0.18	....
Bottom of winze	1.28	0.05	0.24	....	0.17	. .
Average of ore analyses	1.427	0.063	0.217	....	0.253	. .
Gabbro	0.06	0.01	0.10	....	0.01	. .
Chalcopyrite	27.66	0.11	2.08	....	1.01	. .
Concentrates	43.81	1.17	4.60	....	3.54	. .
Concentrates (*Eng. and Min. Jour.*, Sept. 27, 1919)	36.96	1.27	6.10	0.10	. . .	2.93
Concentrates	. . .	. .	. .	0.04	. . .	2.56
Concentrates	39.41	1.20	5.18	0.04	. . .	3.38
Average of concentrates	40.06	1.213	5.293	. . .	3.147	..

Platinum Occurrence Ratio Is Estimated

From these data it is possible to estimate the percentage recovery of the precious metals in the concentrates. If the concentrates average 40.06 per cent of copper, each ton of concentrate will contain 801.2 lb. of copper. Then, as the average copper content of the ore is 1.427 per cent, each ton of ore contains 28.54 lb. of copper; and the number of tons of ore used to produce 1 ton of concentrates, on the assumption of a copper recovery of 100 per cent, would be 801.2 ÷ 28.54 = 28.07 tons. The recovery of gold, silver, and platinum metals in ounces per ton is obtained by dividing their

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[1]An alloy of palladium and gold is used as a platinum substitute, for chemical ware and for jewelry. An alloy of palladium and silver is used for contact and spark devices for internal combustion engines.

[2]Wright, C. W.: "Geology and Ore Deposits of Copper Mountain and Kasaan Peninsula, Alaska"; U. S. Geological Survey, Prof. Paper 87, p. 73, 1915.

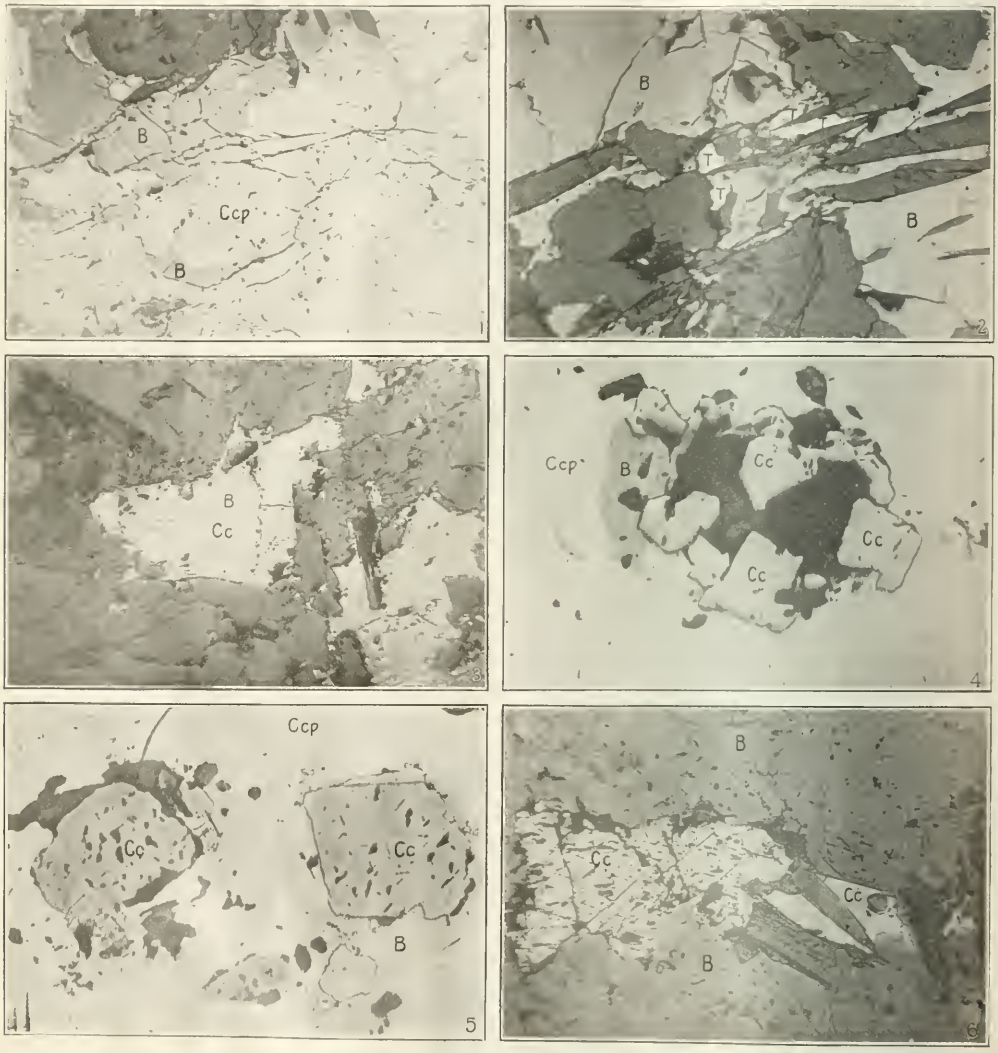
[3]Knopf, Adolph: "Mining in Southeastern Alaska," 1910; U. S. Geological Survey Bull. 480, p. 101, 1911.

[4]Campbell, D. G.: "Palladium in Alaska Lode Deposits"; *Min. and Sci. Press*, Vol. 119, pp. 520-522, 1919.

respective figures in the "average of concentrates" by 28.07; and the ratio of the resulting quantities to the corresponding quantities given in the "average of ore analyses" furnishes the percentage of recovery for the precious metals in terms of the assumed 100 per cent recovery of copper—that is, gold, 68 per cent; silver, 87 per cent, and platinum metals, 44 per cent. The exact percentages of precious metals recovered are obtained by multiplying these computed percentages by the true recovery of copper.

On reducing the copper percentage to troy ounces per ton, and comparing the result with the figures for the precious metals, it appears that the ratio of the copper to the gold, silver, and platinum metals is 6,607, 1,918, and 1,645 to 1, respectively, and that the ratio of the gold to the silver and platinum metals is roughly 1 to 3 and 4, respectively. Of course, an average of three assays affords no basis for exact deductions, but, nevertheless, these figures are useful in giving a general idea of the occurrence of these metals.

A little free gold may be seen in some of the ore, but the disparity between the recovery of gold and the recovery of platinum metals leads to the belief that a considerable part of the gold is chemically combined or



POLISHED SECTIONS OF SALT CHUCK ORES

Fig. 1—Typical intergrowth of chalcopyrite and bornite (Magnified 30 times). Fig. 2—Argentiferous tetrahedrite (?) (Magnified 125 times). Fig. 3—Bornite cut by indistinct veinlet of chalcocite (Magnified 30 times). Fig. 4—Chalcocite (with crystalline outlines) replacing chalcopyrite and bornite (Magnified 125 times). Fig. 5—Chalcocite replacing chalcopyrite and bornite (Magnified 125 times). Fig. 6—Chalcocite replacing bornite (Magnified 30 times).

mechanically held with sulphides. The high content of silver relative to gold suggests an additional source of silver besides that alloyed with gold; and the high silver recovery indicates that the silver is present as a silver or copper-silver mineral, probably a sulphide or sulpho-salt, which is highly adapted to the flotation process. Possibly it occurs in both these forms. The high content but low recovery of platinum metals, when considered in the light of the known relationship between copper and platinum metals in these ores, indicates that the larger part of the platinum metals is held mechanically by the copper minerals and liberated in the ball mill. The ratio of palladium to platinum appears to vary considerably, but is believed to average about 50 to 1.

Higher Gold-Silver-Platinum Ratio in Chalcopyrite

The analysis of the chalcopyrite is also of interest. Gold, silver, and platinum metals are found in the chalcopyrite, and although this fact does not permit inferences as to the state of existence of the precious metals, it serves partly to corroborate those already drawn. The ratio of gold to silver to platinum metals in the chalcopyrite is about 1 to 19 to 9, whereas in the average of ore analyses it is 1 to 3 to 4. The higher ratio of silver to gold in the chalcopyrite analysis is probably attributable in part to the lower content of gold in the chalcopyrite than in average ores, owing to the presence of a certain percentage of free gold in the country rock; but probably it is due more largely to the higher content of silver in the chalcopyrite as a result of the presence of intergrown silver or copper-silver sulphides.

The higher ratio of platinum metals to gold in the chalcopyrite analysis is interpreted as evidence that more of the platinum metals are associated with the copper minerals than occur free in the country rock, thus corroborating the relationship that appears to exist between the copper and platinum metals in the mine. The analyses above given show from 0.13 to 0.21 oz. of platinum metals to the ton for each 1 per cent of copper; the lower figure is more probably representative of the average.

The mode of formation of this deposit and the distribution of the ore present some puzzling features. The country rock, though mainly pyroxenite, shows gabbroic and gabbro-pegmatitic phases, and at the west end of the glory hole a basic dike 4 ft. thick cuts the pyroxenite. Considerable epidote also occurs, in part replacing the minerals of the country rock and in part as traversing veinlets. The ore is evidently later than the dike, for a bornite-chalcopyrite oreshoot cuts directly across the dike. The country rock is much fractured, but there is no particular system to the fractures, and there are no large displacements. The general trend of the zone of the fractured and faulted rock, however, is believed to be about N. 75 deg. W.

A cursory inspection would indicate that the bornite and chalcopyrite may be regarded as ores segregated from the gabbro mass. The copper minerals do not appear to follow the larger fracture planes to the extent that might be expected in an ore deposited from circulating waters. The ore occurs in shoots, which appear independent of the rock fractures, and the bornite is found as disseminated particles within these shoots, some of it in massive country rock at some distance from any apparent openings. Also, free gold was observed which had been drawn out and elongated by faulting subsequent to its deposition, showing that at least some of the fracturing movements occurred after the deposition of the ore.

On the other hand, some of the copper ore, particularly the chalcopyrite, lies along the fractures in such a manner as clearly to show that it entered the rocks and was deposited subsequent to the fracturing. Moreover, where the bornite occurs in massive unfractured pyroxenite, the rock-forming minerals of the pyroxenite are noticeably altered, chiefly to epidote with less chloritic material; and the degree of this alteration appears to be a function of the amount of ore present. Finally, the texture of the ore as seen under the microscope belies the appearance of primary character which is seen in hand specimens.

The country rock contains many minute cracks, adequate for circulating ore solutions, and the ore itself shows that it has entered the rock in this manner and replaced the rock minerals. Hence, though all the details of the ore deposition cannot be explained, it seems certain that this is at least an epigenetic deposit —that is, it was formed later than the containing country rock.

Unusual Example of Enrichment

The presence of chalcocite, covellite, and native copper points unmistakably to enrichment due to the action of meteoric waters working downward from the surface. The chalcocite and native copper observed by Knopf[6] were at a depth of about 200 ft. below the surface, and show that enrichment has occurred at least to this depth. This is rather remarkable for southeastern Alaska, for it has generally been believed that in that region the recent glaciation had removed the zone of oxidation and practically all of the secondary sulphide zone. It would be of interest to know whether this supergene enrichment is a remnant representing a preglacial secondary sulphide zone, or whether it has occurred in post-glacial time. In either case the theoretical conclusion is that the ore will be found to become leaner with depth, but it is doubtful if this feature will prove of much economic importance, as the percentage of secondary sulphides appears to be relatively small.

Polished Sections as Evidence of Genesis

A number of polished sections of the Salt Chuck ores were made and examined, primarily to discover the source of the high silver content of the ore. Other interesting features, however, were noted.

Fig. 1 shows the relationship between bornite and chalcopyrite, when these two minerals occur together. There is nothing in the photograph to indicate the formation of one of these minerals prior to the other. On the other hand, they appear to be primary hypogene intergrowths. Fig. 2 shows another occurrence of the same mineral. Fig. 3 illustrates a peculiar form of alteration from bornite to chalcocite. The chalcocite is present as a shadowy indistinct veinlet, cutting the bornite. Much chalcocite alteration of this type is seen in the ores.

Figs. 4 and 5 show other types of replacement of bornite and chalcopyrite by chalcocite. Fig. 6 also shows chalcocite replacing bornite, and it illustrates the well-known cleavage of the chalcocite.

[6]Knopf, Adolph: "Mining in Southeastern Alaska, 1910"; U. S. Geological Survey Bull. 480, p. 101, 1911.

One specimen of chalcopyrite ore from the Salt Chuck mine was observed to contain a large percentage of pyrrhotite, and some pyrite, but no photographs of this specimen were made.

Mine Development Shows Indefinite Mineralized Zone

The Salt Chuck ore deposit has been developed at the surface by a small glory hole and an open cut almost adjoining it on the east, and underground by a tunnel 300 ft. long, which at its face opens upward through a stope into the glory hole. Near the face of this tunnel a winze has been sunk 200 ft., connecting with a new lower tunnel, and the winze has been continued upward as a raise for 90 ft. A tram 2,200 ft. long has heretofore been used to transport ore from the mine to the mill. The new lower tunnel, 1,225 ft. long, has now been completed and will be used as the main oreway.

Ore is now being taken from the stope that connects the upper tunnel with the glory hole. One of the difficulties of mining operations at this property is the irregular distribution of ore stopes. Practically no data are available on which to base prospecting, for there is no vein or well-defined shear zone, and the stopes occur seemingly at random. There is a limit to the mineralized zone, which probably coincides with the limit of the faulted and fractured area of peridotite, but this is neither sufficiently definite nor sufficiently circumscribed to be of value in laying out the mine. That such a limit exists is shown in the new lower tunnel, which is 1,225 ft. long and in which no ore was seen until the tunnel had been driven 990 ft. The horizontal sequence in this tunnel from the portal inward is as follows:

SEQUENCE IN LOWER TUNNEL AT SALT CHUCK MINE

	Feet
Barren country rock	990
Zone of disseminated bornite	15
Barren country rock	15
Zone of disseminated bornite	30
Barren country rock	170
Zone of disseminated ore, chiefly chalcopyrite, subordinately bornite	5

It is not known in what manner the ore zones shown are cut by the tunnel, and the thicknesses given therefore may or may not represent true cross-sections of the shoots.

Ore Treatment Consists of Concentration by Tables and Flotation

The ore is reduced in a concentration and flotation plant on the property. Power for the mill and mine is generated partly by water and partly by means of a 75-hp. Fairbanks-Morse semi-Diesel engine. Water is taken from a 31-acre lake and delivered to the wheels in a 10-in. stream, under a head of 179 ft.; and when the supply is adequate, 220 hp. is generated by this means. The supply of water, however, is usually inadequate, and the engine has to be run much of the time. This constitutes one serious handicap to economical mining.

Ore is delivered at the mill into a 175-ton storage bin, from which it goes through two sets of jaw crushers and is reduced to about 2-in. size. This material is then dumped into a seventy-five-ton bin, whence it is fed automatically to a Worthington ball mill, with a rated capacity of sixty tons in twenty-four hours. Fine grinding is at present accomplished by this operation, but the ball mill is overtaxed, and it is planned to introduce rolls between the crushers and the ball mill, reducing the product to 1¼-in. size before delivery to the mill. This will be a great improvement. The pulp from the ball mill goes to a classifier, from which the oversize is conveyed back by a scraper belt to a trommel, and the fines flow off and are raised by a bucket-elevator belt to the flotation cells. The oversize from the trommel goes back to the ball mill, and the undersize to a Diester-Overstrom concentrating table.

The flotation plant consists of five cells, in which are used mixtures of oil of pine, pine tar, creosote, and coal tar. About 90 per cent of the ore is caught in the first two cells. From these the concentrate goes to Callow cones, where it is largely dewatered. Final drying is accomplished in filter presses, and a shipping product containing only 10 per cent of moisture is said to be produced.

Three Nickel Companies Operating in New Caledonia

The New Caledonian nickel industry is having somewhat of a boom at present, according to *Chemical Engineer and Mining Review*. Three companies are operating. The Nickel Co. is the oldest, and for that reason is better situated than the others in regard to its leases. Its smelting plant is at Thio. This company has recently taken over the electric furnaces installed by the Haut Furneaux Co. at Noumea, and will, it is stated, soon begin the production of ferro-nickel. Ballande & Son, which is the trading name of a Roman Catholic order of priests, also operate a furnace at Noumea. The most recent entrants into the field are the Japanese, who are erecting a smelting plant at Noumea to be equipped with up-to-date appliances for handling the ore at all stages. This is known as the Point Chaleix smelters. Nickel is found all over the island, and is almost invariably mined by open cut. It is hand picked so as to average the furnace charge at 5.5 per cent.

The entrance of Japanese capital is a new factor in the nickel industry. It is unlikely, however, that the Caledonian supply could ever make Japan independent of the British-owned deposits.

Results of Testing a Silver-Lead-Zinc Ore By Differential Flotation

The Simon Silver-Lead Mines Co., Mineral County, Nev., recently sent a sample of the sulphide orebodies that have been developed between the fourth and sixth levels of their mine, to the Minerals Separation North America Corporation, for testing. The ore is a complex lead-zinc sulphide, and the results secured may be of interest, even though made under laboratory conditions. The differential flotation process which was used has not been made public.

	Ag, Oz.	Per Cent			
		Pb	Zn	Fe	"Insoluble"
Feed	6.46	9.1	9.2	6.5	...
Lead conc.	39.0	67.6	9.6	2.8	2.0
Zinc conc.	8.2	3.2	46.8	9.0	2.6
Tailings	0.54	trace	1.6	5.7	...
Total recovery	93.9	97.3	71.3	...	...

The silver-lead concentrate contained 76.1 per cent of the silver in the ore treated, the zinc concentrate containing the remainder, 17.8 per cent. This is equivalent to 81 per cent of the recovered silver appearing in the lead concentrate.

Mining Engineers of Note

Bartlett L. Thane

JUST along about the time that the last century was getting out of the arena of activity, a football team was licked into shape on the Berkeley campus in California. It was a perfect machine. Every player acted and every play was "pulled off" with clock-like precision. No flock of birds ever moved more in unison than did this aggregation of clean-limbed, speedy players. Well—it "mopped up" the Stanford team with a conclusiveness and a dispatch that left the adherents of that university speechless and in consternation. The young quarterback of the winning eleven was a student in the mining department of the University of California. The same generalship which marked his management of that celebrated football game has been shown in his own affairs, for Bartlett L. Thane, while yet in college, made very definite plans for his future career as a mining engineer. When a senior student he wrote a short article on "Stoping With Machine Drills," which was subsequently published in the "Transactions" of the American Institute of Mining and Metallurgical Engineers. In the article, Mr. Thane called attention to the need for machine drills in stoping. Strange as it may appear to mining engineers now, it is a fact that at the time Thane wrote his paper only three mines in California were using stoping drills in their operations. As Thane obtained his first mining experience at the "chuck" of a "baby Ingersoll," he was in a better position than many older engineers of that day to appreciate the many advantages of light, readily portable drills in stoping work. His paper played an important part in helping the idea along.

BARTLETT L. THANE

Thane was first laborer, later miner, then shift boss, foreman, assistant superintendent, and, finally, engineer for the Sumdum and Bald Eagle mines, at Sumdum, Alaska. Evidently the individuals who controlled the destinies of the two mines decided to try him out in every imaginable position. In 1903-05, Thane was superintendent of the Wyndham Bay and Ebner gold mines. He next became superintendent of the Eagle River mine, where he stayed from 1905 to 1910. Next, he assumed charge of the Kensington gold mine, Eagle River mine, Perseverance, and then became manager for the Alaska Gastineau Mining Co., remaining in this position until 1919, when he became managing director.

For the last five years Thane has directed the affairs of the "B. L. Thane Exploration," a company organized for exploration work in connection with the development of raw-mineral products in the Pacific Coast states. He has retained certain operating positions at the same time. These have served to divide his interest between engineering and promotion. Probably one of the most successful enterprises which he succeeded in bringing to a vital position in the mining industry of the country was the Northwest Magnesite Co. Acting in the capacity of consulting engineer, Thane brought this company into the position where it became an active competitor with the Eastern refractories companies. He has proved his abilities along lines apart from engineering by his advocacy of tariff legislation for the protection of domestic magnesite, appearing before Congressional committees and holding his own as an expert witness in behalf of the domestic producers. Mr. Thane's interests have broadly covered the field of mining. Gold, silver, copper, lead, magnesite, and oil comprise the range of his work, and if an iron and steel industry ever becomes solidly established on the Pacific Slope, it will be due largely to his vision. Compared with his other enterprises, this is the biggest job he has tackled. He organized a working staff and painstakingly investigated iron-ore deposits, refractories, fuel and metallurgical methods pertaining to an iron and steel industry on the Pacific. In a clever way he drew all the lines together and welded his scheme into a reality as far as preliminary work could go. Only the business conditions incident to the war interfered with the consummation of the plan.

Like many another mining engineer, Thane has traveled extensively, having visited practically all of Alaska and the United States, Northern Mexico, England, Central Europe, and Western Canada. He is a member of the American Institute of Mining and Metallurgical Engineers, Mining and Metallurgical Society of America, and Alaska Engineering Society.

By The Way

A Douglas Memorial

The children of Dr. James Douglas have arranged for the erection in the plaza at Nacozari, in memory of their father, of a replica of Blondat's fountain at Dijon, France. The bronze figures are being cast, and after their arrival at Douglas, Ariz., a sculptor, Leslie Cauldwell, will come from Paris and fashion the fountain out of local tufa and erect it. It is planned that it shall face the main entrance of the library building.

A movement has also been launched at Bisbee by Hoval A. Smith to erect a monument in the Warren district to Dr. Douglas. Referring to this, the *Tucson Citizen* says:

> Bisbee is one of the most interesting mining cities in the country and is itself a great monument to Dr. Douglas. No shaft of granite is needed there to spread his fame among Arizonans of the present day, but it is fitting that some appropriate memorial should perpetuate his fame and what he did in establishing this great district. Nor was his work confined to the Warren district alone. Nacozari, Morenci, Tyrone, Dawson, the El Paso & Southwestern, and finally Douglas, the city which bears his name, are all his monuments.

Dr. Douglas made his one of the great names of the Southwest and it will endure long after a monument of stone has ceased to be significant. Monuments and memorials more often perpetuate the sculptor's fame than that of those to whom they are erected.

Overheard Today

1. The Amateur Geologist: "Do you know Dr. Ransmith of the United States Geological Survey? He wrote a monolith on the Divipah Mining District." The more we think this over the more hidden meanings we see in it.

2. The Amateur Optimist: "I ain't with the majority that is always tryin' to pull down what the other feller puts up: I'm with the majority that says, 'Sure, he made a poor job of it, but chances are ten to one the other feller would have done a damsite worse.'" A cheery faith in human nature will cure all evils.

A Losing Victor

Zinc operators of Baxter, Kan., are enjoying a little hard luck that recently befell Victor Rakowsky, when he wagered 10 to 1 that the Chanute Spelter Co. could not make 450 tons of concentrates in one week at its new mine on the Hartley land, just west of Baxter. He lost because the mine turned out about 475 tons for the week ended June 12. The wager is understood to have been $1,000 to $100, and the "easiness" of Rakowsky is explained by the fact that he gets a royalty out of all the earnings from the land and also has a large acreage of leases in the vicinity.

Bad News for Potato Bugs

According to the news section of the *Mining and Scientific Press* of June 19, "Alder Island, one of the smaller of the Queen Charlotte group, consists of one large deposit of metallic arsenic." Here is news that is news. Probably when another of the smaller islands is investigated it will be found to be of metallic silver, another of metallic antimony, another of metallic gold with the sovereign stamp partially developed, and another of that rare mineral punketite.

Cottrell's Philanthropy

A recent press bulletin of the Chamber of Commerce of the United States is rather unique in that it is devoted to a description of Dr. F. G. Cottrell's work in devising his precipitation process. It begins:

> The remarkable story of how Dr. Frederick Cottrell, head of the United States Bureau of Mines, took riches from the air and presented them as a gift to humanity is strikingly told by James B. Morrow in the July number of *The Nation's Business*. Mr. Morrow says that Dr. Cottrell is one of America's greatest philanthropists as well as one of its great scientists. The fine foundations of Rockefeller and Carnegie, in some respects, seem commonplace by comparison to what Dr. Cottrell has done for humanity.

"During the years that Dr. Cottrell toiled over his invention, he earned his livelihood by teaching," the bulletin says in concluding, "and when wealth was at hand he turned it away."

Unrewarded Zeal

"M'son," said Cap'n Dick, "did'st ever 'ear tell 'ow Jan Trembath come to loose h'out with Tom Tregillis' girl jus' as 'e 'ad made up 'is min' to marry 'er? Well, I'll 'ave to tell 'e, for it do show 'ow sometimes a chap may 'itten off wrong w'en 'e 'as tha bes' of h'intentions. Tom Tregillis lived h'over on east side o' town an' Jan's boardin'-house 'wuz t'other way, so h'each time 'e gaws to see Mary Jane 'e 'as to walk baout a mile an a 'alf. One evenin' w'en Jan wuz sittin' up with 'er h'it starts rainin', an', dam-me, the 'eavens h'opened jus' like these 'ere cloudbursts thee reads of. The h'ol outdoors wuz wetter than w'en we cut that vug sinkin' nummer six shaf', m'son, w'en we bloody near drowned tha mine. Tom, 'e comes in tha parlor w'ere wuz Jan an' Mary Jane, an' sez 'e to Jan, 'M'son, naw use thee gawin' 'ome along this night an' spoil tha Sunday clothes. Better for thee to put up 'ere in tha spare room.' An' 'e tells Mary Jane to fix tha room h'up a bit w'ile 'e gaws h'out to set tha rain barrel for to catch sof' water for washin'. W'en tha girl comes downstairs Jan wuz gone, but, dam-me, baout 'alf 'our in 'e comes. 'W'ere 'ast thee been?' sez 'er.' 'Been 'ome,' sez 'e. 'Wo't for did'st thee go 'ome?' 'Went 'ome to get my h'umbrella,' sez Jan, 'might be still rainin' w'en I gaws to work in tha mornin' an' I'm feared for to get my good clothes wet.' 'Oh, gos along, thee gert fool,' sez she, 'didn't thee get they all wet gawin' for tha h'umbrella?' 'Oh, dam-me,' sez Jan, 'never did'st I think o' that.' An' dost thee naw, m'son, that h'after that, 'er would 'ave nothin' to do with 'e?"

Oil and Mining Interlock

A. A. Hassan, formerly of the Great Falls Mine of Maryland, announces that he owns, controls and has under option to purchase about 100,000 acres of oil and gas leases in Texas, Louisiana, and New Mexico in about 100 counties, most of which territory he has examined personally. One-half of these holdings he will sell at reasonable prices, so as to obtain sufficient funds to start drilling on some of the remaining acreage. Mr. Hassan's offices are in Fort Worth, in the Westerbrook Hotel Building, where, according to his letterhead, there are "two entrances leading downstairs."

CONSULTATION

The Miner's Inch

"Does the miner's inch represent a definite flow of water? To one interested in measuring the flow, an answer to this question, and any other information you may give, will be appreciated. From my investigations there seems to be quite a difference of opinion as to what constitutes a miner's inch."

The miner's inch, being an orifice 1 in. square, will naturally allow varying amounts of water to pass through it, as the quantity depends upon the head. In using this hydraulic unit of measure, the head is usually arbitrarily fixed and measured to the center of the orifice. The head varies in the Western United States from 3 to 9 in., but 6½ in. is generally regarded as standard. The size of the plank through which the orifice is made may also vary from 1 to 3 in., and, furthermore, the method of cutting the hole, and its position, are subject to variation. The hole may be chamfered, flaring outwardly and placed flush with the bottom of the flume or box, or it may be raised a few inches above the bottom. All these variables greatly influence the quantity of water that is discharged by a miner's inch. From the ordinary formula, ($Q = K\sqrt{2gh}$, where Q = cu. ft. per min. discharged by the orifice, K is a constant depending upon the construction of the miner's inch, ordinarily about .2583; g = 32.2 ft. per sec., and h = head in ft.), the amount of water discharged under a head of 6.5 in. would be about 1.53 cu.ft. per min. from one miner's inch.

Various states have taken it upon themselves to establish legally the relationship between the miner's inch and the flow. Thus, California and Nevada have set 40 miner's inches as equivalent to 1 cu.ft. per sec.; in Colorado, 38.4 miner's inches = 1 cu.ft. per sec. In other Western states, such as Arizona, Idaho, Nevada, and Utah, 50 miner's inches seems to be commonly accepted as equivalent to 1 cu.ft. per sec. Frequently, when ditch companies supply the water, an arbitrary standard is set by them, to measure miner's inches.

Few Nickel Deposits

"Although I know that the United States is regrettably deficient in nickel resources, I understand that there are several localities in which nickel ore is found. Such a one is the district near Fredericktown, Mo. Can you give me the names of the other localities? Is there any duty on the imported ore?"

Though we do not claim to name in the following list every place in the United States where nickel can be found, it covers the most important discoveries and deposits: The old deposits at Gap, Pa.; the complex nickel ores at Fredericktown, Mo.; a deposit near Julian, San Diego County, Cal.; nickel-bearing veins forty-five miles from Lovelock, Nev., in the Stillwater Range; the deposits near Key West, Nev., and low-grade metal silicates near Webster, N. C. Some of these deposits are large, and only two of them, the Missouri, and Gap deposits, are known to have been exploited. There is one relatively important domestic source of nickel, however, that is frequently overlooked—the recovery as a byproduct from copper refining. About 950 tons of nickel per year are obtained from this source.

There is no duty on imported nickel ore and nickel matte, but the manufactured product, when imported in the form of nickel, nickel oxide, pigs, ingots, bars, rods, or plates or as the component part of an alloy, is subject to a tax of 10 per cent ad valorem. Sheet and strip nickel is taxed 20 per cent.

Small Arsenic Ore Market

"Will you please tell me where I can market arsenic-bearing ores and what the price is for ore containing 40 to 45 per cent arsenic? I note that you quote the price of prepared arsenic under the heading of 'Mineral Products,' but do note quote the price for ore."

So far as we know, there is no market for arsenic ores as such. So much arsenic is produced as a by-product to ordinary smelting that this is sufficient to supply the market, and, naturally, as it is a byproduct, it could always undersell any material which was prepared and offered as a primary product. Many ores of gold and silver and other metals are arsenical, and the arsenic, which is easily volatile, either goes up the chimney into the atmosphere or is precipitated from the fumes and marketed.

Possibilities of Mica Development

"We are interested in the mica market, and desire to know what the prospects are of successfully developing a property in this country that looks rather favorable to us."

Although mica is a common mineral, and is found extensively in the United States, the special grades that are required by the trade are not so plentiful. In fact, foreign mica, from India, Canada, and elsewhere, is imported and is generally able better to fill the rigid requirements demanded. If the mine is to be worked purely as a source of mica, a favorable location with regard to transportation and milling is essential. It is seldom that a mica property is worked for its available grindable product, and a good grade of sheet mica must usually be produced to make the operation profitable. But sheet mica, to be marketable, must yield rectangles that are at least one and a half by two inches and must split readily, and be reasonably free from foreign material and cracks. To yield this size of uncut sheet, the rough trimmed mine product must be much larger. The deposit should also contain mica that will furnish larger uncut sheets. In the ordinary mica prospect the mineral contains many imperfections, such as cracks, holes, and specks that render it unfit for commercial use. According to the U. S. Geological Survey, good sheet mica, a thousandth of an inch thick, can readily be bent into a cylinder one quarter of an inch in diameter without showing cracking. Before attempting to work your property you should endeavor to obtain all the information possible regarding the quality of your mica and the grade of mica that it is likely to produce. Prospective mica producers should proceed carefully about their enterprises.

THE PETROLEUM INDUSTRY

The Oil Shales of Estill County, Ky.

Laboratory Retorting Tests Disclose Lack of Coking Action, Which Is Prevalent in Western Shale Distillation—Simple Design of Retort—Absolute Heat Control Required for Treatment—Commercial Possibilities

BY C. S. CROUSE
Written for *Engineering and Mining Journal*

ALTHOUGH the Western oil shales have been widely advertised, and a great deal has been written about them in the last few years, little, if any, mention has been made of the vast deposits of shale in the State of Kentucky. The Kentucky shales are of Devonian origin, and outcrop extensively in a roughly semicircular formation, with Lexington as a center and an approximate radius of fifty miles, with smaller outcroppings in various places throughout the state. In addition, a large part of the state is underlain with the shale at varying depths and of varying thicknesses. In the western part of the eastern Kentucky coal field the shale is found at a relatively shallow depth, but, owing to the normal dip of the subsurface strata, it rapidly falls to deeper levels, with a thickness varying from twenty to two hundred and fifty feet, the oil sands of eastern Kentucky being found beneath the shale, which often contains gas.

Relatively little investigation has been done on the Kentucky shales. However, during the last year or more I have had the opportunity to do considerable research work on the shales coming from Estill County, in the eastern part of Kentucky.

The outcrop or weathered shale of Estill County is of brownish-black color on a fresh fracture, is often streaked with brown iron stains, and contains lesser content of oil than the unweathered shale. The latter has a velvety black appearance when freshly fractured, and, although both the weathered and the unweathered shale disclose bedding planes, the fracture does not necessarily follow these lines. The texture is fine grained, and the shale breaks easily, exhibiting no tendency to gum, as do many of the Western shales. A thin splinter ignites readily and burns with a yellow, smoky flame, and larger pieces held in the flame will crackle, emitting gas which will burn at various places over the surface. A true story is told of the man that built himself a new house, using the black shale as the building material for the chimney of his fireplace, with the result that on the kindling of the first fire the house burned down.

FAVORABLE SITUATION OF ESTILL SHALES

Large deposits of shale occur in this region along the Kentucky River, with little or no overburden, which offers a particularly advantageous condition for steam-shovel work, with plenty of water available for condensing and other refinery purpose. The nearness of the deposits to Lexington, Cincinnati, and Louisville, in connection with the necessarily good railroad service, because of the oil and coal developments of this region, makes the conditions most favorable with regard to transportation.

All of the samples which I have tested have come from various parts of Estill County, and include both weathered and unweathered material. Although none of the deposits has been thoroughly sampled, the unweathered shales from different parts of the county show a remarkable uniformity in oil content.

APPARATUS USED IN THE TESTS

The apparatus used in the tests consists of an ordinary cast-iron retort which holds about a pound of shale and is connected by means of a gooseneck to a five-foot, home-made, iron-pipe condenser. This discharges into a graduate and consists of a $\frac{3}{8}$-in. iron pipe running through a $2\frac{1}{2}$-in. iron pipe, the latter having two short lengths of $\frac{3}{8}$-in. pipe screwed into it, one at each end, for the ingress and egress of the condensing water. The inlet and outlet pipes are connected to the water tap and sink, respectively, by pieces of rubber tubing, the whole apparatus being supported by means of clamps from an ordinary ring stand. It will be noted that the retorting apparatus is of the simplest form, with no provision made for mechanical agitation of the shale or for the use of superheated steam, nothing being recovered but the crude oil.

METHOD OF TESTING SAMPLES

The sample is first crushed by means of a small jaw breaker or in a mortar with a pestle to a little smaller than walnut size. The selection of this size is the result of experiments on crushing and retorting material of 100-mesh and over and of various mixings of coarse and fine shale. Although no great difference in the amount of oil yield from the various sizes was noted, there was a considerable difference in the distillation or retorting time, both the very fine material and the very coarse material taking longer for total distillation than the size specified. The reason for this, in the fine material, is because it packs in the retort and, the heat being applied from the outside to the interior, a semi-insulating stratum of spent shale is soon formed, which retards distillation. In the treatment of the coarse material the reason is the same, in that the heat must travel from the outside of the lump to the center before all the oil gas can be expelled. In a retort in which the shale is subjected to agitation this difficulty will not be met

to such an extent, although very large pieces would be objectionable even then.

After the sample has been crushed and mixed, seventeen ounces are weighed out and placed in the retort. Seventeen ounces are taken merely for convenience, as, with this amount of shale, every two cubic centimetres of oil recovered represents one gallon of crude oil per short ton of shale. The cover, which is machined to fit tightly, and which, in addition, rests on an asbestos paper gasket, is then put on and forced tightly into place by means of a wrought-iron clamp and screw, care being taken to tap the cover down with a hammer several times after tightening, and then to tighten again and repeat. This is necessary because unless the retort is absolutely tight gas is bound to leak out and vitiate the results.

The retort is lifted into a ring which is supported on a stand and connected to the condenser by means of a union with an asbestos paper gasket between the end of the gooseneck and the end of the condenser tube. A large tin can with the necessary openings cut in it is then placed over the retort, so as completely to cover it, and thus conserve heat and make the temperature at both the top and bottom of the retort as nearly uniform as possible. A heavy piece of asbestos is also placed under the gooseneck where it joins the condenser, to prevent overheating and cracking of the gas. The water is then turned on in the condenser, a graduate is placed beneath its open end, a large bunsen burner is put in position beneath the retort and lighted, and the process begins.

Loss of Oil Caused by Too Rapid Distillation

At the end of fifteen or twenty minutes, if the retort is cold, or sooner if it is hot, water begins to drop into the graduate. The heat at this time should be applied slowly, to avoid any danger of cracking the first gases that come off or of driving them off too rapidly. A certain amount of non-condensable gas is evolved at all times during the distillation, but at no time should visible gas be driven off, as this indicates too rapid distillation for the condensing system, and a consequent loss of oil.

After about six cubic centimeteres of light-colored liquid (water) has collected, the oil begins to make its appearance. It is of a greenish black color, and lies on top of the water, a clear line of demarkation being visible at all times. For about three-quarters of an hour this will be condensed rapidly, and at times will drop fast enough to approximate a stream if the heat is carefully regulated. At the end of this time, or soon afterward, the evolution of oil, and with it the evolution of non-condensable gas, begins to slacken, until, between an hour and an hour and a half after the first appearance of oil, the distillation is complete.

During all of this time some water has been coming over with the oil, due to the fact that as the heat travels into the retort the oil gases are being driven off from the outside shale and at the same time the water is being driven from that nearer the center. The water generally amounts to about one-fourth of the total liquid obtained, and a separation can easily be made in a separatory funnel.

Toward the end of the distillation, or after the largest evolution of oil has taken place, the temperature may be increased somewhat, but a careful watch should be kept to see that no visible gas makes its appearance, and at no time should the retort itself show red. After the gas has been turned off, the retort is torn down, the spent shale dumped out, and the apparatus is ready for another run. The second, as well as the following runs of a series will be completed in a shorter time than was required for the primary operation, owing to the fact that the retort is hot and also more nearly representative of the shale, for the reason that after the condenser has drained over night or longer, it takes up some oil before it will flow. The amount of oil obtained from the first run will be low, whereas that from the last will be high if the condenser is allowed to drain after the last run, although an average of the two will be normal.

Results Obtained From Distillation

The results of several runs on unweathered Estill County shale show an average oil yield, excluding water, of about twenty-one gallons to the ton, or a half a barrel per ton of shale. Some of the shale runs a gallon or two higher and some a little lower, but at no time is there a great variation from the average. On the other hand, the weathered shale contains from three to five gallons less oil per ton.

I have said that a large volume of non-condensable gas is evolved during the entire distillation, the amount varying directly with the quantity of oil. No facilities were at hand to determine the amount of this gas, but it was conveyed by means of a two-branched glass tube to a bunsen burner, where it burned with a good flame and a strong smell of sulphur dioxide.

There are varying amounts of pyrite in the shale, and the decomposition of this is undoubtedly the source of the sulphur. A report from one of the commercial laboratories on the gas procured from shale similar to that under discussion indicates that one ton of shale contains sufficient non-condensable gas to give a fuel value of about three and a quarter million B.t.u.

The amount of nitrogen contained was not determined directly from the gas and water obtained in distillation, although both smelled strongly of ammonia. However, considering the nitrogen found on analysis, figuring 60 per cent of it as recoverable, and transposing this into ammonium sulphate, gives a result of about forty pounds of this product per ton of shale.

A number of samples of the spent shale were treated in both the hot and cold state with water, some with hot and some with cold, and this water was then tested qualitatively for potash. All the filtrates showed some water-soluble potash, the finer-crushed shale which was treated with hot water showing the most. No quantitative tests on potash were made, but an outside test has shown nearly four pounds of potash per ton of shale, which can be recovered by merely treating with water.

Fractionation of Oil

The total product from three runs, or from three pounds of shale, was taken for fractionation. The light-colored, heavy liquid was not drawn off prior to fractionation, as it was desired to determine whether or not this was all water. The liquid, amounting to a total of 163c.c. with 45.5c.c. light colored and 117.5c.c. dark, was placed in an ordinary glass distillation flask and connected to a twenty-inch glass condenser, the heat being applied directly through a wire gauze by means of a bunsen burner.

The liquid began to boil at 60 deg. C., the first cut being taken at 150 deg. and the second at 300 deg. C. The first cut gave a total of 74.5c.c. of liquid, of which 45.5c.c., or the exact amount of the light-colored liquid in the orignal sample, was water. Of the remainder, 19c.c. came off below 100 deg. C. and can be called naphtha, and 10c.c. between 100 and 150 deg. C., which can be called gasoline. The second cut gave 59.5c.c. of liquid, which contained the kerosene and light lubricating oils. The residue was a black viscous mass containing some lubricants and tarry materials, but it did not coke. No attempt was made further to analyze this tar. The oil has a paraffine base, and considerable amounts of a white wax-like substance came over at about 98 deg. C.

Not including the water, the total oil from three pounds of shale is 17.5c.c., which is equivalent to 20.7 gal. of crude oil per ton of shale. Of this total, 29c.c., or 24.7 per cent, is naphtha and gasoline, and 59.5c.c., or 50.6 per cent, is kerosene and light lubricating oils. Reducing this data to gallons per ton of shale, it is equivalent to 20.7 gal. of crude oil per ton of shale, of which 5.11 gal. is naphtha and gasoline and 10.48 gal. is kerosene and light lubricating oils, leaving 5.11 gal. as a residue consisting of some lubricants, and tars. Converting these figures to gallons per barrel, two tons of shale producing a barrel of crude, there results 10.38 gal. of naphtha and gasoline per barrel of crude oil and 21.25 gal. of kerosene and light lubricating oils, or a total recovery of 31.63 gal. of naphtha, gasoline, kerosene, and light lubricants from one 42-gal. barrel of crude shale oil, which is the product of two short tons of shale.

Spent Shale Shows No Coking

Up to this time no commercial application has been found for the spent shale, although a limited use as a black-paint base may be developed. However, indications point to the fact that the shale from shale plants will create the same sort of problem as that presented by the slag from metallurgical plants. In this connection it is important to note, in contradistinction to a great deal of the Western shale, that at no time did the spent shale coke nor were any signs of coking shown. A test run was made on 100-mesh shale and finer, with the heat carried high enough to show bright redness in the retort, and absolutely no coking was noted.

Suggestions as to the Proper Commercial Retort

As the oil obtained from shale does not occur in it as such—that is, it cannot be removed by any wet or solution method so far as known, but, rather, must be recovered in the form of the so-called "kerogen"—a destructive distillation process must be used in its recovery. This, in turn, necessitates a retort and very close temperature control, lest the oil gases formed shall be cracked into non-condensable gas or a complete distillation be not obtained.

The shale technicians in this country have practically no precedent, for, even though the industry has been extant in Scotland for sixty-odd years, the Scotch retort is held by most of those who have studied the subject not to be applicable to best advantage to American conditions. As a result, there are nearly as many retorts as there are men interested in the technical branch of the shale industry in America, and practically all have been designed with the Western shales in mind. However applicable these retorts may be to the Western shales—and I shall not, at this time, discuss the relative merits of the many retorts now on the market—I think that none of them precisely meets the requirements of the Kentucky shales.

These shales offer a splendid opportunity for a mechanically simple retort, and the fact that a retort should be as simple as possible cannot be too strongly emphasized, as it must run continuously, with a comparatively short distillation time, which will result in, as I have heard it put, "a stream of shale going in at one end and a stream of oil coming out of the other," for twenty-four hours in the day and for practically three hundred and sixty-five days in the year. Such a retort is indicated by the facts that the shale will not coke and that the gas is evolved easily, and, being so indicated, it is bound to be only a matter of a short time before it is designed.

Absolute heat control is necessary, beginning with a relatively low temperature at the feed end and gradually increasing this to the discharge end, so that all of the gas may be finally evolved without undue evolution at any one point in the retort or cracking of the gases first formed. To prevent this, the gas should be withdrawn as formed or as soon as possible. Provision must be made for the use of superheated steam, as this will not only increase the ammonia yield, and probably also the oil yield, but will greatly increase the non-condensable gas yield due to the formation of water gas through the action of the steam on the fixed carbon of the shale.

Commercial Possibilities of Estill Shales

The questions, then, are, "How can the data obtained be translated into commercial terms?" and "Can the Kentucky shales be worked at a profit?" I will try to show how the former may be done, and I think that the answer to the second question is "Yes," provided certain conditions, which I shall enumerate, are fulfilled.

First, as to how the data obtained in the laboratory will work out in practice. I feel positive that commercial recovery will show an increase of at least from four to five gallons to the ton over that shown by the laboratory method outlined. The reasons for this statement are as follows: A certain quantity of oil, probably mostly naphthas and gasolines, and amounting to several gallons per ton, is practically certain to be carried mechanically by the non-condensable gas. This was lost in the laboratory experiments, but can be saved in a commercial plant by scrubbing the gas. The use of superheated steam is almost sure to show an increase in the oil yield, and employing a continuous retort, which is always hot and in which the individual pieces of shale are in a state of agitation, will certainly cut down the distillation time and probably increase the ultimate oil yield.

As to gas, there will undoubtedly be a great abundance of non-condensable gas with which to run the entire plant, including mining and refining, and, especially with the use of superheated steam, a probable excess which may be sold for domestic purposes if the plant is situated favorably in that respect. The nitrogen and the potash have been mentioned, but this leaves a wide range of investigation yet to be pursued in the byproducts that may develop from the tarry residue left after the lighter oils have been removed.

As to commercial possibilities. Figuring conservatively on the basis of the known laboratory results,

which will undoubtedly be increased in practice, one ton of shale, which should be mined (steam-shovel methods being used), retorted, and the oil refined at the cost of a dollar to a dollar and a half a ton, will yield half a barrel of crude oil, which will refine to a little more than five gallons of gasoline and about ten and a half gallons of kerosene and light lubricants, about two and three-tenths gallons of which will be lubricating oils. Balancing the value of these products against the cost per ton, a favorable result can be obtained in figuring on oil values alone, which, I think, are the only ones that should be considered in a preliminary estimate. This is, of course, leaving out of the calculation entirely ammonium sulphate, potash, probable excess gas, and tar products.

Conditions for Low Costs Favorable

Of course no definite cost per ton can be given without a close study of the particular conditions involved, as they vary widely, but I have based my tentative figure of a dollar to a dollar and a half on these facts: The known character of the shale; the extremely favorable conditions under which Estill County shale is found as regards mining, water and transportation; no charge will have to be made for fuel, either for heating the retorts or for power, as sufficient non-condensable gas is practically sure to be evolved for all such purposes; such a plant would not require a large amount of expensive labor, and amortization would be spread over a number of years, as the shale supply is enormous.

However, in my opinion, three conditions are absolutely essential to the success of a commercial oil-shale plant in Kentucky, or elsewhere, for that matter; and these are: Sufficient capital to start with, so that operations may be conducted in a large way—say from two and a half million dollars up, depending on the size of the plant desired and the conditions, the minimum plant being one of five thousand tons per day; the proper retort, and the proper management.

With the above-named conditions fulfilled, I believe that the oil-shale industry will develop into a straight mining and manufacturing proposition, with the returns coming in regularly and for many years in the future. Of course, there will be many disappointments and apparent failures, as there always are in any new venture, but I feel positive that in the hands of men of capital, breadth of vision, and faith in shale, the oil-shale industry of Kentucky will eventually develop into one of the largest sources of wealth in the state and be of inestimable value to the nation.

News From the Oil Fields

Article 27 Claimed To Be Unconstitutional

Oil Interests Seek Final and Permanent Settlement of Questions Involved in Mexican Petroleum Laws

In presenting requests for the cancellation of all petroleum decrees promulgated by the late President Carranza, and the right of unrestricted exploration and exploitation of oil lands, foreign oil interests claimed that Article 27 of the Mexican constitution, nationalizing petroleum lands, was unconstitutional. General Jacinto B. Trevino, Secretary of Industry, Commerce and Labor, to whom the request was addressed, stated, according to *El Universal*, that he had no authority to discuss the constitutionality of the decrees. He asserted that both legislative and judicial authorities had taken part in their issuance, the first having granted the President authority to make the decrees in question and the second having refused on numerous occasions to entertain appeals from the provisions of the presidential orders with respect to the petroleum fields.

Upon the conclusion of the conference, the oil men are said to have declared they would consult again with their principals for the purpose of arriving at conclusions which would permit a final and permanent settlement of questions involved in petroleum legislation.

The reported presentation of these demands came as somewhat of a surprise, as provisional president de la Huerta, during his first conference with foreign newspaper men, said the petroleum interests were satisfied with the new government's program and had shown their satisfaction by beginning important work and anticipating certain payments that were required under the regulations.

Oil Swindlers Indicted

Charging misuse of the mails for purposes of defrauding investors, the Federal Grand Jury of New York City indicted four oil companies, ten brokerage concerns and more than fifty individuals on June 24. The four oil companies are the Ranger Oil Co., the W. P. Williams Oil Co., the Great Western Petroleum Corporation, and the Crown Oil Co. The brokerage firms indicted are Curtis, Packer & Co., United Securities Company, H. Kent Holmes & Co., H. Morgan Pollok & Co., Thompson, James & Co., Stickney, Rawlinson & Colclough, Crossman, Sherman & Co., George A. Lamb & Co., E. M. Fuller & Co. and Greenbaum, Bigelow & Greenbaum. Nearly all officers of the oil companies and brokerage concerns and the companies' stock salesmen also were indicted.

This action is stated by Jerome Simmons, Assistant U. S. Attorney General, to be only the beginning of extensive prosecutions against sellers of worthless stocks in oil and other industrial promotions.

Encouraging the Gasoline Supply

From Our Washington Correspondent

That the problem of obtaining greater supplies of gasoline will be solved primarily by the extraction of supplies from mineral matter, and that alcohols and other substitutes derived from vegetable matter can be but a minor factor in the situation for an indeterminate period, is the opinion of Van. H. Manning, expressed as he was leaving the directorship of the Bureau of Mines. At that time the matter of substitutes for gasoline was being agitated in Congress and resulted in the preparation of the following statement, recently available, which in brief is as follows: High prices and threatened shortage have been caused by an increase in the uses of gasoline. As a solution, every encouragement should be given to the acquiring of supplies abroad, and the Government should do its utmost to provide technical and scientific guidance for the domestic industry. Serious consideration should be given to encourage the development of gasoline and gasoline substitutes; (1) by increasing the recovery of oil from our oil fields, (2) by developing processes for making synthetic gasoline out of heavy oils, (3) by encouraging the development of processes for making gasoline and gasoline substitutes out of oil shales, coals, lignites, peats, and (4) by developing processes for making alcohols and ethers from waste vegetable matter.

Deep Drilling To Be Done in Pecos County, Tex.

Oil Discovered While Prospecting for Sulphur—New Productions in McCulloch and Harris Counties

From Our Special Correspondent

A lease on 6,400 acres northeast of Fort Stockton, Pecos County, Tex., has been granted by Judge W. W. Turney, of El Paso, to J. G. Grant, of Pittsburgh. Deep drilling will be done. A small quantity of oil was discovered at shallow depth in this locality several years ago when the Arizona Mining Co. drilled for sulphur.

A well completed recently, and of interest on account of its location, is the No. 4 White of A. W. Cooper et al, near Mercury, McCulloch County. It will pump about 20 bbl. from 381 ft. No. 3 well in the same district is also pumping about the same. A shallow field of some extent may be opened here.

No large producers were completed in the coastal fields during the third week in June, but several producing wells making from 100 to 300 bbl. were brought in. The No. 2 Luscher well of the Gulf and West Production companies at Blue Ridge, Harris County has been completed. This well made an initial production of 250 bbl. from 2,640 ft. It now appears as though Blue Ridge will finally prove to be an oil field. Several other companies are actively developing there. The Gulf Production Co. brought in a well at West Columbia, flowing 100 bbl. daily. This well is 1,200 ft. northeast of any producing well, and adds somewhat to the area of the field. Production from West Columbia decreased to 15,000 bbl. daily during the third week in June.

In the Kemp-Munger-Allen field, Wichita County, the wells that came in making a large flow have settled rapidly to what is considered a normal flow, and the production from the district has decreased in consequence. Several wells producing from 100 to 400 bbl. each daily have been completed recently, however, and it is believed that the production from this field will gradually increase again. The completion of the Borg, Ard & Maer wells in Block 41 may mean an extension of the field nearly two miles south.

Development of new territory north of Breckenridge, Stephens County, continues. Good wells have been completed recently by the Sapulpa Oil & Refining Co. and the Gulf Production Co. The Texas Co., Prairie Oil & Gas Co. and the Mid Kansas Oil & Gas Co. also have producing wells in this section. One of the largest wells near Breckenridge completed recently is the Ward well of the Plateau Oil Co., making 4,000 bbl. daily.

The Casmalia field, in Santa Barbara County, Cal., has developed into an important oil producer and the yield is now 150,000 bbl. per month, according to the Department of Oil and Gas of the California State Mining Bureau.

Kentucky Oil Districts

From Our Special Correspondent

Pipe line runs reported by the Indian Refining Co. for the month of April show 181,771 barrels from Allen, Lee, Powell, and Estill counties. This is an increase of 40,000 bbl. over the highest mark for 1919, and 29,000 bbl. more than in March of this year, the highest up to that time. Of the total in April, 82,202 came from Allen County alone. The pipe line is to be extended soon into Warren County.

A $50,000,000 syndicate is being formed to purchase the Atlantic Refining Co., and two Kentucky oil companies, the Log Cabin and the Flesher. R. M. Catts is said to have offered $200,000 for the Log Cabin and $500,000 for the Flesher, but neither has been accepted or even favorably considered. The new syndicate has already acquired the Old Dominion for $6,000,000, the Pyramid for $1,700,000, and has offered $800,000, for the Rex, but stockholders of the latter are holding up negotiations.

In Warren County, a 75-bbl. well was brought in on the Joe Perkins lease. The Harris well, seven miles west of Bowling Green, has developed into a big producer, but has not been rated yet. The well on the J. E. Burch lease in the McGinnis pool was shot and is good for 100 bbl. a day. The Balmer well, on the Tarrant lease, is now reported making 600 bbl. a day and is only 450 ft. deep.

Oil Drilling Near Bowie, Ariz.

From Our Special Correspondent

The United States Oil & Refining Co. is drilling fifteen miles north of Bowie, Ariz. A new standard rig has been installed and operations will be continued to a depth of 5,000 ft. unless oil is struck before. The lease includes four sections of state land and four sections of located land, a total of 4,800 acres. At present the drill is between 1,050 and 1,100 ft., in stiff clay and shale. The tools and bailer show oil, and the slush pit is covered.

No capping material has apparently been cut and the formation still seems to be unconsolidated. Lack of water has been annoying, but arrangements have been made to pipe slush water from a well near by, although boiler water will still have to be hauled in. L. R. Caulfield is geologist. The principal stockholders are Lem Shattuck, C. Brewster, Frankenberg Brothers, and Dr. Bledsoe and son, all of Douglas and Bisbee, Ariz.

Natural gas has been struck near Ramsayville, Russell Co., Ont., seven miles from Ottawa, on the farm of D. J. Wallace, who was sinking a well for water. At a depth of 120 ft. a pocket or vein of gas was encountered. The gas was lighted and a flame shot up six feet. After some unsuccessful attempts, a cap was placed on the pipe. The discovery has caused some excitement in the district.

California Oil Notes

Our Special Correspondent

In the Midway field four wells were begun near Taft, two by the Chanslor-Canfield Midway Oil Co., on Sec. 8—33-23, and two by the Fuel and Oil Department of the Southern Pacific, one on Sec. 27—31-23 and the other on Sec. 17—32-24. The Tennehil Oil Co. has spudded in its No. 10 well in the Sunset field, on Sec. 33—12-24, and the Associated Oil Co. has started its No. 57 well on Sec. 5—29-28. The Mohawk Oil Co. is drilling its No. 12 well in the Coalinga field for the second time. Five other companies are deepening or redrilling wells in this field.

Conference Urges Gas Conservation

From Our Washington Correspondent

As a result of the agitation in West Virginia and other states to have natural gas held exclusively for the use of residents of the state in which it is produced, a conference was held in Pittsburgh on July 2 between the Public Utilities Commissioners of Ohio, Pennsylvania, and West Virginia to discuss the steps Ohio and Pennsylvania are willing to take to conserve natural gas supplies. The commissioners present at the conference were John S. Rilling, of Pennsylvania; E. D. Lewis, of West Virginia, and Byron N. Glendenning, of Ohio. Representatives of the New York, Indiana, and Maryland Public Utilities Commissions were present, as well as of the Bureau of Mines.

Secretary Payne of the Interior Department has revoked the regulation limiting to 4,800 acres the acreage which any one oil operator is permitted to acquire in the Five Civilized Tribes in Oklahoma. When this question was first taken up it was decided that the acreage which any one person, firm or corporation would be permitted to lease would be limited to prevent a monopoly of the oil and gas deposits. The rule has been enforced for several years, with the result that a large number of persons and firms are interested as lessees in oil lands belonging to Indians in eastern Oklahoma so that many of the Indians have had the restrictions removed from their land, and at present only about 15 per cent of the land allotted to members of the Five Civilized Tribes remains under the jurisdiction of the Interior Department.

General Salvador Alvarado, Minister of Finance of Mexico, has formally requested the Mexican Congress to annul the settlement with the Tehuantepeo Ry. (formerly operated by S. Pearson & Son, Ltd., of London, England.) General Alvarado declares that the government lost more than 9,000,000 pesos by the transaction.

Seventy thousand barrels of crude oil were exported from Mexican Gulf ports during the month of May, according to an official announcement made recently.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Winning of Alluvial Diamonds Described by W. L. Honnold

Ground From Shallow Deposits Usually Dry-Screened in Field—Wet Treatment for Cemented Alluvium

W. L. Honnold, speaking on May 29, last, at Johannesburg, before the meeting of the Anglo-American Corporation of South Africa, gave an interesting account of the present methods of winning diamonds from the extensive alluvial deposits of Southwest Africa. The following is taken from the London *Financial Times* on June 2:

"It is usually the procedure in the case of shallow deposits to dry-screen in the field through hand-revolved trammels, thus eliminating the material above and below the range of normal size diamonds, then transport the remainder to a wet-treatment plant, where it is jigged and the concentrates are hand-picked for diamonds. Secondary picking follows in combination with magnetic separation of associated minerals. This treatment is not necessarily complete; the coarse material eliminated in the fields may include cemented gravel-carrying diamonds, and fine material hitherto discarded no doubt carries diamonds of size now profitable.

"The first clearing of ground is bound to leave diamonds in the superficial crevices of the rock below. These are released by further weathering, which is facilitated by incidental shifting of ground into heaps. The secondary working is often justified, as in certain places the ground is worked over as many as five times. Where cementation occurs, which is often, the material discarded in the first treatment may give profitable results when crushed and treated by the wet method.

"On the Bergbau properties, particularly in the deepest deposits, cementation is so prevalent as to call for wet treatment on a large scale. This involves transportation to plant of all of the material, which is there passed through successive stages of screening, crushing, jigging and hand-sorting, the concentrates being dried for magnetic treatment and final sorting. There is a plant of this type in the Northern Block of Bergbau, which is still in course of completion, but is already treating about 12,500 cu.yd. monthly, say one-third of its ultimate capacity, recovery now being at the rate of about 7,500 carats monthly.

"A plant on modified lines is under consideration for the South Block, but will not be undertaken until conditions are more favorable for construction. Sea water is used where required. Treatment and electric power are provided by a central generating plant located at Luderichtbucht. On the South Block of Bergbau over ninety miles of trenching and 800 ft. of test pitting have been done, with the object of proving by sampling the deposit of about 1,500,000 cu.yd. of diamond-bearing gravel, which is estimated to contain between four and five million carats of diamonds. On a portion of this block the payable ground is shown to a depth of 35 ft., although other portions are much shallower. The deposit is to a large extent suited to mechanical excavation, together with sluicing away of sand where practicable. It is in connection with this ground that new plant is planned."

Mining and Metallurgical Society Declares for American Rights

The *Engineering and Mining Journal* published in the issue of May 1 the text of a resolution ballotted on by the Mining and Metallurgical Society of America. This resolution was almost identical with the Curtis bill, then before Congress, demanding reciprocity and retaliation in mining laws, and barring foreign citizens and companies from such privileges in the United States as our own citizens are deprived of in countries discriminating against American nationals.

The canvas of the ballots by the society showed that of the 150 replies received, 123 favored the passage of such a bill, 4 opposed it, and 4 were undecided. The reasons given in opposition, as published on p. 133 of the Society's bulletin for April-May, 1920, indicate objections to the phraseology rather than the object of the bill; but one reply states "it is inadvisable to copy the bad laws of other countries."

Washington State Metal Mining Association Reorganizes

With the object of bringing about a closer relation among all the mining men of Washington by promoting harmony among them, of encouraging prospecting and development, and of correcting such abuses as may crop up in the mining industry of their state, the Washington State Metal Mining Association has recently met and reorganized. The association now plans an active campaign to establish county locals through the vice-presidents, one of whom represents each county of the state. Later the association will establish co-operation with the American Mining Congress by forming a new or reorganizing the present non-operative state chapter. The meeting elected L. K. Armstrong, president; E. H. Knight, first vice-president; and M. E. Poole, secretary-treasurer. The headquarters are in the Peyton Building, Spokane, Wash.

Fatal Blasting Accident Due to Careless Tamping

Need of Proper Tools Emphasized—Penalty for Disregarding Well-Known Safety Rules Severe

In the "Reports of Investigations" for May, 1920, issued by the U. S. Bureau of Mines, Oliver Bowles and J. E. Crawshaw report on an accident of unusual character.

On April 19, 1920, a fatal explosion occurred in a limestone quarry in Pennsylvania, causing the death of six men and injury to three others, under somewhat unusual conditions. The shot that was being prepared consisted of six 5⅝-in. churn-drill holes in a single row. The line of holes crossed a depression that had at one time been used for the bed of an inclined track. Thus, holes Nos. 1 and 2 were on a bench about twenty feet higher than the other four holes. The approximate depth of holes Nos. 1 and 2 was 73 ft., and of Nos. 3, 4, 5, and 6, 55 ft. On account of previous blasting operations, the rock was in a shattered condition, and hole No. 1 was found to be blocked with rock fragments, so that it could not be loaded. It seemed desirable, therefore, to load hole No. 2 with a heavy charge, to compensate for the absence of a charge in hole No. 1. As the blast under consideration was small, a blasting expert was not employed, though it is customary to employ an expert for all large shots.

A line of cordeau detonating fuse was placed in hole No. 2, no electric detonators being used in the hole. After twelve or thirteen cases of 40 per cent nitro starch powder had been poured into the hole in loose form, it was found that a space of only 17 ft. remained for stemming. It was then decided that space for an additional case of powder might be obtained by tamping the charge. The tamping was done with a plunger weighing 30 or 40 lb., about 3 in. in diameter and 10 in. long, made of lead with an iron core with an iron eye in the top, to which a ⅜-in. rope was attached. This weight was intended for use in sinking explosive in wet holes, and not for tamping. It is estimated that the tamping had continued at least ten minutes. The quarry superintendent had gone a considerable distance for a box of powder, returned, and reached a point about 10 ft. from the hole, when the charge exploded, instantly killing the man who was tamping and injuring the superintendent and the shovel runner, who was also near by. The rock hurled down killed five and injured another of a group of men bailing out the holes on the lower edge.

Important conclusions may be drawn from the accident to which careful con-

sideration should be given by every quarryman.

1. The explosion seems to have been caused by hard tamping with a heavy plunger. With a smooth and regular drill hole such tamping might be conducted without accident, but not in an uneven hole having jagged rock projections.

2. It is evident that for all purposes a wooden tamping bar should be used. This has been urged repeatedly by the Bureau of Mines. Even with a wooden tamping bar the tamping should not be continued beyond the minimum time necessary.

3. If it is found necessary to use a lead plunger to sink powder in wet holes, the plunger should be provided with a copper rather than an iron eye. Hammering an explosive with a heavy weight is dangerous practice.

4. A circumstance of extreme importance, in that it resulted in undue loss of life, was the employment of men on a lower ledge adjacent to a face back of which explosive was being placed. The holes of the lower bench should have been loaded first and all workmen removed from the lower bench before loading hole No. 2. Under such circumstances the premature explosion would have resulted in one fatality and two injuries rather than six fatalities and three injuries. Workmen should not be at the base of a quarry face after loading begins.

5. Every quarryman will observe that the conditions surrounding this shot were unusual. Quarry operators should give more careful supervision to blasts of unusual character than to regular blasts where all operations are standardized.

6. The Bureau of Mines has pointed out that the employment of thoroughly competent blasting experts is to be recommended. Such experts are employed for large shots in the quarry under consideration, but it seems advisable to extend this practice to include all primary blasts.

7. Quarrymen should familiarize themselves with the various safety rules promulgated by the Bureau of Mines and should endeavor on every occasion to put them into practice. Such rules may be obtained upon application to the Director of the Bureau of Mines, Washington, D. C.

Federal Reserve Board Comments on Mining Situation

In reviewing the general business situation for May, the Federal Reserve Board commented on the metal mining situation as follows:

"Metal mining has shown a slight improvement in Colorado, despite some shortage in labor, while lead and zinc have shown a price reaction on the Joplin market, although much of the output is still in cars and on the sidings. The average price for lead ores is one of the highest for many months, but the supply of ore is insufficient to meet demand. Production, however, is fairly well maintained."

American Engineering Council Indorses New F. A. E. S.

Engineering Council has in many ways aided and furthered the creation of a comprehensive representative body of engineers, and extended great assistance to the Organizing Conference held in Washington recently. The Council has now capped its past performances, writes its secretary, A. D. Flinn, with the following actions taken at its regular meeting on June 17, after hearing a report on that conference:

"Voted, that Engineering Council heartily indorses the plan of organization of the Federated American Engineering Societies and the American Engineering Council, adopted by the Organizing Conference of technical societies in Washington June 3 and 4, and authorizes its Executive Committee to proffer and perform on the part of Council such assistance as may be practicable in completing the work of the Organizing Conference and of the Joint Conference Committee of the Founder Societies in establishing the American Engineering Council.

"Voted, that Engineering Council authorizes its Executive Committee to deal with any question of co-operation with the Joint Conference Committee of the Founder Societies, relating to the permanent organization of the Federated American Engineering Societies, which may come up during the summer.

"Voted, that the secretary be instructed to invite to future meetings of Engineering Council delegates of the societies participating in the Organizing Conference in Washington, June 3 and 4, and editors of technical journals who may be interested."

Arsenic Content of Superior Copper Ores

Copper arsenides have been found in a number of the Lake Superior copper mines. At present Ahmeek is producing varying quantities of algodonite, domeykite and whitneyite, these three minerals occurring in rich pockets. In the Mohawk mine there are pockets of the same ores and, in addition, a fourth arsenide, mohawkite. Algodonite carries 83 per cent copper and 16 per cent arsenic. It must be handled in lots that will give a smelter furnace a full charge. Domeykite ordinarily carries 71 per cent copper and 28 per cent arsenic. Whitneyite was found on surface at the old Pewabic property, at the Cliff and at the Minnesota mine in Ontonagon County, now the Michigan.

The showing of this arsenical copper ore, to be distinguished from the native copper, keeps increasing at both Mohawk and Ahmeek and is a factor in their total output. At present much of it is stocked at the smelters awaiting its special treatment. Seneca is expected to find this sort of ore in paying quantities. The Copper Range mines, on the Baltic lode, have opened up some of it, indicating that it is not exclusively a Kearsarge lode product.

Conference Approves Distributing Plan for Natural Gas Conservation

The tentative resolutions on natural gas conservation which have been adopted by the National Committee on Natural Gas Conservation were approved by a conference of state and public utility officials in Washington on June 11. The resolution follows:

"Whereas, the National Committee on Natural Gas Conservation, appointed by the Secretary of the Interior to work out a constructive program in co-operation with the U. S. Bureau of Mines for the conservation of natural gas, has, at a conference of Governors and Public Utility Commissions of the natural-gas producing states, held at Washington, D. C., on June 11, 1920, submitted its report, wherein is set forth in detail the methods to be employed in the production, transmission and consumption of natural gas, in order that the failing supply thereof be properly conserved, therefore be it

"Resolved, That this conference approve the recommendations so made by the National Committee on Natural-Gas Conservation, acting in co-operation with the U. S. Bureau of Mines, and we hereby respectfully urge that the recommendations so made be carried out by all natural-gas companies and their patrons, to the end that this valuable natural resource may be conserved for public use over an extended period."

This conference was opened by Secretary Payne of the Department of the Interior, following the course of Secretary Lane, who initiated the matter. F. G. Cottrell, director of the Bureau of Mines, who presided, set forth the keynote of the conference in the following language:

"This is a matter not of individual concern of each state, and it was thought necessary to call this general conference rather than to take up the matter individually with the several state governments, as there are problems of mutual concern, and it will be far more effective if it will be possible to obtain unified action throughout the various natural-gas using states and communities."

As a result of the conference, a tentative agreement was reached that the state public-service commissions of Pennsylvania, Ohio, and West Virginia would meet with utility interests of the three states on June 29 in an effort to determine a mutually satisfactory plan for the development of distribution of the natural-gas supplies of the tri-state field. If some protective program is worked out for this territory it is hoped that a similar plan can be adopted for the Kansas, Oklahoma, Missouri situation.

M. L. Alexander, the conservation commissioner of Louisiana, also stated that he expected to introduce in the legislature of his state, now in session, appropriate measures to give effect to the program recommended by the resolutions here adopted.

Book Reviews

The Engineering Index, 1919. Published by the American Society of Mechanical Engineers, New York City; 6½ x 9½; cloth; pp. 528. Price, $4.

This book is similar to, and a continuation of, the annual indexes of engineering articles which have been published heretofore by the Engineering Magazine Co. The A. S. M. E. has now taken over the work, and the present book presents, in bound form, the references published monthly during the year in *Mechanical Engineering*, the journal of the society. The Engineering Societies' Library receives regularly about 1,100 periodicals, reports and other publications devoted to science and engineering, which have been reviewed for the purpose of compiling the present volume. Over 12,000 articles are here indexed, each item concluding with a note summarizing the article in a few words. All forms of engineering are covered, but necessarily some published articles of lesser importance, and those of specialized interest, have been omitted. The work has been well done, and the book will be valuable to those who are frequently required to consult references on various engineering subjects.

While on the subject, we might add that the Engineering Societies' Library, 29 W. 39th St., New York, makes a specialty of looking up published information on any given subject for engineers, its files being particularly complete. Abstracts or photostat copies of articles are made, the cost being commensurate with the work done. Those who wish to collect all available information on any subject will find it to their interest to get in touch with this organization. E. H. R.

Technical Papers

Copper in Slags—On May 19, 1919, the *Engineering and Mining Journal* published the results of some investigations made by Maier and Van Arsdale on the manner in which copper is held in slags. A further report on more extended investigations by the same authors may be found in the June 16 and 23 issues of *Chemical & Metallurgical Engineering* (New York, 25c. each). Like the former articles, these last are well illustrated by photomicrographs which show that the prills of matte are floated in the slag by minute bubbles of SO_2; the latter resulting from a chemical reaction between the sulphides of the matte and ferric iron (including magnetite) in the slag. The matte thus floated takes the form of white metal by this reaction. The present articles discuss the composition of converter slag as well as that from blast and reverberatory furnaces and show what happens when converter slag is poured into a reverberatory. For best results a reducing zone should be maintained in the latter in the region where the converter slag is poured. Or, preferably, a separate reverberatory furnace smelting a pyritic siliceous material and producing a low-grade matte should be used for the purpose, as is done at Anaconda.

Increase of copper in matte is generally thought to result in increased slag loss, but the connection is shown to be not truly causative. It is the highly oxidizing condition of the furnace, necessary to produce a high-grade matte, which is the direct cause of suspended copper sulphide loss, through the formation of ferric iron and its subsequent reaction with matte particles.

The average dissolved copper content of blast furnace slags is about 0.16 per cent, regardless of the grade of matte, and of reverberatory slags, about 0.21 per cent. Converter slags vary more, but the dissolved copper is around 0.50 per cent. Further justification is offered for the silver nitrate method of determining dissolved copper and a method is given for the approximate determination of ferrous and ferric iron in slags.

This paper is of importance as a guide to further experimental work on a practical scale, and as an explanation of hitherto little-understood phenomena, even though no concrete information is given which is likely to result in the immediate improvement of smelting practice.

Industrial Fellowships—The Seventh Annual Report on the Industrial Fellowships of the Mellon Institute, Pittsburgh, Pa., is now available. Anyone who has a problem requiring investigation may contribute a sum of money to the Institute which will be adequate for the purchase of any special apparatus required as well as paying the salary of the investigator. The Institute will select a proper person to carry on the work, give him laboratory and library facilities, and assure careful direction to the progress of the research. All results belong exclusively to the donor. Some of our readers will remember that it was while working on one of these fellowships that the late H. P. Corless developed the use of alpha-napthylamine in flotation. C. L. Perkins and R. E. Sayre are now doing similar work there, and G. A. Bragg is also engaged in experimentations into metallurgical methods of the copper industry.

Lake Superior Iron Ores—"The Future of the Lake Superior District as an Iron-Ore Producer," by Edward W. Davis, has recently been issued as Bulletin No. 7 by the Experiment Station of the Minnesota School of Mines, Minneapolis. This treatise deals with the necessity of utilization of low-grade ore materials if the district is to maintain its production. Various estimates place the time period for the removal of merchantable ore at from fifteen to thirty years, and this limit will terminate the usefulness of the district as an iron-ore producer unless successful economic methods can be devised for the handling and treatment of enormous tonnages of low-grade ores. A general review of the methods of concentration now used and of the experimental work being done are given. Attention is called to the operations of the Mesabi Iron Co. on the eastern end of the Mesabi Range, where this company is completing a plant for the treatment of low-grade magnetic ores, and to the importance that may be attached to the economic success of the experiment.

Iron-Ore Transportation—In the July issue of *Mechanical Engineering*, issued by the A. S. M. E., appears an article by William S. Mitchell, "Design of Ore Fleet for Upper Mississippi," an abstract of a paper presented at the spring meeting of that society. Two experimental trips which were made during the war for the purpose of determining the possibilities of the upper Mississippi River route for ore transportation are described. Following the success of these experiments, the United States Shipping Board, Emergency Fleet Corporation, appropriated a fund of $3,860,000 to cover the cost of construction of nineteen barges and four towboats, together with provision for adequate terminal loading and unloading apparatus. It is estimated that the annual capacity of such a fleet operating between St. Paul and St. Louis will be 576,000 tons, this figure including Minnesota iron ore on the down trip and coal or other commodities on the up trip. Details of construction of the barges and towboats are given and sketches shown.

Gypsum—Those interested in this subject should write to the American Society for Testing Materials, 1315 Spruce St., Philadelphia, for "Report of Committee C-11 on Gypsum." It is a thirty page pamphlet, giving proposed specifications for gypsum and gypsum plasters, and methods of chemical analysis.

Queensland Mining Industry—The April number of the "Queensland Government Mining Journal," (Brisbane, price 6d., postage extra) contains an excellent review of the mining industry of that province during 1919, with a map in colors. The most important minerals produced are copper, coal, gold, and tin.

Smelter Smoke Litigation—E. E. Thum has an illustrated article in the June 23 issue of *Chemical & Metallurgical Engineering* (New York, 25c.) on the smoke litigation in the Salt Lake Valley. The history of the suits is given briefly and the principal points in the decree recently issued by Judge Johnson are discussed. The A. S. & R. has reduced injury by closing down certain smelting units when conditions of light, temperature, humidity, and wind direction are unfavorable.

MEN YOU SHOULD KNOW ABOUT

A. G. McGregor, metallurgical engineer, of Warren, Ariz., is in New York on business.

E. C. Humphreys is inspecting the fluorspar properties of the Lordsburg, N. M., district.

I. T. Pardee will do work in glacial geology in Montana and Washington during the present field season.

M. C. Lake, geologist for M. A. Hanna & Co., is examining copper properties in the Lordsburg, N. M., district.

E. G. Sievers is engaged in an investigation of natural-gas gasoline in the Charleston, W. Va., and Tulsa, Okla. fields.

James G. Ross, mining engineer, of Milton Hersey Co., Ltd., Montreal, is examining properties in the Western States.

M. Stockder, of American Smelting & Refining Co., has been looking over copper properties in the Lordsburg, N. M., field.

James MacNaughton, general manager of Calumet & Hecla Mining Co., is in Boston.

C. E. Siebenthal has returned to Washington after visiting zinc mines in Wisconsin and lead mines in southeastern Missouri.

Frederick G. Shipley has been appointed chief engineer of the Moctezuma Copper Co. of Nacozari and Pilares, Sonora, Mexico.

Arthur J. Collier has completed an inspection of the Osage petroleum district, but will visit several small fields in Wyoming prior to his return to Washington.

William R. Todd, president, and **W. Parsons Todd**, vice-president, of Quincy Mining Co., 32 Broadway, New York City, are visiting the company's mine at Hancock, Mich.

Nelson H. Darton has been granted an extension of furlough by the U. S. Geological Survey, that he may continue to Nov. 30 on the private oil work he is doing in Mexico.

W. G. Mather, president of the Cleveland-Cliffs Iron Co., and **Samuel L. Mather**, president of Pickands, Mather & Co., are expected to return from Honolulu by June 30.

Errol MacBoyle, consulting and mining engineer, president of Durango Silver Mines, is in Mexico inspecting the company's property. His address is: Hobart Building, San Francisco, Cal.

T. Wayland Vaughan will examine the Tertiary strata at several points on the Pacific Coast, during the summer months, with the idea of making comparisons with Tertiary strata on the Gulf and Atlantic coastal plains.

Alan M. Bateman, professor of economic geology at Yale University, and editor of *Economic Geology*, New Haven, Conn., has gone to British Columbia and Alaska on professional business.

H. C. Plummer, former assistant superintendent of the Cananea Consolidated Copper Co. at Cananea, Sonora, Mexico, is mine superintendent for the Arizona Commercial Mining Co. at Globe, Ariz.

W. V. Van Camp, recently of the field force of the Consolidated Arizona Smelting Co. at Humboldt, Ariz., has taken charge of underground operations with the United Verde Copper Co. at Jerome, Ariz.

R. C. Brown has resigned as chief engineer for the New Cornelia Copper Co., Ajo, Ariz., and will open an engineering office in Los Angeles, Cal. He will be succeeded by **G. F. Coope**, of Ajo, Ariz.

G. F. Loughlin, who is in charge of the Mineral Resources Division of the U. S. Geological Survey, is conducting some field work in eastern Massachusetts. **J. P. Dunlop** is acting in his absence from Washington.

Morris P. Kirk, has resigned as general manager of Yellow Pine Mining Co., Goodsprings, Nev., effective July 1. Mr. Kirk plans to engage in the ore-purchasing business in the Southwest, with headquarters in Los Angeles, Cal.

Prof. J. C. McLennan, of the University of Toronto, who was scientific advisor to the British Admiralty at the close of the war, is in London arranging with the Admiralty for the establishment of a helium gas plant in Canada.

K. D. Koliasnikoff, resident manager of Kyshtim Corporation, Ltd., 7 Gracechurch St., London, E. C., and Kyshtim, Perm, Russia, is in San Francisco, Cal. He is preparing for a trip through the mining districts of western North America.

Horatio C. Ray, professor of ore dressing, University of Pittsburgh School of Mines, has resigned to accept a position with the Keystone Consolidated Publishing Co., Pittsburgh, Pa. His address after July 1 will be 711 Penn Ave., Pittsburgh, Pa.

John A. Dresser, consulting geologist of Montreal, will head a party including **Professor McLean**, of Toronto University, and **Edmond Speaker**, of the Department of Geology, Johns Hopkins University, to make investigations in the Peace River region for the British Columbia government.

Allen Murray Yonge, mining and consulting engineer, of 229 East Main St., Staunton, Va., has resigned his position with the Crimora Manganese Corporation, of Virginia. He is leaving this week on an inspection trip to the properties of the Keith-Marshall interests in the West Indies.

L. T. Buell, mining engineer, after several years in Chile and other South American countries, has been on an extended vacation in the United States. He is now accepting a position with the Phelps Dodge Corporation, in Douglas, Ariz. Mr. Buell's latest address was P. O. Box 100, Miami, Ariz.

D. G. Kerr, of New York, vice-president of the United States Steel Corporation; **M. Shiras**, ore agent for the corporation, and **A. Klingerman**, of Pittsburgh, together with president **W. J. Olcott** and other officials of the Oliver Iron Mining Co., have been making a tour of the Michigan and Minnesota iron ranges during the last ten days.

Gerald S. Lambert, assistant professor at Leland Stanford Jr. University, has been appointed associate professor of geology, and **Dr. A. E. Koenig**, assistant professor of chemistry at the University of Wisconsin, has been appointed associate professor of chemistry at the Montana State School of Mines.

Alfred James, of 28 Victoria St., London, S. W. 1, a past president of the Institution of Mining and Metallurgy, sailed from New York for England on June 26. Mr. James had been on an inspection trip through the United States and Mexico, and reported conditions in the latter country to be better than is generally believed.

Dr. E. P. Taylor, agricultural extension director at the University of Arizona, has resigned to take up commercial work in the agricultural department of the Anaconda Copper Mining Co. of Montana, which will engage in the manufacture of fertilizer from sulphuric acid produced at the Anaconda works and from Western phosphate beds. Dr. Taylor will have offices in Chicago.

J. Parke Channing, vice-president of the Miami Copper Co., was the principal speaker at a recent meeting of the Globe-Miami Chapter of the American Association of Engineers. **Arthur Crowfoot**, of the concentrating department of the Arizona Copper Co., Ltd., read a paper before the Clifton-Morenci Chapter, on the handling of low-grade sulphides in the company's experimental mill at Morenci, Ariz.

Benedict Crowell, mining engineer, president of the Rosiclaire Fluorspar & Lead Mining Co., and senior member of Crowell & Murray, 407 Perry Payne Building, Cleveland, Ohio, has resigned his position as First Assistant Secretary of War, effective June 30. Mr. Crowell, as First Assistant Secretary, was in charge of the munitions program during the war and of the adjustment of claims and contracts of munitions-making firms since the armistice.

Thomas H. O'Brien, formerly manager of the Dawson (N. M.) Coal Co., has been appointed general manager of Inspiration Consolidated Copper Co., Miami, Ariz. Mr. O'Brien assumes his new duties at once and relieves Dr. L. D. Ricketts, vice-president and general manager, of the additional work he undertook when Charles E. Mills, the previous general manager, resigned to go into public service. Mr. O'Brien will also be in charge of the International Smelting Co.'s smelter.

Second Prevention of Accidents Conference Held at Duluth

Representatives of Lake Superior Iron and Copper Companies Meet Again With Bureau of Mines Officials—Permanent Organization Effected, With George Martinson President—Operators Urged To Send Teams to Contest at Denver Next September

By ELLERY E. ANDERSON
Special Correspondence of the *Engineering and Mining Journal*

The second annual meeting of the Lake Superior Prevention of Accidents Conference was held at Duluth, Minn., June 23, 24 and 25. Like the first, it took place in the sun room of the Spalding Hotel, under the auspices of the U. S. Bureau of Mines. C. E. Julihn, district mining engineer of the Minneapolis district of the bureau, conducted the sessions. Representatives from practically all the important iron and copper companies were in attendance, as well as from the Bureau of Mines.

The morning of the first day was devoted to the registration of delegates and to brief introductory remarks by Mr. Julihn. At noon the delegates adjourned in a body to luncheon, renewing the session at two o'clock with the consideration of a paper written by Dan Harrington, supervising engineer of the U. S. Bureau of Mines, Golden, Col., on the subject of "Metal Mine Ventilation and Its Relation to Safety and Efficiency in Mining Operations." Mr. Harrington was unable to be present, so the paper was read by R. V. Ageton, of Houghton, Mich., also of the Bureau of Mines. A. A. Krogdahl, safety engineer of the Oliver Iron Mining Co. at Virginia, Minn., followed with a paper on "Mine Ventilation on the Mesabi Range." The technical features of the first day consisted entirely of these two papers on mine ventilation, a comparatively new phase of Lake Superior mining. Both papers emphasized the relation of mine ventilation to efficiency and both brought out interesting discussion. It was pointed out that, although mine ventilation is primarily a humane project, it can be justified as a business proposition in that it increases production and reduces accidents. Instances were cited of many mines and stopes where the air was considered to be pure but upon analysis was found to be impure. Good ventilation in many instances made the miners more alert with regard to both ore shoveling and safety.

At the close of the discussion the chairman announced that it was the desire of the Bureau of Mines that the conference should perfect its own organization and prepare to conduct future conferences under its own auspices. He expressed the entire willingness of the bureau to assist as far as possible in the conduct of future meetings, but explained that the movement should thenceforth stand on its own feet and be conducted with the support of the bureau but not under its direction. Accordingly, Steven Quayle, safety engineer of the Hanna Ore Mining Co., was elected chairman of a committee to be of his own choosing, to perfect plans of organization to be submitted for approval on the second day. In the evening the delegates were the guests of the Lake Superior Industrial Bureau at a dinner and vaudeville entertainment at the Kitchi Gammi Club.

Sebenius Discusses Mesabi Open-Pit Methods

On the following day the session was opened with a paper read by John Uno Sebenius, chief mining engineer of the Oliver Iron Mining Co., Duluth, on "Development of Mesabi Range Open-Pit Methods To Offset Labor Shortage." After a brief preface on Mesabi Range geology, Mr. Sebenius dwelt on the flexibility of open-pit methods used on the range and the quick expansion of production possible in them as exemplified by the great increase in shipments made necessary by the war. He also pointed out the increasing popularity of such methods and the fact that many orebodies formerly held to be workable only by underground development are now considered to be easily available by open-pit methods. He cited instances of properties partially depleted by underground methods, which have lately been stripped and developed as open pits. This tendency, he said, was partially owing to labor shortage and in part to the much smaller accident-per-ton factor possible by open-pit methods. Shortage of labor was also given as one of the principal causes of the development of labor-saving devices which, it was said, in the six years elapsed since the first marked scarcity, have been perfected to such a point that the operator can now proceed with 85 per cent of the number of men formerly required and this in the face of considerably increased production. The locomotive crane, the 300-ton shovel, the 30-yd dump car, the track shifter and the tie tamper were cited as instances of mechanical improvements.

W. A. McGonagle, president of the Duluth, Missabe & Northern Ry., gave an informal and brief history of ore transportation in the Lake Superior district, beginning with 1882. Byron D. Shove, safety engineer for the Oliver company, at Ironwood, Mich., then presented a paper on "Methods Employed in Maintaining Safety in Underground Mining on the Gogebic Range." In it he gave a detailed outline of the safety organization of the Oliver company on the Gogebic Range. The speaker enlarged on the success attained in interesting bosses in direct charge of the work in the safety movement and pointed out the absolute necessity of arousing the interest of these men before any results might be obtained. A very general discussion, bringing out the details of safety organization, followed the reading of the paper.

A paper, entitled "Safe and Dangerous Practices in the Use and Care of Explosives Underground and in Open Pits," was next presented by Spencer P. Howell, of the Bureau of Mines, Pittsburgh, Penn. Misfires and their prevention and the possibility of serious accidents through premature explosion caused by electrical storms were the principal points dwelt upon. The speaker submitted the record of experiments proving that three hours should be allowed to elapse before approaching a misfire.

Permanent Organization Elects George Martinson President

The organization committee, composed of Steven Quayle, Major E. L. Flynn, C. D. Chappell, George Martinson and E. L. Cochran, submitted a tentative plan of permanent organization, suggesting that the affairs of organization be concentrated in the hands of a president, vice-president and secretary; that arrangement be made for annual conferences similar to those of 1919 and 1920; that a shorter name be chosen for the organization; and that the Bureau of Mines be requested to submit these plans to the various operators for their approval. These suggestions were adopted by the conference. George Martinson was elected president, C. D. Chappell vice-president, and Steven Quayle secretary. The papers of the afternoon session were postponed to enable the delegates to accept an invitation to inspect the plants of the Minnesota Steel Co.

A. H. Trestrail, safety engineer for Pickands, Mather & Co., presented the first paper on the third day, entitled "Stench Test at Bennett & Caspain Mines of Pickands, Mather & Co." The tests were conducted by introducing ethyl mercaptan and amyl ethylate into the air lines leading to the working places, when by means of observation stations placed at varying distances from the point of introduction, it was demonstrated that the former was quicker to reach the working place, also more pronounced. Regular injectors for introducing ethyl mercaptan into the air lines are now installed as warn-

ing signals in case of mine fires or other general mine catastrophes.

CALUMET & HECLA EFFICIENCY METHODS DESCRIBED

Ocha Potter, chief efficiency engineer and superintendent of the experimental mine for the Calumet & Hecla Mining Co., presented a paper on "Recent History of Copper Mining in the Lake Superior District." A brief summary of conditions in the copper country, indicating the necessity of improved methods or a complete shutdown, prefaced the paper, after which the improvements which have been worked out were taken up at length. Chief among these was the introduction of the one-man drill, which was given the larger share of credit for the increase in production per man from 11.42 tons in 1912 to 26.92 tons in 1919, the cost per ton of rock in the meantime being reduced about 3 per cent in spite of doubled labor and supply costs. The development of the storage battery locomotive to the point where it trams 6.8 tons per kw.hr. an average distance of 800 ft. was also taken up, as well as the increase in mill recovery from approximately 17 lb. in 1918 to more than 22 lb. in 1919. It was pointed out that this large increase in recovery was not accomplished at the sacrifice of valuable material in any quantity whatever, but by the simple expedient of close supervision over the miners when placing holes for blasting. The tendency of the contract miner to edge his holes into the foot and hanging walls was discouraged, it was stated, by from four to six daily inspections of each stope, thereby slightly increasing the cost at the breast but decreasing the haulage, hoisting and crushing cost per pound of copper produced. The paper was delivered in sections covering drilling and blasting, tramming and slushing, timbering, hoisting, and mining, and each subdivision discussed at length by the conference before passing to the next.

At noon the conference adjourned to the lunch room of the Spalding Hotel, where the delegates were the guests of the subsidiary companies of the U. S. Steel Corporation. Afterwards D. J. Parker, chief of the mine rescue cars and stations division of the Bureau of Mines, Pittsburgh, Pa., spoke on the "Importance of Annual First Aid and Mine Rescue Contests," urging that wherever possible teams be sent to compete in the annual contest that is to be held at Denver, Colo., on September 9 next.

THE MINING NEWS

LEADING EVENTS

Car Shortage Causes Zinc Companies To Shut Down

Suspension Will Last Two Weeks—Move Will Be Followed by Effort To Curtail Output

Following a meeting held at Miami, Okla., on June 24, all the leading zinc ore producing mines of the Kansas-Missouri-Oklahoma district will be closed down from June 26 to July 10, the most notable shutdown in the history of the field. The explanation of the shutdown, as announced, is the inability of ore shippers to get cars for shipments, and also to permit the miners to participate in the wheat harvest.

In previous years attempts have been made to get the larger operators together on a shutdown program, and it was accomplished this time only after weeks of effort. In the past, one large interest in particular had proved a stumbling block, always refusing to agree to a shutdown program, but this time it has agreed, and it appears that the cessation of operations will amount to fully 90 per cent throughout the field. A few mines will operate on reduced schedules by special agreement.

It is understood that the shutdown will be followed by an equally serious effort to curtail output permanently in accordance with the actual demands of the smelters, and to allocate production to the different companies on some basis to be agreed upon. The move is considered locally as the most radical and most likely to produce permanent good results for the field of any in the history of the district. The effects of car shortage upon mining in other sections of the country are marked. In Alabama, some companies are buying their own cars.

WEEKLY RÉSUMÉ

The leading producers of zinc ore in the Joplin-Miami district agreed on June 24 to close down from June 26 to July 10 in consequence of the acute car shortage. Iron and steel companies in the Birmingham district of Alabama, similarly affected, are reported to be taking steps to acquire their own railroad cars to insure a steady supply of ore. Charles Butters, speaking recently in Nogales, Ariz., proposed an interesting plan for providing a silver coinage for Mexico; this plan calls for an arrangement between the silver producers and the Mexican government under which the mints will be rebuilt to mint part of the silver output. Great activity is reported in northern Manitoba this season, centering naturally at the Flin Flon property. In Washington, the War Minerals Relief Commission has handled 70 per cent of the claims made, the remainder including some of the largest. The engineering committees of the National Research Council have been named.

Arizona Mining Companies Seek Lower Assessment

Based upon the comparative inactivity of the copper market for the year past, a number of Arizona mining corporations are asking decreased valuations on their properties for purposes of taxation. The Arizona Copper Co. has asked at least a decrease of $1,000,000 from the tentative figures of $25,000,000 in the State Tax Commission's estimates. The commission also has been asked to lower the figures on the Grand Reef property in western Graham County, now operated by the Aravaipa Leasing Co. and secured from the John W. Mackay estate. It has been assessed at $200,000 and the company has asked that this be reduced 50 per cent.

Silver Coinage for Mexico Proposed by Charles Butters

Suggests That Producers Furnish Minting Facilities Under Arrangement With Government

"Mexico is absolutely devoid of coin," says Charles Butters. "Why should her silver be offered at a constantly falling price to the market when it is absolutely needed in Mexico to give a basis for business? As the need of 200,000,000 to 300,000,000 oz. of silver money is absolutely essential in Mexico, I should supply it in this way:

"Let the producers form an association to coin this under an arrangement with the Mexican Government by which the former supply the necessary minting facilities and issue the coins as desired. The producers in Mexico will pay all their Mexican bills in this silver, pay their laborers and for supplies bought in Mexico, which would immediately absorb more than half their output, diminishing to this extent the bullion to be marketed, which would so reduce the new supply that production would appreciate. The producer could buy export goods for his silver and export other commodities instead of silver if he had the coin to pay in.

"To furnish the coinage facilities I would say: Let the producer build the mints under a concession. Whatever profit was made in the coinage let that be credited to the cost of depreciation on the mint. When this amortization was completed by return of capital and interest, then turn the mint over for Government operation. The producers would have lost nothing; the Government would have lost nothing. The price of silver naturally under a plan of this kind would go to coinage value

eventually. Should such a value be reached before the amortization was complete, the mints could still remain under the concession for, say, a period of two years, to insure the producer his return of capital. In this case, as the producer would be getting coin value, he could consider that within at least two years the difference between a market of 80c. and, say, $1.25 would mean a return of capital.

"I propose a coinage uniform with that of the United States, of the same fineness and weight, but our 50 cent pieces would become pesos and our dollars two peso pieces, and so on, and when silver became coinage value in both countries, the money would be interchangeable.

"I see that the U. S. Mints refuse to give out coin for bullion sold to them. This position is untenable, because the function of the U. S. Mint is to coin according to demands, and if the demand is powerful enough and the American companies use their silver in the business, the Government will never be able to get its silver back, but that would make no difference, as the people would have the silver."

The subject of a silver coinage for Mexico was discussed by Mr. Butters on June 16 before the Nogales (Ariz.), Chamber of Commerce. In his speech he dealt with the matter at greater length than in the preceding remarks here given, which are from a letter written by him to his New York office.

"Mexico is practically stripped bare of metallic money and the nation's business is being halted for lack of small change to carry on trade with the smaller merchants," said Mr. Butters at Nogales. "Before Mexican retail trade can resume anything like normal conditions it will be necessary to provide the people and merchants and banks with metallic money.

"Mexican mints are not working, and this, coupled with the fact the revolutions and world markets' demand for silver during the late war sent billions in silver bullion out of Mexico, has left that country minus the needed medium of exchange in carrying on retail trade.

"Mexican mines are producing silver and ought to produce much more. The trouble is twofold. The silver output in Mexico today is practically all speculative in that the silver bullion is being shipped out of Mexico for export and sale in the markets of India and China, via San Francisco. An equal fault in the silver market is that the price of silver to producers is so low that it cannot be mined at a profit.

"We face, therefore, the three-way need in the Mexican silver market. First, the necessity for providing Mexico with hard money and plenty of small change. Second, the necessity of increasing the market value of raw silver from the mines so that production can be stimulated and the miners receive a profit on their production. Third, the creation of a market for Mexican silver right in the territory in which it is produced.

"With a home market made for the silver, and the demand created for silver in that home market by filling the need of Mexico for silver coinage, the price is bound to be better to the producers for their bullion bars.

"The silver mining men of Mexico are forming an association, the object of which is to re-establish and rebuild the mints of Mexico in the various states and that these mints then be used for the coinage in Mexico of the hard money in change necessary to supply the public, the banks and the merchants with the necessary metallic coin to carry on their trade and business.

"The plan in brief is that the silver men make a deal with the Mexican government to rebuild the mints and put them in operation for free and unlimited coinage in Mexico of silver bullion. The cost of the rebuilding of mints is to be taken from the 10 per cent production tax levied by the government on the silver output at the mines and by charging off each year a certain per cent of the 10 per cent federal production tax, the balance to be paid the government in cash as at present. Then at the end of a specified term of years when the mints shall have been rebuilt and are in full operation, these mints shall be turned back to the Mexican government without further charge."

Electric Smelting Planned on Large Scale in Norway

"In northern Norway," says a translation from *Verdens Gang* (June 12, 1920), "very large industrial undertakings are developing. Glomfjord will be first—if we leave out Narvik, which is virtually a shipping port for ore. At Glomfjord 150,000 hp. can be regulated for big industries. Of this about 45,000 hp. is on the point of completion. The first large industry is a large electric zinc smelting proposition, which is also nearly ready to make a start."

In *Bergverksnyt* (Kristiania) of Oct. 3, 1914, it was stated that "the Glomfjord company is the largest of its kind in the whole of north Norway. The company was the first to come under the new concession law for water power reguluation. It is computed that when the whole of the construction is completed some 60-70,000 hp. will be available. . . . What the power is to be used for has not yet been decided, but it is said that electric smelting on a large scale has been planned, and in several places in north Norway a number of ore beds have been secured."

Would Avert Closing of Cornish Tin Mines

Sir Edward Nicholl recently asked in the House of Commons whether, in view of the fact that notices had been given by several tin mines of Cornwall of their intention to close down, the government intended to take immediate steps to carry out the recommendations of the Non-Ferrous Mines Committee and make suitable grants from the funds in the hands of the development commissioners.

Fast Nearing Production Stage at Sacramento Hill

Phelps Dodge Expects To Start Mining Early Next Year—New Mill Ready Then—Remodeling Tyrone and Nacozari Plants

At the outset of the Sacramento Hill steam-shovel operations of the Copper Queen branch of the Phelps Dodge Corporation at Bisbee, Ariz., the total amount of waste to be removed before ore production starts, which will be early in 1921, was 6,167,000 cu.yd. Of this 4,370,000 cu.yd. was removed by the end of April so that 71 per cent of the waste stripping necessary before ore production starts was then complete. It is expected at present that steam shovel operations will be ready for steady production early in 1921.

It is anticipated that the new mill for handling the concentrating ore from the steam shovel pits will also be complete very early next year, the exact month being dependent on the supply of labor during the remainder of the year and also on steel deliveries. This mill is being designed by H. Kenyon Burch and is planned for the treatment of 4,000 tons of ore daily. A large part of the excavation and concrete work is complete. Erection of steel for the new machine shops and also for the carpenter shop and supply house was recently completed and is now proceeding over the ore bins at the head of the mill. During the last month some of the low-grade leaching ore taken from Sacramento Hill averaging between 0.5 per cent copper and 1 per cent copper has been heaped at the site of the proposed new leaching plant which is a little below the mill.

The remodeling of the Tyrone mill at the company's Burro Mountain branch, in New Mexico, is practically complete and operations are expected to be resumed there within thirty to sixty days. The new flow sheet will permit the treatment of 2,000 tons per day but it will be a few months before the mine will be able to adjust itself to this tonnage. The flow sheet consists of primary and secondary fine grinding with gravity concentration in between, and with pneumatic flotation following the secondary fine grinding, and tables following the flotation.

Construction work is under way in the mill of the Moctezuma Copper Co. at Nacozari, Sonora. To date this has consisted of tearing out the equipment and old foundations in the south half of the present mill. Later this year this side of the mill will be re-equipped on the lines of the latest flowsheet. It is expected that operations can start in this half during the first quarter of 1921. Two thousand tons of ore per day will be handled in half of the mill. In the meantime, current operations are continuing in the north half of the mill at the rate of about 1,500 tons per day. When the alteration of the south side of the mill is completed, it is expected that part of the north side will then be remodeled so as to provide a mill able to treat 3,000 tons daily.

NEW IDRIA QUICKSILVER MINING CO., IN CALIFORNIA, DELIVERS RED HOT CALCINES TO DUMP BY AERIAL TRAMWAY

Prospectors Drawn to Manitoba This Season

Flin Flon Development Progressing—Gordon Claims Being Drilled—Gold Strike Near Elbow Lake Causes Rush

Mining activity in Northern Manitoba is chiefly confined to three sections namely, the copper area, in which are the Mandy and Flin Flon properties, north of Schist Lake; the gold area in the vicinity of Cranberry and Copper lakes, which lie approximately 20 miles east of the Mandy; and 80 miles farther east the Herb Lake section of the gold area, which is reached from the Hudson's Bay Ry. From The Pas this railway maintains a trimonthly service to the Herb Lake district and adjacent points along the railway for 214 miles.

Northern Manitoba this year is attracting many prospectors and men looking for prospects that will warrant the expenditure of money in development. On a whole the country is comparatively free from wild-catting and a healthy development of different discoveries is under way.

Mining of high-grade copper ore at the Mandy has been completed. The Mandy machinery purchased by the Flin Flon Syndicate has been moved and installed at the Flin Flon property, and is now operating in conjunction with the plant which was purchased from the Beaver Lake Mining Co. and moved from Beaver Lake to the Flin Flon ground. The plant is now in full operation and two shafts are down 75 and 60 ft. respectively. These are being sunk 1,000 ft. apart on the foot wall of the orebody. Work is being rushed on them, but is somewhat retarded by excessive water from Flin Flon Lake. The sawmill, part of the Mandy plant purchased, has been set up on the north shore of Schist Lake, four miles from the mine, and is running to capacity cutting lumber for camps and mine timber. A passable wagon road from Schist Lake to the mine has been built. The underground development work at the mine is being done under contract by the Longyear company. At the present 120 men are employed in connection with this work.

The present work is being done by the Flin Flon Syndicate to check the results determined by diamond drilling during the last two years. Results from new development will determine whether the syndicate will take up its option to purchase during the latter part of this year.

In the gold area at Cranberry and Copper lakes, diamond drilling is being done by Smith & Travers, drilling contractors of Sudbury, Ont., on the gold property known as the Gordon claims. Sufficient drilling has been done to indicate a large tonnage of gold quartz carrying some sulphides. The third drill hole, cutting the orebody at the 150-ft. level, showed a width of 51 ft. of ore. Assay results from these have not been received.

Further northeast in this district in the Elbow Lake area, prospecting is being vigorously carried on, owing to a recent discovery of gold on the Webb claims. Very rich specimens have been brought out from this area, which has caused the prospectors in the surrounding country to concentrate there, in a stampede. The district has long been a promising one for exploration, but until this year prospectors in this large area met many difficulties.

Aerial Tramway Used for Handling Red Hot Calcines

New Idria Quicksilver Co. Carrying Discharge from Rotary Furnaces to Dump Through Air

The New Idria Quicksilver Mining Co., at Jamestown, San Benito County, Cal., has recently erected at its reduction plant a wire rope tramway for transporting the red hot calcine from the rotary furnaces to the dump. The furnaces are arranged in parallel 25 ft. apart. Each discharges into a small hopper from which the calcine is in turn discharged into a single 2-ton tramway bucket. The bucket, which is of the ordinary type, travels along the line of spouts. An arc gate at each spout controls the discharge of the calcine.

The tramway, which was erected by the Painter Tramway Co., of San Francisco, is 1,100 ft. long and is supported by two wooden towers, one an intermediate and the other a terminal tower. The latter is constructed so as to take up the pull of the stationary cable without guys. The spans are respectively 500 and 600 ft. The stationary or track cable is 2 in. in diameter and of "solid" or smooth-coil construction. The traction cable is ½ in. in diameter. The bucket weighs 900 lb. and is dumped automatically by a tripper. The rope speed is 600 ft. per minute and the capacity of the tramway 20 tons per hour. The terminal is 100 ft. higher than the loading chute.

CHUTE OF ROTARY FURNACE BY WHICH CALCINES ARE DISCHARGED INTO TRAMWAY BUCKET, IDRIA, CAL.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Revision of Mining Law Expected at Next Session

That Proposed Calls for Changes Regarding Extralateral Rights and Size of Claims

It is expected that the effort to secure the revision of the mining law will be begun immediately on the convening of Congress in December. A great deal of thought and labor has been expended on a draft of the bill which has been placed in the hands of the Committees on Mines and Mining of the Senate and of the House. This draft was prepared by a committee consisting of W. R. Ingalls, Walter Douglas, J. Parke Channing, J. R. Finlay, John Hays Hammond, L. D. Ricketts, Horace Winchell, and James R. Jones. The committee, in preparing this draft of the bill, was governed largely by the returns from a questionnaire containing thirty-three specific questions regarding mooted points in the existing law.

The principal point of difference is the section of the law pertaining to extralateral rights. With minor differences the wording of the draft of the bill covering the ownership of minerals within the claim is that adopted by a large number of mining societies. That section of the proposed bill reads:

"Subject to the existing extralateral rights of mining claimants or patentees, the holder or patentee of a mining claim located hereafter *shall* have the exclusive right of possession and enjoymen of the surface held by him and of the minerals under it, bounded by vertical planes passing through *the* surface boundaries of said land, but *shall* not *have* the right to follow any mineral deposit beyond said planes. And the holders or patentees of claims heretofore located *shall* have similar exclusive possession of all the minerals in said claims that is not covered by any existing extralateral rights."

In that connection the Ingalls committee calls attention to the following:

"Inasmuch as the owner of unpatented mining claims does not at present possess 'exclusive right of possession and enjoyment of the surface' for purposes other than mining (see Teller v. U. S., 113 Fed., 273, 51 C. C. A., 230; U. S. v. Rizzinelli, 182 Fed., 685), it is suggested that it may be advisable to separate this paragraph in order to qualify the rights of the owner of an unpatented claim. For example, after the words 'shall have,' in the part relating to unpatented claims there might be inserted the words 'for mining purposes.' The construction at present given to the words 'exclusive right of possession and enjoyment of all surface' would not make it necessary to change the above paragraph, but the Forest Service may take the view that this proposed new legislation, if enacted, in the light of existing law might be construed so as to give the owner of an unpatented claim the right to the timber on his claim."

In the proposed bill mineral deposits on the public lands are declared to be free and open to exploration and purchase by citizens of the United States only. In that connection, the committee calls attention to the following:

"A Mr. F. W. Carnahan, who appears to be connected with the International Copper Co., of Clarkston, Wash., wrote to the Bureau of Mines from Leland, Ore., suggesting that the mining law should be changed so as to permit aliens to take up mining rights on the same terms as American citizens. His argument is that such privileges are conferred on Americans in Mexico and most of the other Latin American countries, and that if we do not reciprocate there will eventually be discrimination in these countries against Americans who wish to take up such rights. He was promised that the question would be put before the committee. There may be pointed out in this connection that mining on American public land is free while in the other countries which Mr. Carnahan has in mind, a charge of some nature is usually made for such mining and those countries are anxious to have foreign capital come in and develop mines. Moreover, to make any change will probably bring up the question of the privileges to be granted to Orientals, with resulting embarrassments."

The draft of the bill provides that all mining claims shall be located in the form of a square containing forty acres. The committee points out that this could be changed so as to make the form of the claim either a square or a rectangle or the provision might be made so that the claim could be of any size not exceeding forty acres.

The proposed bill does not change the requirement that the annual assessment work is to be at the rate of $5 per acre. The committee calls attention to the suggestion that, instead of requiring development work to be performed and proved in terms of money, some other index be used as, for example, that the claimant be required to perform 1,000 cu.ft. of excavation work annually for each claim and 5,000 cu.ft. in all, in order to obtain a patent.

In a recent opinion the Interstate Commerce Commission points out that tariffs on infusorial earth are not restricted to ground earth. In some cases higher rates have been applied where the earth is in blocks. The United Verde Extension Mining Co. was the complainant.

Large Claims Still Awaiting War Minerals Commission

Thirty Per Cent Remain To Be Handled —Anaconda Claim Voluntarily Withdrawn

Having made recommendations on 70 per cent of the cases before it, the War Minerals Relief Commission plans to wind up its work not later than January 1. Recommendations have been made in 850 cases, out of a total of 1,203. The commission has given some preference to the smaller claims on the assumption that the claimants were less able to wait for their money. The cases remaining include some of the larger claims. More than half of the original amount claimed is involved in the 30 per cent of cases still to be handled.

The claim of the Anaconda Copper Mining Co. for $500,000 to cover losses in connection with its manganese and ferro-manganese operations has been withdrawn voluntarily by that company. The improvement of the ferro-manganese market, if sustained for a few months, will give the Anaconda company an opportunity of recouping the losses it suffered.

Awards recommended by the commission during the week ended June 19, were as follows: (The name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown), Pruitt, Conway & McGlawn, manganese, $4,802.38, 41 per cent; J. Paul Jones, manganese, $929.85, 73 per cent; James O'Brien, chrome, $815.30, 31 per cent; Strange Mining Co., manganese, $95,633.04, 33 per cent; Western Ore Co., chrome, $6,762.84, 35 per cent.

Name Engineering Committees of National Research Council

The personnel of the various committees comprising the division of engineering of the National Research Council has just been selected. The division of engineering is conducted under the immediate direction of Dr. Comfort A. Adams, Lawrence professor of engineering at Harvard University. He now is on leave and is giving his whole time and energy to the work of the division. With Dr. Adams on the executive committee of the division are G. H. Clevenger, Henry M. Howe, D. S. Jacobus, Charles F. Rand, H. H. Porter and Bradley Stoughton.

The pulverizing committee, which is a joint committee of the milling committee of the A. I. M. E., consists of the following:

Robert H. Richards (honorary chairman), professor emeritus of mining engineering, Massachusetts Institute of

Technology; G. H. Clevenger (chairman) consulting metallurgist and vice-chairman of the division of engineering, 29 West 39th St., New York; Frederick Laist (first vice-chairman) Anaconda Copper Mining Co.; Charles E. Locke (vice-chairman) professor of mining engineering, Massachusetts Institute of Technology; Paul Avery, E. S. Bardwell, John W. Bell, C. H. Benedict, A. L. Blomfield, F. S. Bosqui, F. W. Bradley, H. K. Burch, Charles Butters, W. A. Caldecott, D. S. Calland, John M. Callow, Robert C. Canby, J. Parke Channing, Charles A. Chase, A. J. Clark, David Cole, E. W. Davis, J. V. N. Dorr, Arthur S. Dwight, H. W. Fox, C. H. Fry, H. W. Gepp, Rudolph Gahl, H. A. Guess, R. S. Handy, Frank Janney, A. H. Jones, R. T. T. Kiliani, C. B. Lakenan, W. P. Lass, Luther W. Lennox, Robert S. Lewis, A. D. Marriott, Jr., Charles W. Merrill, L. D. Mills, B. S. Morrow, Walter Neal, E. H. Nutter, T. M. Owen, C. Q. Payne, John B. Porter, Elmer R. Ramsey, L. D. Ricketts, W. M. Roseberg, Lewis G. Rowland, T. B. Stearns, E. A. C. Smith, W. G. Swart, A. F. Taggert, Arthur Thacher, George D. Van Arsdale, Thomas Varley, A. P. Watt, Bulkeley Wells, Albert E. Wiggin, George H. Wyman, Jr., and R. B. Yerxa.

The committee on uses of tellurium and selenium is: A. E. Hall (chairman), American Smelting & Refining Co., Omaha, Nebraska; H. D. Greenwood, V. Lenher, Oliver C. Ralston, E. W. Rouse, S. Skowronski, and A. W. Smith.

NEWS BY MINING DISTRICTS

ALABAMA

Iron and Steel Companies Buying Rolling Stock To Ease Transportation Situation

Birmingham—Transportation is now proving one of the greatest difficulties in the production of iron ore in Alabama, though labor is not as plentiful or efficient as might be expected. Pig iron and steel manufacturing companies, which must have a regular supply of ore, are purchasing railroad cars themselves to put in a service between their mines and their furnaces. The Alabama company is among the latest to put in this service, buying eight ore cars which will come near caring for a steady production at one of their smaller mines. This company has two blast furnaces in operation at Gadsden, Ala. The Tennessee Coal, Iron & Railroad Company will have two more cars with which to handle its ore.

For several years the Tennessee company has been considering an ore railroad from its mines at Fossil, on Red Mountain, to the blast furnace plant at Ensley. At one time it was reported that an aerial tramway was planned and, later on, an overhead railway line. Recently rights of way were obtained through the Federal Court to build an overhead railway line over the tracks of the Birmingham Railway, Light & Power Co., which concern is in the hands of a receiver. This was thought to mean that steps are being taken to build the proposed ore railway in the near future. Estimates of costs, however, made at intervals since the first consideration of the plans, give larger and larger figures until, it is heard, that the expenditures at present appear to be a little excessive. The development of the Tennessee company's ore mines on Red Mountain is such that an aërial or overhead railway would not only expedite the handling of the ore but would ease the situation at the furnaces as to ore supply.

The Gulf States Steel Co. is losing but little time in developing its deep ore mining proposition at Shannon, where, after several years of hard work, the slope was driven to the ore. Drifts on the ore must still be driven. A little ore is being taken out but it will be several months before the expected daily output will be attained. This is one of the biggest developments in years for this district.

H. L. Brittain, of New York, and associates are said to have looked at ore and coal properties on what is known as Pigeon Mountain, north of Gadsden, Ala., and south of Chattanooga, Tenn., in Georgia, to the west of Rome, Ga. Henry L. Brittain is at the head of the Mobile Shipbuilding Co., which has as subsidiary the Birmingham Steel Corporation, a steel fabricating plant in Birmingham. The ore on Pigeon Mountain is reached by the Tennessee, Alabama & Georgia Railroad, which at present extends from Chattanooga to Gadsden. No positive or definite information is as yet given out by the promoters though property owners in the vicinity are hopeful that plans looking to the development will be consummated.

ARIZONA

Globe—George Wilson and H. Woodward, of Globe, have purchased the claims of Howard Gravelle, near Superior, for $50,000. The property was located two years ago.

Greaterville—The St. Louis mine at Greaterville has been taken over by the Liberty Silver Mines Co., a corporation headed by J. C. Forney. The former owner, J. B. Anderson, retains a large interest. C. H. James has been retained as consulting engineer. The shaft, now in 3 ft. of good ore at 145 ft., is to be deepened.

Ajo—Cornelia Extension, near Ajo, is reported planning a reduction plant and a narrow-gage railroad to connect with the Gila Bend broad gage.

The New Cornelia Copper Co. has given a building lot and $500 in cash and General Manager J. C. Greenway has given $250 to the American Legion post at Ajo, Arizona, as the start of a building fund.

Tombstone—Here about 40 leases are being operated. Monthly shipments of about 100 carloads are being made to El Paso of ores that sample from $10 to $50 a ton.

CALIFORNIA

Mammoth Reserves Increased—Keystone Mine for Sale—Silver Ore Found in Alcalde Mines

Portola—The mill of the Gruss Copper Co. is now being remodeled and in the next forty days should be ready. Orebodies on the 200 and 400 levels are improving in width and values.

Kennett—Active work is being carried on in some of the mines operated by the Mammoth Copper Co. It is expected that the smelter will be blown in early in 1921. Ore reserves in the Mammoth have been greatly increased in the last year.

Shawmut—The output of the Belmont Shawmut Mining Co. is keeping 70 stamps dropping. A full crew is working at the mine and the management is experiencing little labor trouble. The Shawmut is controlled by the Tonopah Belmont Development Co.

Amador City—Negotiations for the sale of the Keystone mine are under way. The mine has exhausted its facilities for storing tailings, and has been unable to secure additional adjoining ground at a reasonable price. Limited prospecting will continue.

Grass Valley—High-grade silver ore has been found in the Alcalde creating much interest. At present the silver is occurring in small shoots, accompanied by gold. Developments are continuing on the main gold ledge and the mill is reported to be crushing ore of medium-grade.

The operators of the Boundary group have acquired the Black Hawk 5-stamp mill and are transfering the plant to their own property, where it is expected to be in commission inside of two months. Development work has reached a depth of 150 ft. and much decomposed quartz, rich in gold, has been opened.

Kelsey—A 3-ft. ledge of gold quartz is reported to have been cut in a virgin section of the North Star mine. It is planned to push developments on a larger scale. The mine has been idle for several years.

Idria—Fire destroyed part of the New Idria Quicksilver Mining Co.'s plant recently. The extent of the loss is not known.

COLORADO

Ouray-Silverton Road Now Open

Ouray—The Ouray-Silverton road is now open and traffic is passing both ways. This will allow of a much-belated opening up of the Ironton, Red Mountain and Chattanooga sections.

The Eurades Mining Co. finished installation work and began drilling on June 20, ten days ahead of schedule. A long cross cut west will be driven through the andesite, as well as several drifts on veins. A number of types of drill are being tried out thoroughly with the intention of standardizing on the drill found best suited to the ground. Raising on veins will also be done later.

Golconda Mines Cons., Lake City, has resumed work at the Golconda mine, where ore is being mined for shipment. Headquarters are being finished at Rose's Cabin at Henson Creek and the work of building a new mine plant in Hurricane Basin is starting. The company will buy an air compressor, drills and equipment for drifting and raising at this plant.

The Barstow lease has just finished its mill run of gold ore mined last winter but is unable to ship because the Silverton Ry. has not yet run its first train of the season. The mill run yielded enough 16-oz. gold concentrates to ship.

The Silver Mountain Mines Co. has abandoned mining ore in the winzes and old upper workings, although considerable time and money were spent in equipping these workings. Work has been resumed in the new workings below in the Concave tunnel, which should have been continued from the first.

Davis and Kinley have reported a strike of good gold ore in the B. B. property up Corbett Creek near the old Teller mine. This has not been developed and may be only a pocket; but very good ore has been produced in this neighborhood in times past and many prospectors believe that adequate work will develop some good bodies. The district has been neglected for years.

Labor conditions at Ouray have improved much in the last ten days and are now much better than for a long time.

Mayday—Lon Wigmore and associates have secured a lease on the Lucky Moon and have started a tunnel to cut a vein along a fault where good ore was mined a few years ago. This property has been idle for several years.

Lessees are reported to have taken over the Mountain Lilly above La Plata and have begun work there.

Thomas Welborn and Joe Clark are making an examination of the Tomahawk, with the view of taking a lease on it. They are also working the Idaho dump and have shipped two cars of $40 ore from it.

Fred Marr has secured a contract at the Ten Broeck and has started work with a small force.

William Graflin has a force at work on the Copper Queen.

IDAHO

Chicago-Boston Makes New Discovery on Surface—Paragon at Murray To Sink Below Creek Level

Wallace—On the west side of the gulch, about 500 ft. from the shaft and 400 ft. above it, a ledge has been uncovered on the Chicago-Boston property. It is 22 ft. wide with streaks and bunches of galena the full width, making a remarkable showing practically at grass roots. It is believed that this is a continuation of the Chicago-Boston vein, although it is quite probable that it may be the Kill Buck vein, which lies south of the Chicago-Boston and belongs to the same company, control of which is under option to John A. Percival, of New York, president of the Callahan Zinc-Lead Co. A crosscut is being run to the Kill Buck vein from the bottom of the 200-ft. shaft on the Chicago-Boston, and preparation is being made to deepen the shaft 200 ft. A splendid showing of lead-silver ore has been developed on the 100 and 200 levels.

William Fahle, manager of the Independence Placer Co., accompanied by nine men, has gone to the company's ground on the North Fork of the Clearwater River, near the old camp of Moose City, where he will build a bedrock flume and also a ditch a mile and a half long to provide water for hydraulic mining. The property is remote and all supplies must be packed 55 miles from Rivulet, Mont., the nearest railroad point. The ground has been held for years, for lack of money. Funds are said to be available now. The ground has been thoroughly prospected.

A meeting of stockholders of the Leslie Copper Mining Co. will be held in Wallace on July 8 to vote on the proposition to transfer all property of the company to the Amazon-Dixie Mining Co. in exchange for 1,000,000 shares of stock, the plan being to increase the capital stock of the latter company to that extent, making its total capitalization 2,500,000 shares. The holdings of the two companies join and cover the same vein.

The main tunnel of the Amazon-Dixie is being extended into Leslie ground. In the Amazon-Dixie proper considerable ore has been exposed in the main tunnel, from which a shaft has been sunk 400 ft. On this level a good grade of lead-silver ore has been opened for 350 ft. Preparations are being made to sink 400 ft. further, and a complete electric equipment is being installed for the purpose. The company is controlled in Cleveland, Ohio. The property is situated at Sildix, Montana, just across the state line.

Murray—The Paragon Mining Co., which recently purchased the claims owned by the Murray Hill Mining Co., together with a 100-ton mill, is overhauling the mill and expects to have it running about July 15, taking lead and zinc ore from the Murray Hill mine. At the same time the shaft on the Paragon, now down 60 ft., will be deepened 300 ft. This company has shipped considerable lead and zinc, from ground above the level run from the bottom of the shaft. The sinking of this shaft will be the first attempt to test the orebodies of that section below the creek level, and the result is therefore being watched with unusual interest.

MICHIGAN

Gogebic Range

Pabst Mine Down Temporarily Owing To Accident

Ironwood—Most of the mines on the Gogebic Range were shut down on June 24 because of the celebrations of midsummer day by the various nationalities. There has been no change in the general operating conditions. The movement of ore from the mines continues to be far below normal.

The Pabst mine was shut down several days due to an accident to the electrical haulage system. For three years or more this mine has had great difficulty in keeping its levels open for haulage. Although new ground, it is very heavy, due to operations in the Newport mine adjoining, and in several places the bottom comes up and the back comes down. About seventy men are employed in this non-productive repair work.

MINNESOTA

Cuyuna Range

Cuyuna—Wiston Dear Co. has started to load manganiferous ore from the Sagamore with a drag-line excavator. The drainage drift, 95 ft. below the lowest point of the pit, has been advanced 300 ft. north under the orebody.

JOPLIN-MIAMI DISTRICT

Oklahoma-Missouri-Kansas

Baxter Springs, Kan.—The Tampa Mining Co. has purchased the Brown Bros. lease and concentrator, located just southeast of the U. S. Smelting Co.'s mill about five miles west of Baxter. The mine was opened and the mill built in 1917 by J. Wise Brown, of Tulsa, and Frank Brown, of Kansas City, and was first known as the Brown-Head mine. It has been a steady producer, though not notably rich. G. C. Warren, of Tampa, Fla., is the principal in the Tampa company and will be general manager.

The Chanute Spelter Company's new mine on the Hartley land, west of Baxter, Kan., is proving the best of the year in the district. It is just being opened up, so its recent feat in turning out 475 tons of concentrates in the week ended June 12 is worthy of note. The company, which is a subsidiary of the American Metal Co., has spent over a million dollars in development work on the land, most of this amount going for pumping operations, so the success is deserved. It is expected that four or five other mines will be opened in the vicinity before winter.

Joplin—Drury Adams, of Batesville, Ark., has taken over the controlling interest in the Louisiana mine, four

miles southwest of Joplin, and will actively manage the property. Steam power will be changed to gas at once. The mine is located in an entirely new field in the Joplin camp, and though not fully developed, has given promise of being a steady producer. Operations are carried on at 150 ft., where faces 7 ft. in height have been developed.

Picher, Okla.—To aid the district in its trouble with frequent car shortages, the Mineral Belt R.R., with headquarters in Miami, has recently ordered 300 new freight cars and expects deliveries to start immediately.

MONTANA

Anaconda Continues To Bar I. W. W.—Men More Efficient at North Butte

Butte—Little improvement in production is looked for this month from Anaconda as compared with May when the output showed a falling off of 6,100,000 lb. of copper as against the yield for April. If so disposed, Anaconda could employ more men, but such a course might entail a departure from its announced policy of barring employment to all the I. W. W. and other radicals, and it is proposed to worry along to weed out the reds, as it is believed that they cannot continue to agitate in the Butte district if they are unable to live there.

The high-grade orebody recently uncovered during the sinking of the Stewart shaft will be crosscut from the 3,800-ft. level.

The orebody which the Davis-Daly has opened on the 2,500-ft. level of the Colorado mine is attracting much attention locally in view of its high grade. This ledge strikes into the property of the Butte & Ramsdell for 250 ft. and the Davis-Daly has concluded a satisfactory arrangement whereby it will hoist the ore. Notification has been given the Butte & Ramsdell to assemble its working forces and start production. Cutting of the No. 2 vein on the 2,700-ft. level is expected soon.

Stoping operations on the 500-ft. level of the Main Range mine of the Tuolumne has opened a 5-ft. body of native silver ore. Crosscutting for the Rory O'More vein on the 1,200-ft. level has been suspended temporarily, the face being about 25 ft. from the fissure.

A marked increase in efficiency is the outstanding feature of the operations of the North Butte company, it being estimated that 700 men now are doing the work formerly done by 1,000. Retimbering of the Speculator shaft in sections is in progress. The company plans to sink this to the same depth as that of the Granite Mountain, which is down 3,800 ft., and to connect the two shafts. Concreting of the Speculator shaft is also proposed. A part of it has already been fireproofed.

Shipments from the Crystal Copper's Goldmsith mine are ranging around 500 tons monthly, with the ore running well in silver. The ore is principally coming from the 600-ft. level and the workings above.

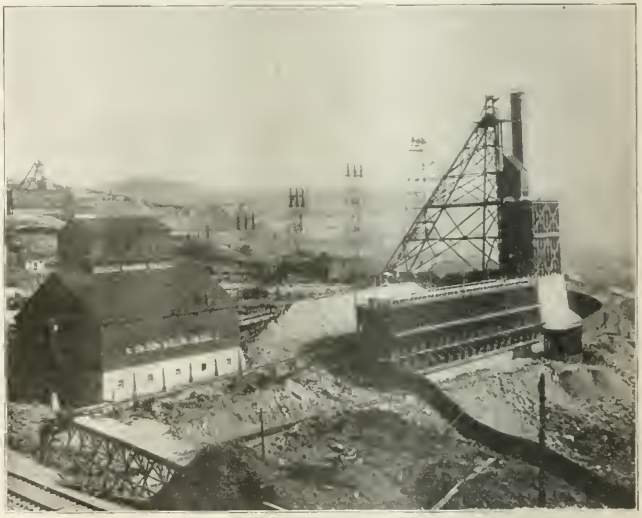
What appears to be a good deposit of copper ore has been opened at the Butte-Duluth property, which is being operated by the Mines Operating Co. Shipments are being made to the Anaconda leaching plant.

Sinking of the Plutus shaft of the Butte & Plutus is under way from the 200-ft. level to the 400 at which depth it is planned to drive the first crosscut to the Norwich orebody.

Champion district—High-grade silver ore recently cut at a depth of 450 ft. in a tunnel being driven to reach a point under the workings of the old Champion mine is showing a width of four feet, and carrying about 200 oz. of silver and a comparatively high gold content. The orebody thus far has been cut at two points 50 ft. apart. from where laterals will be run north and south, with east and west crosscuts at intervals. This is one of H. G. Humphrey's allied corporations. It is capitalized at 2,000,000 one dollar shares.

Battle Mountain—Ten shafts have been sunk to bed rock in the Copper Basin placers and from the bottom of one a crosscut is being run to determine the channel's width. Water is scarce and machinery is being installed to pump from a deep shaft in a nearby quartz mine. This property has been idle for six or more years owing to litigation.

Pioneer—Consolidated Mayflower and other companies using distillate for generating power have been notified by the Standard Oil Co. and other concerns that a sufficient supply of distillate will not be available in future; therefore it is necessary to remodel the distillate-burning engines at the Mayflower to burn crude oil. The work of making these changes has been started.



Schoettner Studios, Butte

GRANITE MOUNTAIN MINE PLANT, NORTH BUTTE MINING CO., BUTTE, MONT.

Elkhorn—Foundations for the 500-ton mill of the Boston & Montana company have been completed.

Corbin district—The property of the Alta-Montana has been leased to L. S. Roper, of Helena, who will continue driving a crosscut on the 1,300-ft. level with the old Alta vein the objective.

Unwatering of the 400-ft. shaft of the Corbin Copper King claim is to begin shortly.

Helena—A compressor plant and ore bins have been installed in the Soler Mining Co.'s Stemwinder property.

NEVADA

Paramount Comstock To Work Central Group

Virginia City—The Paramount Comstock Mines Co., recently incorporated, has secured the mineral rights to a depth of 1,000 ft. on the ground owned by the Best & Belcher, Gould & Curry, and the Savage, collectively known as the central group. A tunnel will be driven to the center of the orebody,

Manhattan—A drift from the White Caps shaft has cut the vein east of the fault on the 800-ft. level. The shaft will be sunk 200 ft. deeper.

Hamilton—J. D. Tilford, who is working a lease on the Midvale, has contracted with the smelter at Midvale, Utah, to treat 200 tons of silver-lead ore a month. The Midvale is equipped with a 75-ton concentrator.

Eureka—The receiver of the defunct Bank of Eureka, which failed ten years ago, has given an option on the Ricco Homestead mine to W. A. Simpkins, of San Francisco. One of the provisions is that $1,000 must be expended monthly on development work.

Winnemucca—The new compressor at the Rexal mine is now in commission.

Pioche—The Black Metals is sacking 50 tons of ore daily from the 325 north level. The last carload shipped averaged 285 ozs. of silver per ton, 25 per cent lead, with some gold and copper.

Tule Canyon — The Silver Hills Nevada Mines Co. has exercised its option on the Jaggers mine and has also met the first payment on the Ingalls mine, adjoining. A 5-stamp mill is working on the oxidized surface ores taken from both properties in sampling. These have averaged $20 a ton.

Ryepatch—Six feet of ore on the Boardinghouse vein has been uncovered in virgin ground on the Ryepatch mine, below the old workings.

NEW MEXICO

Lordsburg—The fluorspar industry in this vicinity has received an impetus through the firm of H. C. Humphreys & Co., of Chicago, which has contracted for all the fluorspar produced. This includes the output of the Great Eagle mine here, the Luckey properties near Duncan, Ariz., and mines near Hatch, N. M., where a representative, M. C. Myers, formerly of Pittsburgh Pa., will be stationed, to handle spar from the Rio Grande Valley.

PLANT AND DUMP AT PORTAL OF MAIN TUNNEL OF BOSTON & MONTANA COMPANY AT ELKHORN, MONT.

Two old copper properties, the Cobre Negro and the Nelly Bly, both patented, have been taken under a lease and bond by parties identified with large iron and coal interests of Cleveland, Ohio. A geologist is on the ground making an examination. This ground joins the 85 mine on the west and the Bonney-Consolidated property on the north.

SOUTH DAKOTA

Homestake To Send First Aid Team to Denver Meet

Lead—The Homestake Mining Co. will send a first aid and mine rescue team to the Bureau of Mines Meet at Denver this September.

Galena—The Horseshoe Comet mine has been leased to Grimshaw and Koenigsberger, of Deadwood. Work has been started putting the property in shape and shipments of lead-silver ores will be made to the smelter soon.

Deadwood—Work has been resumed at the Ironsides on Squaw Creek. Extensive development work will be started immediately and the company is preparing to continue work.

The Elder tunnel is nearing completion and should tap the workings of the Iron Hill mine during July. It will be over 1,300 ft. long and will drain the old workings, making them accessible to lessees. The mine was once one of the richest silver properties in the district.

CANADA

British Columbia

Road To Be Built Beyond Premier—Consolidated's Copper Smelter to Resume

By ROBERT DUNN

Stewart—Great activity is reported at the towns of Hyder and Stewart, respectively the American and Canadian gateways to the Salmon and Bear River mineral zones of Alaska and northern British Columbia. Real estate values have climbed and accommodation is at a premium. Every northbound vessel from Seattle and Vancouver has brought in many newcomers.

George Clothier, government mining engineer, has recently pointed out emphatically that there are but three actually proven mines in the northwest district, namely, the Premier, in the Salmon River section; the Dolly Varden, in the Alice Arm section, and the Engineer, in the Atlin district. There are many properties of an extremely promising character under development.

It is apparent that Mr. Clothier would warn operators and prospectors not to take too much for granted. Claim holders, he thinks, are apt to hold out for too high prices for prospects.

The construction of a road by the British Columbia Government from the Premier mine, Salmon River, to the Joker Flats and the reported decision of the United States authorities to expend about $100,000 this summer in opening up the American section of this mineralized zone should have important results in rendering the Portland Canal district of British Columbia accessible to prospectors and in facilitating the development of those properties on which work already is under way.

It is indicated that this road will meet the needs of a number important mining enterprises, among which are the Big Missouri Group, on which work has been in progress for over a year and which still is being vigorously prosecuted, the company intending to do about 12,000 ft. of diamond drilling within the next few months; the Mineral Hill, on which there has been nearly two years' work; the Hercules, which is to be opened up this summer, supplies already having been forwarded; the Silver Tip and Silver Crest, being developed by Vancouver City interests; and the several groups of claims of the Algunican Development Co.

The latter company controls a subsidiary known as the Northern Light Consolidated Group, with claims adjacent to the Premier mine, and it is planned to diamond drill this season. The company also has the Spider Group under option. It is situated on the west side of Long Lake, is equipped with an air compressor and other plant and will be opened up to a considerable extent as soon as weather conditions permit.

The Monitor group of claims, Salmon River, is reported to have been bonded by Vancouver interests.

Nelson—The annual meeting of the California Mining Co. was held recently at Nelson. Officers were elected as follows: President, John R. Cassin, Spokane, Wash.; vice-president, J. B. Schieger of La Crosse, Wis.; secretary-treasurer, W. B. Orndorff, Spokane; auditor, John Fraser, Nelson; mine superintendent, W. H. Turner, Nelson. Installation of new equipment in the Athabasca mill is progressing.

Trail—The site of the Consolidated's new concentrator has been definitely selected. It is between the towns of Rossland and Trail, on the hillside and within reach of an adequate and certain water supply. A spur line is to be built by the C. P. R. from Warfield to the new mill site, following a line surveyed by one of the Consolidated staff. This road will be down grade from Warfield.

The company's copper smelter is expected to resume operations immediately with one furnace. The Canada Copper will not be ready to ship concentrates to Trail before September.

The magnetic test mill, operated for some time on the Sullivan ores in competition with the Sullivan flotation mill, is being dismantled.

Ore shipments received at the Consolidated smelter during the week ended June 14 were as follows:

Mine	Location	Gross Tons
Bluebell	Rio [illegible]	192
Bell	Beaverdell	70
Emerald	Salmo	31
Electric Point	Boundary	110
Florence	Princess Creek	35
Jone	Rossland	115
North Star	Kimberley	345
Spokane Trinket	Ainsworth	20
Company Mines		5986
Total		6,913

Phoenix—The mining camp of Phoenix is gradually being dismantled. The Granby Consolidated has a crew of men removing its plant and shipping it to Grand Forks and elsewhere, twenty or thirty cars having been forwarded already. This work will not be finished before August, when the C. P. R. will remove its steel. Its depot is being taken away. The Great Northern has been busy in dismantling its railway line for the last month. Several buildings in the town also are being taken elsewhere.

H. S. Munroe, the newly appointed general manager of the Granby Consolidated Mining & Smelting Co. in British Columbia, before leaving to take up his work at Anyox made a public statement, which, in part, is as follows:

"I have just made an inspection of the Cassidy coal holdings on Vancouver Island. Cassidy is a miniature Gary and we expect to continue and expand our coal holdings at that point. The Granby company has achieved prominence in the mining world under its former management and our policy will continue to be one of progress. We hope to increase copper production at Anyox and to mine more coal at Cassidy.

"As to the Granby operations at Anyox it may be stated that the difficulties at the coke plant, incident to new operations of this character, are rapidly being overcome and in the course of a few weeks a satisfactory solution will be found which will make Granby entirely independent, as far as its coke supply is concerned."

Ontario

The Ontario Bureau of Mines will make a re-survey of the geological conditions of Cobalt this summer. The former survey by Prof. Willet G. Miller was found to be of very great benefit in the development of the mines, and it is believed that the extensive amount of underground work done since that time will prove of material aid in carrying on the re-survey. Cyril W. Knight, assistant Provincial Geologist, has been given charge of the work and is now in the field. He has selected the Beaver-Temiskaming area as a point of beginning. A careful examination will be made of surface and underground works, linking up each property, as the survey proceeds. It is hoped to complete the work this year.

It is stated that the British America Nickel Corporation, which blew in its new smelter at Nickelton in January, has found the cost of labor and supplies much higher than estimated. As the company's only certain market was in England, the government guaranteeing to take a certain tonnage for a certain number of years, the exchange situation is also no doubt a determining factor. The company is employing about 800 men and recently purchased a large number of water-Leyner drills.

Gowganda — At the Trethewey's Castle property a vein of good ore has been found to run directly under the office. The vein recently found near the lake edge is being developed, four shipments of ore having been made since operations were started.

Cobalt — Work has begun on the Ruby, adjoining the old Green-Meehan in Bucke Township, operations on which were discontinued in 1907 owing to financial difficulties. The workings have been dewatered. A strong calcite vein carrying milling ore is in evidence in the shaft.

The Victory has increased its capital from $500,000 to $2,000,000. M. R. Cartwright, formerly manager of the Adanac, has been appointed manager.

South Lorrain — An encouraging quantity of good silver ore has been cut on the lower levels of the Keeley. Drifting operations have been carried into the adjoining Beaver Lake property, which is under option to the controlling interests of the Keeley.

VENEZUELA

The Venezuelan government has granted a contract to an American citizen for the construction of an electric railway from San Felix, on the Orinoco River, to the Guasipati gold fields, as well as the rental of the Caroni River Falls to furnish the necessary hydroelectric power.

SIAM

Two dredges, which the Yukon Gold Co. formerly used in its Alaskan operations, have been received at the company's tin property in Siam. These will be set up as soon as possible and production should start toward the end of this year. The Yukon Co. has to date invested a large sum in its Siamese tin venture, from which it hopes to recoup some of its losses in gold mining and meet its outstanding obligations. The company will confine its Siamese activities to tin mining.

SMELTER OF GRANBY CONSOLIDATED MINING, SMELTING & POWER CO. AT ANYOX, B. C.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

June	Sterling Exchange	Silver: New York, Domestic Origin	Silver: New York, Foreign Origin	Silver: London	June	Sterling Exchange	Silver: New York, Domestic Origin	Silver: New York, Foreign Origin	Silver: London
24	396	99½	90	50¼	28	396	99½	93	53
25	396	99½	90	50¼	29	394½	99½	92	52½
26	396	99½	90	50½	30	394	99½	91	52

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Daily Prices of Metals in New York

June	Copper: Electrolytic	Tin: 99 Per Cent	Tin: Straits	Lead: N. Y.	Lead: St. L.	Zinc: St. L.
24	17.85	45.50	47.00	8.15	7.90	7.40
25	17.85	45.00	47.00	8.15	7.90	7.40
26	17.90	45.50	47.75	8.15	7.90	7.40
28	18.00	45.50	48.75	8.15	8.00	7.45
29	18.10	45.50	48.75	8.25	8.10	7.50
30	18.10	45.00	48.00	8.40	8.20	7.55

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

June	Copper: Standard Spot	Copper: Standard 3 M	Copper: Electrolytic	Tin: Spot	Tin: 3 M	Lead: Spot	Lead: 3 M	Zinc: Spot	Zinc: 3 M
24	84½	86½	99	247½	250½	32¼	33½	39¾	41½
25	83¼	86	99	245	247¾	31	32¾	39¼	41¼
26	....	....	...	....	....	...	...	...	...
28	84¾	87¼	99	244¾	246¾	32	33¼	38¾	40¾
29	85½	88	99	246¼	250¼	32¾	33¾	39½	41½
30	86½	89	99	246	251	33	34¼	40½	42½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, June 30, 1920

But little real change can be chronicled in the metal market for the last week. The volume of sales was even less than usual. However, a more hopeful feeling seems to be in evidence, no doubt inspired by the stronger tone of the London market during the last three days.

Copper

Second-hands seem to be momentarily fairly well sold up, and there was a disposition, both with them and on the part of the smaller producers, to raise prices about ⅛c. over those quoted last week. Whether or not the price will be allowed to drop back in July remains to be seen. The position of the large producers is unchanged. The principal consumers overbought early in the year, for they were unable to use as much metal as they expected, owing to unsettled industrial conditions.

Export business is little changed. It amounts to something like 40 per cent of domestic production, compared with about 50 per cent before the war.

Lead

Lead is decidedly quieter. Prompt metal is still in demand, and the price we quote holds in general for July deliveries. August lead has been sold as low as 7.50c., St. Louis, but is in no great demand. A 1,000-ton lot of Penarroya lead has been offered for prompt shipment from Spain at 7¼@7⅜c., duty paid, New York, but found no takers. This could doubtless be delivered here early in August, but the quantity seems to be too large to be assimilable.

Monthly Average Prices for June

Copper:	
New York Electrolytic	18.065
London Standard	87.864
London Electrolytic	101.909
Lead:	
New York	8.323
St. Louis	8.169
London	34.330
Silver:	
New York	90.957
London	51.096
Sterling Exchange	393.663
Zinc:	
New York	7.815
St. Louis	7.465
London	41.193
Tin:	
99 per cent	46.125
Straits	48.327
London	250.614

Zinc

London accounts seem to be nearly liquidated, and the price is slowly improving, a tendency which is expected to continue. It may not be long before London again will be a buyer in the local market. A decreasing supply, due to partial stoppage of work in the Joplin mines, will also tend to better prices. On the other hand, the sheet mills have a demand for unionization of all shops which they must meet, and are likely to decide on closing down as an alternative to taking this step. Should this occur consumption would be decreased considerably, at least temporarily. Also, it must be remembered that we are away above London parity, today's London price being equivalent only to about 6.80c., St. Louis.

Tin

This metal has been inactive, and there seems to be no reason for the daily fluctuations. Spot Straits is none too plentiful. A boat arrived yesterday with 1,350 tons, but it is stated that most of this has been sold to tin-plate mills in the Pittsburgh district. Some of it, however, may be resold in case of a shortage. Electrolytic has been unusually quiet, marked discounts over Straits not tempting consumers. The strike at the A. S. & R. tin refinery was quickly settled.

Straits tin for future delivery: June 24th, 46¼@46½c.; 25th, 45¾@46¼c.; 26th, 46¼@47c.; 28th, 46½@47c.; 29th, 46½@47c.; 30th, 46½@47c.

Arrivals of tin in long tons: June 23d, Bristol, 235; Rotterdam, 200; 24th, Liverpool, 25; 25th, London, 75; 28th, London, 50; 29th, Straits, 1,350; London, 100.

Silver

Eastern exchanges still show lack of firmness. The future of silver depends to a large extent on the China situation. The export trade still continues dull, with no movement of bullion of importance to the East. Shanghai stocks remain unchanged. Tenders of "domestic" silver to our Mints at $1 per oz. 1,000 fine are now in operation.

Mexican Dollars, June 24, 68⅜c.; 25th, 68¾c., 26th, 68¾c., 28th, 70c.; 29th, 69¾c.; 30th, 68¾c.

Gold

Gold in London on June 24th, 104s.; 25th, 103s. 7d.; 28th, 103s. 7d.; 29th, 104s.; 30th, 104s.

Foreign Exchange

No outstanding changes mark the foreign money market during the last week except a decline in Indian rupees from 38.25c. a week ago to 35.25c. yesterday and a decline of Brazilian rios from 26½c. to 23.62c. In units to the dollar, francs were quoted on Tuesday at 12.20 and lire at 16.97. German marks, 2.60c, and New York funds in Montreal, 12⅝c. premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32@32½c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½@7¾c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7¾@7¾c. W. C. C. brand, 8c.

[1]**Antimony, Needle**—Chinese needle antimony, lump, firm at 9½c. per lb. Standard powdered needle antimony (200 mesh), 12 to 15c. per lb. Unchanged.

Bismuth—$2.70 per lb., 500-lb. lots. Market very quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Unchanged.

[1]**Cerium Metal** — Ingot form, $8@$9 per lb.

Cobalt—Metal, $2.50 to $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $300 per oz. No business.

Magnesium—Metallic, 99 per cent or over pure, $1.60@$1.85 per lb., f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$75@$85 per oz.

Platinum—Market weak at $80@$90 per oz. Little business transacted.

Quicksilver—Market steady; $90 per 75-lb. flask. San Francisco wires $85. Steady.

Ruthenium—$200@$220 per troy oz. Unchanged.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $1.75@$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $18@$20 per lb.

Metallic Ores

Bauxite — Containing about 52 per cent alumina, less than 2 per cent iron oxide and up to 20 per cent silica, and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 72@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports; Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Producers and consumers are protesting proposed increased freight rates.

Manganese Ore—85@90c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 85c. per lb. of contained sulphide.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO_2, 2c. per lb. for ore. Rutile, 95 per cent TiO_2, 20@25c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6.50@$7.50 f.o.b. mines.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1 to $2.50 per lb. of metallic vanadium content.

Zircon—Washed, iron free, 10c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., June 26—Zinc blende, per ton, high, $48.10; basis 60 per cent zinc, premium, $46; Prime Western, $45; fines and slimes, $42.50@$40; calamine, 40 per cent zinc, $36. Average settling prices: Blende, $42.32; calamine, $36.78; all zinc ores, $42.25.

Lead, high, $101.60; basis 80 per cent lead, $92.50@$90; average settling price, all grades of lead, $100.36 per ton.

Shipments the week: Blende, 10,310; calamine, 127; lead, 2,169 tons. Value, all ores the week, $658,710.

Shipments for six months: Blende, 297,580; calamine, 4,978; lead, 46,349 tons. Value, all ores six months, $19,894,930. The shipment is an increase of 26,419 tons blende and 8,060 tons lead; decrease, 2,262 tons calamine. The increased value is $6,660,000 over the first six months of last year.

Buyers held out until 10 o'clock today on offerings of $43.50 basis Prime Western, but advanced to $45 since that hour, sellers declining to accept less.

Producers claim 90 to 95 per cent of the production will be down the next two weeks. Buyers acknowledge there will be 60 per cent reduction in output. Mine owners have organized a two weeks' holiday, and it is claimed that it will be nearly general.

Platteville Wis., June 26—Blende, basis 60 per cent zinc, $49 base for high-grade. Lead ore, basis 80 per cent lead, $90 per ton. Shipments for the week: Blende, 1,076; lead, 267; sulphur ore, 65 tons. Total shipments of blende and calamine for the first half of the year show a decrease of 26 per cent from the corresponding figures of 1919. Shipped during the week to separating plants, 2,982 tons blende.

Non-Metallic Minerals

Asbestos — No change since last issue.

Barytes — Crude, 88 to 94 per cent barium content, $8@$10 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $25@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Imported lump, $25@$35; imported powdered, $30@$60; domestic lump, $10@$20; domestic powdered, $25@$30, all per net ton, f.o.b. New York. Crude, $8@$12 net ton, f.o.b. Virginia points; ground, $15@$40 net ton, f.o.b. Virginia points.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10 f.o.b. Maine; ground, $22@$25, car lots, f.o.b. Baltimore; ground, $16@$20, f.o.b. North Carolina points; $16 to $20 per ton, No. 1 ground, f.o.b. New York State.

Fluorspar—Standard grade, domestic washed gravel, f.o.b. Illinois and Ken-

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

tucky mines, $25 per ton; lump, $17.50, f.o.b. Tonuco, N. M.

Fuller's Earth—Domestic, granular, $25; powdered, $18, f.o.b. mines, Florida; imported, powdered, $35@$40 per ton.

Graphite—Crucible flake, 85 per cent carbon content, 8c.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Mexican, amorphous, $45@$55 per short ton; Korean, 3¼c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c. There has been no change of note in the Alabama graphite market since the last report. Demand for small quantities of lubricating grades continues to come in, and a large number are repeats. The prevailing price of this material in packages is 25c. per lb. Car lots can be sold at any time, with the tendency toward higher prices. Dust grades continue about as previously quoted.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—For fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa. Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa

Magnesite Brick—See Refractories.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Magnesite, Dead-Burned—$32.50 per net ton, Chewelah, Wash.; $50@$60, Chester, Pa.

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $42 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports, 68 per cent tricalcium phosphate, $6.85; 70 per cent, $7.35; 74 to 75 per cent, $10; 75 per cent minimum, $10.50; 77 per cent minimum, $12.50.

Pumice Stone—Imported, lump, 4@ 5c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c. c.i.f.; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. New York, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sulphur—Unchanged; $18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, $9.50@$14 per ton; roofing grades, $8@$9; rubber grades, $9@$15, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, carload lots, $12 per ton; less than carload, $15, f.o.b. cars. Freight to New York, $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70.

Mineral Products

Arsenic—White arsenic, 14@15c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y. Unchanged.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 19@20c. per lb. of chromium contained; 4 to 6 per cent carbon, 20@21c.

Ferromanganese—For 76@80 per cent, $250 spot; $225 prompt; $200 contract, freight allowed; Spiegeleisen, 18 to 22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.75 per lb. of contained metal.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$90; 75 per cent, $150 @$160.

Ferrotungsten—70 to 80 per cent W, 90c.@$1.10 per lb. of contained tungsten.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained.

Ferrovanadium—Basis 30-40 per cent, $6.50@$7.75 per lb. of V contained.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22@22½c.

Lead Sheets—Full lead sheets, 12¼c.; cut lead sheets, 12½c. in quantity, mill lots. Unchanged.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c. Unchanged.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb. Unchanged.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—9-in. straights and sizes, $80@$90 per net ton, Baltimore;[1] 9 x 4½ x 2½ in., $90, Chester, Pa., carload lots.

Chrome Cement—45 to 50 per cent Cr_2O_3, in sacks, $50 per net ton, Chester, Pa., carload lots.

Clay Brick — First-quality fireclay, per 1,000, $45@$55, Pennsylvania; $40 @$50, Kentucky; $40@$50, Ohio; $45, St. Louis; $75, New Jersey; second quality, per 1,000, $35@$45, Pennsylvania; $30@$40, Ohio.

Magnesite Brick—9 x 4½ x 2½ in., $90 per net ton, Chester, Pa.; 9-in. straights, $90, Baltimore; 9-in. sizes and shapes larger than 9 in., regular extras. (For dead-burned see Magnesite.)

Silica Brick—Nine in. and 9-in. sizes, per 1,000, $51@$55, Birmingham, Ala.; $50@$55, Mount Union, Pa.; $55, Chicago district.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Iron Trade Review

Pittsburgh, June 29, 1920

The Amalgamated Association at the last moment made overtures to the sheet and tin mills that have hitherto signed its scale, for another conference, and the conference begins its sessions today at Columbus, Ohio. The change of front is presumably due to many of the men assuring the officials that they did not wish a strike. Another factor probably was the reported compromise whereby the A. F. of L. will give the Amalgamated Association a 51 per cent representation on the new iron and steel industry organizing committee it is to set up, pursuant to resolution at the recent Montreal convention.

All branches of the iron and steel market continue quiet. Except for buying from the Steel Corporation, consumers preserve a conservative attitude, limiting their commitments to such early deliveries as they feel they must have. Prices for prompt shipment continue to soften, lessening the premiums over late deliveries, which show practically no decline. Most buyers evidently feel that eventually the whole steel market will decline to the Steel Corporation prices, which are those of the Industrial Board schedule of March 21, 1919.

Pig Iron—A sale of 2,000 tons of bessemer, delivery over two or three months, sets the market at $44, Valley, as minimum, or $1 advance, and a somewhat similar sale of basic sets that market at $44, Valley, a 50c. advance. Foundry remains at $45, Valley. The market remains quiet.

Steel—The market continues quiet, with prices nominal, at $60@$65 for billets and $75 for sheet bars.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $14@$16; foundry, $15@$17.

New River — Furnace, $12.50@$15, and foundry, $12.50@$14 per ton.

Pocahontas—Furnace, $12.50@$13.50 per ton.

Wise County — Furnace, $12.50@$15 per ton; foundry, $12.50@$14 per ton.

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York			London		
	1918	1919	1920	1918	1919	1920
January	88 702	101 125	132 822	44 356	48 438	79 846
February	85 716	101 125	131 295	42 792	48 027	85 005
March	88 082	101 125	125 551	43 620	48 171	74 194
April	95 346	101 125	119 729	47 215	48 886	68 848
May	99 505	102 135	102 585	48 980	52 104	60 010
June	99 500	110 430	90 957	48 875	53 896	51 096
July	99 625	106 394		48 813	54 133	
August	100 292	111 320		49 072	58 835	
September	101 125	114 540		49 500	61 668	
October	101 125	119 192		49 500	64 049	
November	101 125	127 924		48 969	70 065	
December	101 125	131 926		48 492	76 432	
Year	96 772	111 122		47.516	57 059	

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		(*b*) Electrolytic	
	1919	1920	1919	1920	1919	1920
January	(*a*)	18 918	92 238	118 095	106 619	123 238
February	16 763	18 569	78 200	120 188	95 700	126 950
March	14 856	18 331	76 821	109 533	82 021	118 348
April	15 246	18 660	77 300	103 025	82 200	111 500
May	15 864	18 484	77 767	96 750	81 227	109 200
June	17 610	18 065	83 062	87 864	85 900	101 909
July	21 604	....	99 576	.....	103 046	.
August	22 319	....	97 300	.....	106 429	.
September	21 755	....	100 767	.....	.....	...
October	21 534	..	103 418	.....	.....	...
November	19 258	..	98 894	.....	.....	...
December	18 295	..	103 708	.....	.....	...
Year	18 691		90 796	.....	.....	.....

(*a*) No market. (*b*) See note on page 43.

Lead

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	5 432	8 561	5 316	8 300	37 227	47 095
February	5 057	8 814	4 784	8 601	28 675	50 256
March	5 226	9 145	4 992	8 894	27 952	46 054
April	4 982	8 902	4 722	8 618	24 888	39 225
May	5 018	8 576	4 773	8 352	23 852	38 488
June	5 340	8 323	5 020	8 169	22 544	34 330
July	5 626	.....	5 408	.....	23 457	.
August	5 798	.....	5 583	.....	25 330	.
September	6 108	.....	5 853	.....	28 473	.
October	6 487	.....	6 249	.....	34 731	.
November	6 808	.....	6 649	.....	41 202	.
December	7 231	.....	6 955	.....	.	..
Year	5 759	.....	5 530	.....	28 590	.....

Tin

	New York				London	
	1919		1920			
	99%	Straits	99%	Straits	1919	1920
January	67 702	...	61 596	.....	248 557	326 512
February	66 801	...	58 466	59 932	223 963	395 750
March	67 934	....	61 032	61 926	236 843	369 489
April	72 500	.....	61 120	62 115	225 275	345 450
May	72 500	.....	53 230	59 100	234 398	294 813
June	71 240	.....	46 125	48 327	238 263	250 614
July	68 000	.....	.....	.....	253 222	.
August	52 226	.....	.....	.....	223 625	..
September	54 482	.....	.....	.....	280 102	...
October	54 327	.....	.....	.....	279 239	.....
November	53 302	.....	.....	.....	283 556	.
December	53 870	.....	.....	.....	314 113	.....
Av. year	63 328	...	.....	.....	257 601	.....

Zinc

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	7 272	9 483	6 922	9 133	56 045	58 643
February	6 623	9 058	6 273	8 708	46 150	61 338
March	6 500	8 881	6 150	8 531	38 500	53 467
April	6 465	8 534	6 114	8 184	36 118	42 388
May	6 429	7 938	6 079	7 588	35 427	45 088
June	6 901	7 815	6 551	7 465	36 763	41 193
July	7 873	.	7 523	.	41 815	.
August	7 289	..	7 160	.	39 338	.
September	7 510	.	7 473	.	40 955	.
October	7 823	..	7 827	.	43 630	.
November	8 177	.	8 350	.	46 588	.
December	8 700	.	8 350	.	53 101	.
Year	7 338	.	6 988	.	42 879	.

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer ‡		Basic ‡		No. 2 Foundry	
	1919	1920	1919	1920	1919	1920
January	$33 60	$40 47	$31 40	$39 88	$32 40	$39 86
February	33 60	42.954	31 40	42 61	32 40	43 40
March	32 54	43 40	31 40	42 90	29 12	43 40
April	29 35	43 72	22 15	44 22	28 15	43 90
May	29 35		22 15		28 15	...
June	29 35		22 15		28 15	...
July	29 35		22 15		28 15	
August	29 35		22 15		28 15	
September	29 35		22 15		28 15	
October	29 35		22 15		28 30	
November	31 60		31 56		32 16	
December	36 57		35 32		36 86	.
Year	$31 11		$29 26	..	$28 35	.....

‡ As reported by W. P. Snyder & Co.

Monthly Copper Production

The table which appears herewith represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE COPPER PRODUCTION, 1920

	February	March	April	May
Alaska shipments	5,121,609	4,897,088	6,507,515	7,331,594
Arizona:				
Arizona Copper	3,000,000	3,000,000	3,000,000	3,000,000
Calumet & Arizona	5,268,000	4,428,000	3,176,000	4,760,000
Cons. Ariz. Smelting	910,000	1,250,000	1,200,000	1,250,000
Inspiration	7,200,000	6,500,000	6,000,000	7,500,000
Magma	729,546	830,235	895 082	918,321
Miami	4,089,520	4,091,535	4,924,420	5,054,760
New Cornelia	2,822,000	3,408,000	3,560,000	3,720,000
Old Dominion	2,103,000	2,358,000	2,180,000	2,287,400
Phelps Dodge	5,535,500	6,145,000	5,700,000	6,761,000
Shattuck Arizona	340,384	344,938	214,122	219,118
Ray	3,885,000	3,900,000	4,500,000	4,260,000
United Verde	6,490,000	5,900,000	5,300,000	5,400,000
United Verde Extension	2,977,898	3,977,898	3,270,718	3,219,934
Michigan:				
Calumet & Hecla	8,660,052	9,880,577	9,532,476	8,803,811
Other Lake Superior	6,420,000	6,420,000	6,420,000	6,200,000
Montana:				
Anaconda	18,500,000	18,450,000	15,800,000	9,700,000
East Butte	1,460,360	1,909,720	1,291,840	1,412,760
Nevada:				
Nevada Cons.	3,850,000	3,700,000	4,140,000	4,350,000
New Mexico:				
Chino	3,176,489	4,413,329	3,543,471	3,930,728
Utah:				
Utah Copper	9,211,806	8,894,596	9,313,227	9,904,781
Eastern Smelters	1,600,000	1,610,000	1,610,000	1,600,000
Total reported	103,401,164	106,308,916	102,078,871	101,584,207
Others, estimated	14,049,000	14,000,000	14,000,000	13,380,000
Total United States	117,450,164	120,308,916	116,078,871	114,964,207
Imports: Ore and concentrates, etc	10,848,782	9,766,336	7,766,457	.....
Imports in blister, etc	28,319,347	19,108,437	14,182,933	.....
Grand total	156,618,293	149,183,689	138,028,261	..
British Columbia:				
Granby Cons.	2,180,000	2,095,500	2,105,400	2,131,219
Mexico:				
Boleo	911,051	1,193,416	1,063,168	650,908
Cananea	3,400,000	3,200,000	4,000,000	4,300,000
Phelps Dodge Mexican properties	2,050,000	1,786,000	2,098,000	1,141,000
Other foreign:				
Cerro de Pasco	4,718,000	5,658,000	3,942,000	3,890,000
Chile	8,630,000	9,256,000	8,172,000	10,300,000
Katanga	4,133,625	3,229,739	.	.
Backus & Johnston	926,000	958,000	1,354,000	.

Production of the United States by months since the beginning of the year and the corresponding figures for 1918 and 1919 were as follows:

	1918	1919	1920
January	165,431,568	135,733,511	121,903,744
February	160,011,364	111,649,512	117,450,000
March	185,525,168	102,040,460	120,309,316
April	163,207,096	98,808,998	116,078,871
May	181,070,350	92,652,925	114,964,207
June	166,223,599	95,856,570	.....
July	159,329,031	100,369,247	.....
August	165,550,799	107,994,040	.....
September	157,992,487	108,203,075	.....
October	168,638,775	115,143,143	.....
November	159,217,588	112,289,735	.....
December	161,801,916	102,997,633	.....

COMPANY REPORTS

Chile Copper Co.

Copper; Chile

The outstanding feature of the fourth annual report of the Chile Copper Co. for the year ending Dec. 31, 1919, is the deficit of $287,794.78 on the books, in contrast to the surplus of $2,002,862.80 on Dec. 31, 1918. The report shows that this large American copper-mining enterprise in South America was by no means immune to the adverse influences bearing upon the industry, despite the ability of the company to produce low-cost copper. This poor showing would have been tempered considerably had the large unsold stocks of copper on hand Dec. 31, 1919, been disposed of at any price above the cost of production.

There was produced during the year 1919, 76,717,872 lb. of copper, compared with 102,136,658 lb. in 1918, a decrease of about 25 per cent in production, and of this copper 54,556,229 lb. was sold at 18.972c. per lb. The total book cost of this copper was 18.35c. per lb. compared with 17.56c. in 1918 and 21.23c. in 1917. The following comparative table indicates the composition of these costs.

The company's large stock of refined copper is carried at cost, which is according to the 1919 rulings of the Bureau of Internal Revenue, although, to a considerable extent, sold prior to the end of the year for delivery after Dec. 31. It is significant that had these sales been booked for future delivery at the sales price the year's operations would have shown a substantial profit for the Chile Exploration or operating company, instead of a loss of $1,762,703.96.

The combined statement of the Chile Copper Co. and the Chile Exploration Co. shows at the end of the year a surplus of quick assets over quick liabilities of $25,223,199.06 as against $22,924,058.42 at Dec. 31, 1918, an increase of $2,299,140.64.

The detail of quick assets and quick liabilities for 1919 is as follows:

QUICK ASSETS

Steamship investment	$458,991 27
Materials, merchandise, on hand and in transit	8,284,202 35
Deferred accounts	216,476 31
Accounts receivable	1,460,445 69
Ore and copper in process, 12,476,396 lb. at 5.953c.	742,372 11
Copper on hand and in transit, 56,329,835 lb. at 11.572c	6,518,377 26
Liberty loan bonds	2,000,000 00
Call loans	5,100,000 00
Cash	4,114,279 65
Total quick assets	$28,895,144 64

QUICK LIABILITIES

Accounts payable (including accrued interest on bonds)	$3,288,957 30
Deferred credits	302,929 92
Reserve for taxes	80,058 36
Total quick liabilities	$3,671,945 58
Net quick assets	$25,223,199 06

If the copper on hand and in transit were booked at say 18c. instead of at cost, the quick assets would be increased $3,620,993.04, an indication of the showing had these conditions prevailed.

The combined statement of Income and Surplus accounts summarizes operations as follows:

Operating revenue:		
Copper sold and delivered, 54,556,229 lb. at 18.972c		$10,350,167 44
Operating costs:		
Costs, f.o.b. plant yards (including depreciation)	$7,643,990 70	
Delivery and selling expense	1,085,965 20	8,729,955 90
Operating profit		$1,620,211 54
Other income:		
Dividends—Chile Steamship Co.	$500,000 00	
Interest and discount received	343,783 69	
Miscellaneous	25,093 63	868,877 32
Total income		$2,489,088 86
Charges against income:		
Taxes and miscellaneous charges	$395,556 67	
Interest on bonds of Chile Copper Co.	2,823,043 27	3,218,599 94
Loss carried to surplus account		$729,511 08
Charges against 1919 surplus:		
Amortization of discount on bonds	$140,000 00	
Depletion of ore reserves	1,355,507 63	
Plant superseded or abandoned, 1919	65,638 87	1,561,146 50
Loss from 1919 operations		$2,290,657 58
Surplus from operations previous to 1919:		
Balance Dec. 31, 1918, as stated	$2,787,881 69	
Less miscellaneous adjustments	785,018 89	
Net balance Dec. 31, 1918, as adjusted		2,002,862 80
Net deficit Dec. 31, 1919		$287,794 78

COSTS IN CENTS PER POUND

Copper Produced

	Pounds Produced	Plant Cost	Taxes, General Expenses and Miscellaneous	Estimated Selling and Delivery	Cost Expended, Selling and Delivery Included	Depreciation	Depletion	Total Book Cost
1916	41,305,477	11 75	0 61	3 10	15 46	3 48	2 94	21 88
1917	88,370,188	11 56	1 85	3 34	16 75	1 75	2 53	21 23
1918	102,136,658	10 22	0 85	2 23	13 30	1 75	2 51	17 56
1919	76,717,872	9 21	1 73	1 99	13 01	2 94	2 40	18 35

Copper Sold

Pounds Sold	Total Cost Development	Depreciation	Depletion	Total Book Cost
34,961,956	15 42	3 48	2 75	21 65
(a) 71,636,989	15 78	1 75	2 39	19 92
84,695,299	13 62	1 75	2 52	17 89
54,556,229	15 10	2 19	2 49	19 78

(a) In addition to the 71,636,989 lb. shown in copper sold in 1917 there was 14,074,317 lb. of 1916 production sold.

This statement shows the elimination of the net surplus of Dec. 31, 1918, of $2,002,862.80 and the substitution of a deficit amounting to $287,794.78, due chiefly to the fact that the large unsold stock of copper was carried at cost upon the books. The financial condition of the company would have appeared much brighter had this copper been sold above the cost of production or carried at a higher cost.

The calculation of ore reserves shows that there are 694,550,886 tons of positive and probable ore carrying 2.12 per cent copper in the company's property. The low value of the ore mined and milled during 1919 (1.62 per cent copper per ton) as compared with the estimated average value of the oxidized orebody as a whole, is due to the fact that the ore gradually increases in value with depth and that mining is still taking place in the comparatively poorer upper part of the orebody.

The plant is now capable of producing between 145,000,000 and 155,000,000 lb. of copper per year under normal operating conditions, but it is planned to enlarge this capacity when conditions warrant, in three stages: the first stage to approximately 194,500,000 lb. per year; the second to 214,500,000 lb. per year; and the third to about 303,500,000 lb. per year.

The per cent of net copper recovery in 1919 was 86.0, compared with 82.2 per cent in 1918.

MINING STOCKS

Week Ended June 26, 1920

Stock	Exch.	High	Low	Last	Last Div	
COPPER						
Adventure	Boston			*80		
Ahmeek	Boston	62¼	61¼	61¼	Mar. '20, Q	50
Alaska-B.C.S.	N. Y. Curb	1 1/16	1	1 1/16		
Allouez	Boston	30	28½	28½	Mar '19,	1 00
Anaconda	N. Y.	56½	54⅜	55⅝	Feb '20, Q	1 00
Ariz. Com'l	Boston	10⅜	10⅛	10⅛	Oct. '18,	50
Big Ledge	N. Y. Curb	1/16	1/16	1/16		
Bingham Mines	Boston	9	8⅛	8⅛	Sept. '19, Q	25
Calumet & Ariz.	Boston	59	58½	59	Mar. '20, Q	1 00
Calumet & Hecla	Boston	320	315	320	Dec. '19, Q	5 00
Can. Copper	N. Y. Curb	1 1/16	1 3/16	1		
Centennial	Boston	12	12	12	Dec. '18, SA	1 00
Cerro de Pasco	N. Y.	43⅜	41½	42⅛	June '20, Q	1 00
Chief Consol.	Boston Curb	3⅛	3⅛	3⅛	Feb. '20, Q	10
Chile Cop	N. Y.	16	15⅝	15⅝		
Chino	N. Y.	30½	28⅞	29⅛	Mar. '20, Q	37½
Columbus Rexall	Salt Lake	*46½	*43	*46½		
Con. Ariz	N. Y. Curb	3/16	3/16	3/16	Dec. '18, Q	05
Con. Copper M	N. Y. Curb	3⅛	3	3⅛		
Cop. Range	Boston	38⅛	37⅛	37⅞	Mar '20, Q	50
Crystal Cop. (new)	Boston Curb	*42	*30	*38		
Davis-Daly	Boston	8⅞	8⅛	8½	Mar. '20, Q	25
East Butte	Boston	12⅜	12	12	Dec. '19, A	50
First Nat'l	Boston Curb	*95	*90	*95	Feb. '19, SA	15
Franklin	Boston	2¼	1	1⅞		
Gadsden Copper	N. Y. Curb.			*7⅞		
Granby Consol.	N. Y.	36⅞	36⅞	36⅞	May '19, Q	1 25
Greene Can.	N. Y.	30⅜	27⅛	30⅛	Feb. '19, Q	1 50
Hancock	Boston			4½		
Houghton	Boston Curb			*50		
Howe Sound	N. Y. Curb			3⅞	Apr. '20, Q	05
Inspiration Con.	N. Y	52⅞	48⅛	48⅞	Apr. '20, Q	1 50
Iron Cap	Boston Curb	9⅛	8⅛	9⅜	Feb '19, M	25
Isle Royale	Boston	30	30	30	Sept. '19, SA	50
Kennecott	N. Y.	26⅛	25⅛	25⅝	Mar. '20, Q	50
Keweenaw	Boston	1 3/16	1 1/16	1 1/16		
Lake Copper	Boston	3⅛	3	3⅛		
La Salle	Boston	3	3	3		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb			29	Jan. '19, Q	50
Majestic	Boston Curb	*18	*18	*18		
Mason Valley	N. Y. Curb			2⅛		
Mass. Con	Boston	3⅛	3⅛	3⅛	Nov. '17, Q	1 00
Mayflower-O.C.	Boston	6	5	6		
Miami	N. Y.	20⅛	20	20⅛	May '20, Q	50
Michigan	Boston			4⅜		
Mohawk	Boston	62	61	61	Feb. '20, Q	1 50
Mother Lode (new)	N. Y. Curb.	5⅛	5⅛	5⅛		
Nev. Con	N. Y.	12⅞	12⅛	12⅞	Mar. '20, Q	25
New Arcadian	Boston			2⅛		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17	16⅛	16⅜	May '20,	25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	17⅛	16⅛	16⅜	Oct. '18, Q	25
North Lake	Boston			*75		
Ohio Copper	N. Y. Curb			1/16		
Ojibway	Boston	2	1⅞	1⅞		
Old Dominion	Boston			25⅛	Dec. '18, Q	1 00
Osceola	Boston	39⅛	37⅞	39	Mar. '20, Q	50
Phelps Dodge	Open Mar.	†195	†180		Apr. '20, Q	2 50
Quincy	Boston	50⅜	49	49	Mar. '20, Q	1 00
Ray Con.	N. Y.	16⅜	16⅛	16⅛	Mar. '20, Q	25
Ray Hercules	Boston Curb			*75		
St. Mary's M. L.	Boston	40⅛	39	39	Dec. '19,	2 00
Seneca	Boston	14	13⅛	13⅛		
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	25
Shattuck, Ariz.	N. Y.	8⅛	8⅛	8⅛	Jan. '20, Q	25
South Lake	Boston			2⅜		
South Utah	Boston	*12	*12	*12		
Superica	Boston	5	5	5	Apr. '17,	1 00
Superior & Boston	Boston	4	3⅜	3⅜		
Tenn. C. & C.	N. Y.	10⅛	9⅞	9⅞	May '18, I	1 00
Tuolumne	Boston	*60	*60	*60	May '15,	10
United Verde Ex.	Boston Curb	31⅛	30⅜	31⅛	May '20, Q	50
Utah Con	Boston	6⅜	6⅛	6⅜	Sept. '18,	25
Utah Copper	N. Y.	67⅛	64⅛	65⅛	Mar. '20, Q	1 50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17,	30
Victoria	Boston			2⅛		
Winona	Boston			*40		
Wolverine	Boston	16	15⅞	15⅞	Jan. '20, Q	50
LEAD						
Hecla	N. Y. Curb.	4 3/16	4	4 1/16	June '20, Q	20
St. Joseph Lead	N. Y	15⅝	15⅜	15⅝	June '20, QX	50
Stewart	Boston Curb	†*18		*16	Dec. '15,	05
Utah Apex	Boston	1⅛	1⅛	1⅛	Nov. '18,	25
ZINC						
Am. Z. L. & S.	N. Y.	14	14	14	May '17,	1 00
Am. Z. L. & S. pf.	N. Y.			45	May '20, Q	1 50
Butte C. & Z.	N. Y.	8	7⅛	7⅛	July, '18, I	50
Butte & Superior	N. Y.	22⅛	21⅛	21⅛	Sept. '17,	1 25
Con. Interst. Cal.	N. Y.	14	13⅜	13⅜	June '20, Q	50
New Jersey Z.	N. Y. Curb	201	197	200	May '20, SA	4 00
Success	N. Y. Curb.	*5	*4	*5	July '16,	03
Yellow Pine	Los Angeles	1.02	1.02	1.02	June '20, Q	03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y	1⅛	1⅛	1⅛		
Alaska Juneau	N. Y.	2⅛	2	2⅛		
Carson Hill	N. Y. Curb	30⅛	30⅛	30⅛		
Cresson Gold	N. Y. Curb			1⅛	Mar. '20, Q	10
Dome Ex	Toronto	*24½	*23	*23		
Dome Lake	Toronto	*5½	*5	*5		
Dome Mines	N. Y	9⅜	9⅛	9⅛	Apr. '20, Q	25
Golden Cycle	Colo. Sprgs.	*75	*73	*73	May '20, Q	02
Goldfield Con	N. Y. Curb	*9½	*9	*9½	Dec. '19,	05
Hedley	Boston			4¼	June '19,	10
Hollinger Con.	Toronto	5.70	5.55	5.70	Apr. '20, BM	05
Homestake	N. Y.			55	Sept. '19,	50
Kirkland Lake	Toronto	*49	*47	*47		
Lake Shore	Toronto	1.17	1.07	1.17	Oct. '19,	02½
McIntyre-Porcupine	Toronto	1.82	1.80	1.81	May '20, K	05
Porcupine Crown	Toronto	*28	*27	*27½	July '17,	03
Portland	Colo. Sprgs.	*60	*56	*60	Apr. '20, Q	01½
Reorgan. Booth.	N. Y. Curb	*6	*4½	*5½	May '19,	05
Silver Pick	N. Y. Curb	*8	*6	*7		
Teck Hughes	Toronto	*9	*7½	*7½		
Tom Reed	Los Angeles	1.45	1.19	1.32	Dec. '19,	02
United Eastern	N. Y. Curb	3⅛	2⅞	3	Apr. '20, Q	21
Vindicator Consol.	Colo. Sprgs.	*18	*18	*18	Jan. '20, Q	01
West Dome	Toronto	*7	*6½	*6½		
White Caps Min.	N. Y. Curb	*12	*9	*11		
Yukon Gold	Boston Curb			1	June '18,	02½
SILVER						
Arizona Silver	Boston Curb	*57	*23	*26	Apr. '20, M	03
Beaver Con.	Toronto	*42½	*41	*41	May '20, K	03
Coniagas	Toronto		†2.90		May '20, Q	25
Crown Reserve	Toronto	*22	*20	*20	Jan. '17,	05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept. '19,	1 00
La Rose	Toronto			*33	Apr. '18,	02
McKinley-Dar	N. Y. Curb			*48	Apr. '20, Q	03
Mining Corp.	Toronto	1.90	1.90	1.90	June '20, Q	12½
Nipissing	N. Y. Curb.	9	8⅛	8⅛	Apr. '20, Q	25
Ontario Silver	N. Y.	6⅛	6⅛	6⅛	Jan. '19, Q	50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12,	10
Peterson Lake	Toronto	*12½	*12½	*12½	Jan. '17,	01½
Sil. King Ariz.	N. Y. Curb.	*42	*35	*38		
Temiskaming	Toronto	*34	*33	*33	Jan. '20, K	04
Trethewey	Toronto	*30	*28½	*29	Jan. '19,	05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1⅜	*2		
Barnes-King	Butte	†1.28		1.28	Nov. '19, Q	05
Bost. & Mont.	N. Y. Curb.	*70	*60	*61		
Cashboy	N. Y. Curb.	*6	*4½	*5		
El Salvador	N. Y. Curb.	2⅛	2	2⅛		
Jim Butler	N. Y. Curb	*16	*13	*14	Aug. '18, SA	07
Jumbo Extension	N. Y. Curb.	*6	*5	*5⅛	June '16,	05
Louisiana Con	N. Y. Curb	⅛	⅛	⅛		
MacNamara M	N. Y. Curb	1/16	1/16	1/16	May '10,	02½
N.Y. Hond Rosar	Open Mar.	†13⅛	†12⅛		Apr. '20, Q	50
Tonopah-Belmont	N. Y. Curb.	1⅞	1⅞	1⅞	Jan. '20, Q	05
Tonopah-Divide	N. Y. Curb	1⅛	1 1/16	1⅛		
Tonopah Ex	N. Y. Curb	1⅛	1⅛	1 3/16	Apr. '20, Q	05
Tonopah Mining	N. Y. Curb.	1⅛	1⅛	1⅛	Oct. '19, SA	15
West End Con.	N. Y. Curb.	1⅛	1⅛	1 1/16	Dec. '19 SA	05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*26	*23	*24	June, '20, M	01
Consol. M. & S.	Montreal	25⅛	25	25	Apr. '20, Q	62½
Daly-West	Boston	4⅛	4⅛	4⅛	Apr. '20, Q	15
Eagle & Blue Bell	Boston Curb	2 3/16	2 1/16	2 1/16	Apr. '20, Q	10
Electric Point	Spokane	38	32	32	May '20, SA	03
Fed. M. & S	N. Y.			13½	Jan. '09,	1 50
Fed M. & S. pf.	N. Y.	35	35	35	Mar. '20, Q	75
Florence Silver	Spokane			*45	Apr. '19,	01½
Iron Blossom	N. Y. Curb.			3/16	Apr. '20, Q	02½
Judge M. & S	Salt Lake			4 00		
Marsh Mines	N. Y. Curb	*14	*10	*10		
Prince Consol.	N. Y. Curb.	3/16	1/16	⅛	Nov. '17,	02½
Rambler-Cariboo	Spokane	*13	*12	*12½	Feb. '19,	01
Rex Con.	N. Y. Curb.	*7	*6½	*7		
South Hecla	Salt Lake			*90		
Stand. S. L.	N. Y. Curb.	⅛	1/16	⅛	Oct. '17,	05
Tamarack-Custer	Spokane	2.50	2.40	2.45	Dec. '19, K	03
Tintic Standard	Salt Lake	3.20	3.05	3.05		
Wilbert	N. Y. Curb.	*5	*4	*5	Nov '17,	01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	17⅛	17	17⅛	Mar. '19,	50
Internat'l Nick.pf.	N. Y.	82	82	82	May '20, Q	1.50
QUICKSILVER						
New Idria	Boston	6	5⅛	6	Jan. '19,	25
TUNGSTEN						
Mojave Tungsten	Boston Curb	*10	*10	*10		
VANADIUM						
Vanadium Corp.	N. Y.	87⅛	82⅛	84	Apr. '20, I	1.50
ASBESTOS						
Asbestos Corp.	Montreal	85	80	85	Apr. '20, Q	1.25
Asbestos Corp. pf.	Montreal	94	92	93⅛	Apr. '20, Q	1.50
MINING, SMELTING AND REFINING						
Am. S. & R	N. Y.	60⅜	58⅛	58⅛	June '20, Q	1 00
Am. S. & R.pf.	N. Y.	91	89⅜	90⅜	June '20, Q	1.75
Am. Sm. pf.A	N. Y.	74⅛	74⅛	74⅛	Apr. '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	58	56	57⅛	Apr. '20, Q	1 50
U.S.S.R.& M. pf.	Boston	44	42⅛	43⅛	Apr. '20, Q	87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly
SA, Semi-annually BM, bimonthly K, Irregular. I, Initial N, includes extra

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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Volume 110 New York, July 10, 1920 *Number* 2

America an International Miner

THE international aspect of American statesmanship has been preceded by a steady development of international character in the intellectual, social, and economic life of the United States. The machinery of government is only trying to adjust itself, with vast creakings of rusty and inactive parts, to a national condition. No truer example can be shown of the fact that the government does not direct the people, but that the people lead the government, in a democracy, than is disclosed by consideration of this fact.

We are an international people—probably no nation more so. We are international in our population and in our sympathies; we represent in a way within our own borders a prototype of the sometime World Republic, for men of all creeds and of all tongues live here together and work together in harmony. Whatever strivings and jostlings we may endure are not based upon national or racial prejudices or advantage.

Our business enterprise, the use of our capital, the play for the genius of our constructive builders and organizers, have long since leapt our boundaries. This is shown strikingly in our mining industry, which has become within a decade almost as international as that of England, and will be inevitably so in the future. In this national growth we want only fair play and equal rights, such as we expect at home: no American has any desire to have his government help him "hog" a province or a state, or help him to a monopoly anywhere. Our intrepid adventurers in mining are at work in all the continents: even in old Europe they are developing mines with American-born experience and with American breadth of operation.

Everywhere American capital and mining enterprise are welcomed by the peoples, because our record show that behind these there does not tread the ominous shadow of political domination. Jugo-Slavia sends to us an invitation and appeal for us to develop her mines. China trusts us, and looks to us as a model. Even distracted Siberia calls for our capital and our engineering skill in developing her great mineral wealth. We shall soon publish original articles embodying these requests. Not only Armenia has called for us, but even the Turks trust our fairness above that of all other nations, and would gladly welcome our guidance and our enterprise.

We can be, through our pioneering skill, the missionaries of the new democratic order of the world, more than we can with books or with statecraft. For the clear vision there can be no doubt, if one looks through the confusing murk of personalities and the back-and-forth swirling of imperfect political activities, of the forward progress of America, expressed, not by this President or that, but by the great powerful mass of Americans, evolving out of what seems at times confusion, a continually better and stronger form. We are reaching out for trade and for fields for our enterprise in all parts of the world, not from unworthy motives, but because it will be the spirit of the world for all nations to do this: for thus only can the greatest average efficiency and the maximum individual welfare be obtained. Our future development in South America will be most marvelous, and the result will be that the South American republics, instead of being put under a protectorate, governed and restricted for foreign political purposes, will become more powerful, advanced, and independent. That is the trend of our special genius, which no other country has yet attained. However much the tantalizing chaos in Mexico may have tried our patience we must conserve this ideal for Mexico also—that our influence (which should be stronger than we have made it) must be directed toward ultimately building up the dignity, stability, and independence of our sister republic. We want no more territory.

American capital is now developing vast copper deposits in South America, which may ultimately switch the world's center of copper production to that continent; and it is active in silver mining and in tin mining. In Asia it is reaching out in dredging fields for gold and tin, and planning the development of other mineral resources.

Our mining people should realize fully this international nature of our industry, and consider well whether tariffs protective of those portions of our mining industries which lie within our political boundaries are going to be beneficial, or prejudicial, to the whole industry in the long run. What would England gain by tariffs designed to force at an unnatural pace the mineral wealth of Great Britain—by putting a big tariff on the importation of tin from outside of England, for example? It would be a step toward commercial and national ruin. In the new rôle into which we have grown, the same principle will often apply. Rather the question of absolute efficiency will be found to be paramount—where can we buy or produce a certain metal cheapest, and where can we dispose of it to the best advantage?

It is not a question of cheap or high-priced labor: this is a minor element in these problems. A great American company operating in South America is engaged in far-sighted plans of educating its workmen to better things—to more expensive tastes, in a way—knowing and planning that this development will mean increased wages; but those directing it know that the increased efficiency of better and stronger men will more than offset the outlay. It is a question of full utilization of natural advantages—volume of ore, available power, ease of transportation—all inanimate things, which it is for the good of mankind to exploit to the maximum.

The Major Metal Quotations

WE HAVE before editorially sketched out the problem of the quotations of the major metals, and described the ways in which the various more or less independent quotations are obtained. We have described the method by which the *Engineering and Mining Journal* quotations are reached, why they are by far the best approximations of the actual average prices, and why they are necessarily lacking in perfection. We do not need to recur to this exposition, referring the readers to our issues of Feb. 7, 14, 21, and 28.

Journalism and the metal market were apparently relatively primitive when the *Journal* was founded. To this day, quotations for the minor metals and minerals are necessarily computed by consulting those dealers who are familiar with the market, and reflecting the average of the information obtained from them. In some instances, only one organization has the necessary data and oversight of the whole situation. Apparently, the major metal market was in somewhat this stage of development when the *Journal* was founded, and we understand that in the beginning its quotations were practically obtained from a single source. This situation obtained, we believe, virtually up to the administration of our immediate predecessor, who undertook to broaden the range of sources, so as to make it representative, and by averaging up data from various sources to arrive at an independent quotation. This system has been inherited and followed by the present administration, and has been expanded by the addition of further sources and checks. Thus a better and better approximation is being achieved. We have been successful in quoting prices which have been approved as substantially correct by those familiar with the market, both sellers and buyers.

In the long run, however, no approximation is satisfactory to our desires as engineers, and the trend of our efforts has been toward making the quotations exact. For this there is no machinery; moreover, we find certain sectors of the market, particularly in copper and lead, shut off (as they always have been) by the secretive policy of some powerful groups of producers. That is, certain elements which make up the market, and constitute in fact the majority factor in metals, co-operate closely with the *Engineering and Mining Journal;* but certain important factors avoid adequate and accurate co-operation.

We have carried this matter of increased accuracy as far as we can, and we do not regard the situation as satisfactory.

We recommend most strongly to the component factors in the metal market that they devise a method of establishing exact quotations. The *Engineering and Mining Journal* need not be considered in any such arrangement. We shall continue to quote metal prices—we have always done it, and we always shall; but we honestly would prefer not to quote as an "original authority." We shall proceed without interruption on our established methods; and if our prices are still accepted as authoritative, and official, we can only approve, as they are by far the best that can be had; but we earnestly recommend the establishment of a statistical clearing-house among metal producers, whereby the exact daily average of the metal markets can be computed statistically, without the gaps which dissatisfy us. The *Engineering and Mining Journal* would take pleasure in quoting figures so determined, and would take more pleasure in pointing out any defects in such an outside estimate than it does in criticising its own. There is no sufficient reason, it seems to us, why we should indefinitely continue to assume the responsibility of appraising the market.

Nickel Coinage in Australia

A RECENT message from Sydney states that Australia is about to join the great majority of the nations and colonies not only of the Northern but of the Southern Hemisphere, and introduce nickel coins in her subsidiary currency. A dispatch published in the New York *Journal of Commerce* indicates that the new pennies and half-pennies of nickel will go into circulation concurrently with the present copper coins, but that no more of the latter will be minted.

All who have had practical experience in the relative neatness, cleanliness, and convenience of small nickel versus clumsy copper coins—and those who have traveled first in England and then in Belgium or Germany could hardly escape it—will congratulate the Australian public on this great improvement.

However, the new Australian coins are to follow the general lead of India, Ceylon, and the Straits Settlements, where the corresponding coins are cut square, with rounded corners. It is supposed that Australia's choice of a square shape was in consideration of the economy it offers when cutting blanks from the metal sheets and in packing better when boxed. But blanks of hexagonal shape do not waste much metal, pack just as closely as squares, and offer a blunter angle than the square pieces. Perhaps the Indian government recognized the disadvantageous features in the square 2-anna nickel piece, for in 1908 the government minted its wavy-edged 1-anna nickel coin, which has twelve curved corners in place of four.

Incidentally, Australia's decision to use nickel for subsidiary coins will increase the demands on New Caledonia and British America nickel mines, at the same time relieving somewhat the copper situation in Australia. According to the large work published by the Mond Nickel Co., Ltd., in February, 1918, the economy that would be effected by decimalizing and substituting nickel for bronze in the coinage of the British Isles would give a profit of over half a million pounds sterling annually.

The Vanishing Gold Premium

NOT so very long ago the gold miners of South Africa were jubilant over the substantial premium they were receiving for their gold product. They had good reason for rejoicing, as one of the peculiar results of the economic readjustment following the war left them in a position to take advantage of the depreciated currency of their mother country. By selling their gold in a free market they were indirectly able to obtain more of their own depreciated paper currency in return for their gold bullion, a gold premium, so to speak, the amount depending upon, and see-sawing with, the foreign exchange value of the pound sterling. That this premium was not intangible, the increased value of the Rand mining stocks and the steady or increased gold output from that region attested.

The premium started at about 16 per cent, and, as the value of the pound sterling diminished, increased to 44

per cent—a gratifying compensation for the lean war years. Of late, sterling has been advancing, and consequently the premium has dropped, although it is still an appreciable factor.

Jubilation has turned into concern among the gold producers who are affected, for, faced with a possible further rise in the exchange value of sterling, the gold premium may conceivably become a negligible factor in stimulating production in the near future. Should this take place, the South African gold-mining industry will again be faced with the familiar gold miner's difficulties encountered during the war. Whether resort could then be had to legislation similar to that proposed in the United States at the present time, creating an excise tax on gold entering into the arts, is problematical.

The gold question was thoroughly discussed in South Africa by various commissions appointed for the purpose during 1918 and 1919, with no plan for substantial relief suggested. In fact, one of the strong points made in a report upon the subject laid considerable stress upon the advantage gold miners possessed in normal times in the steady price for their product.

The local South African technical press does not suggest, so far as we know, any plan like that embodied in the McFadden Bill, favoring the gold bonus. Instead, governmental assistance to lighten the gold miners' burden through easing of taxes is proposed. Appeals are addressed to the gold miners themselves, to increase the efficiency of their work, for South Africa has not been immune to the lamentable and universal decrease in labor efficiency during the last few years, and undoubtedly an increase in the willingness of labor to do its share, coupled with governmental aid in lowering taxes, will go far to cure existing troubles in this critical and absorbing situation in the world's foremost gold-producing district.

Public Schools and the Mining Camp

FOLLOWING the cry raised by many salaried workers in protest against inadequate compensation, the U. S. Bureau of Education points out the seriousness of conditions in the public schools and insists that they must be given consideration if the schools are to continue their present high standard. From the replies to inquiries made by the Bureau we learn that not fewer than fifteen thousand teaching positions in public high schools will be without properly qualified teachers next September.

It is fair to assume that the greater proportion of the shortage is due to the fact that more adequate compensation is offered in other branches of employment, and that many who might choose teaching as a vocation have been attracted elsewhere. For this, of course, there can be but one remedy unless the alternative of employing persons below the standard prescribed by experience and general practice is adopted. And this at best would be only putting off the evil day.

To a mining community the public school represents a power for good, and embodies the opportunity for the development of the highest type of citizenship. It is doubtful if any individual institution exerts a greater influence, and a tendency to keep this influence on anything but a high plane should not be condoned. Diversified interests are of course to be expected, and a mining community, in common with any other, embraces its cliques, its divisions, and its groups, all of which form combinations that make for separate lines of thought and detract to a great extent from the "get together" idea. Public-school activities have always offered the opportunity for a common ground; the school is the open forum, the nucleus of democracy, and the means whereby all factions can combine in a mutual purpose—that of the up-building of the citizen.

Probably no other industry contains a greater percentage of different nationalities than does mining, and this fact makes it all the more necessary that those who have the responsibility of the public-school guidance in mine communities should realize that the personnel must be of the best in order to meet conditions, which differ from other communities where the population is less mixed. It is a commendable fact that in districts where the mine operators have adopted a broad policy, and have taken a lively interest in public affairs, the schools are of a high order and every effort is made to procure high-grade teachers. The increased expense which has been necessary to maintain the schools under present-day conditions has been met cheerfully, with the realization that such institutions are most essential to the promotion of the public weal. In other districts where the tendency has been to curtail public-school expenses in anticipation of a recession of living costs, it is to be hoped that a realization of such a "penny wise, pound foolish" policy will come before it is too late.

The White-Collar Boys

A WHIMSICAL writer in one of the New York dailies observed that he found the economic problem simple for himself, if frankly viewed: If houses are high, don't buy them; sell them. If wages are too high, go to work and earn them. If stocks are too low, buy them; if they are too high, sell them.

Possibly some of this whimsical philosophy might help some of the white-collar class who find themselves between labor and capital, receiving lower wages and obliged to live more expensively than the class commonly denominated labor. If the clerk finds the house painter is getting double his pay, and can work in overalls, according to our writer's philosophy, he would see in it only an opportunity. Moreover, if he looks into the opulent labor class, he would find that many of these well-paid men have work that requires more training, skill, and intelligence than the work he himself does. He would find, in short, that the law of supply and demand is still working, and not a violation of it; and when there are more volunteers for a certain class of work, the price comes down. Most of the jobs he will, however, not volunteer for—although they may require more intelligence than his own job. He will find them, frankly, too strenuous.

This is the philosophy of a lot of our red-blooded college boys these days, in vacation time and after graduation. Finding labor well paid, they are reaping the benefits exultantly, and building thereon for their future career.

Money is only part of the consideration of any job. You are paid also, in certain jobs, by protection from the weather, or from dirt, by freedom from physical exertion, by convenient arrangement of work hours, and by the association with polite people. If all or any of these, plus the wage, isn't enough, the young man can usually get a larger wage by substituting cash for one of the valuable perquisites of his former job.

WHAT OTHERS THINK

The Lena Gold Mining Co., Siberia

I note in the issue of Jan. 10, 1920, of the *Engineering and Mining Journal*, statements by R. S. Botsford, in his article, "Mining Conditions in Russia," concerning the Lena Gold Mining Co.

I want to make clear the reference to the above-named property. The English company is known as "The Lena Goldfields"; the Russian company is "The Lena Gold Mining Co."

In 1915 I was employed by the Russian company to sample and advise with a view to improved methods of operation, i.e., using more mechanical and up-to-date methods. During 1916 and 1917 I was acting as consulting engineer in this work.

The facts are these: We proved during the three years 98,000,000 cu.yd. of dredgeable material, averaging value 31.2c. per cu.yd. The estimated costs were as follows:

	Cents per Cu.Yd.
Labor	.006
Power	.03
Amortization	.059
Repair	.024
Management	.05
Total	.169

This is about three times our costs at Dawson for the same kind of work.

The amount of proven ground would be equal to three 18-cu.ft. dredges with a life of thirteen years each. These were recommended, and one was ordered, and at last accounts was lying at Milwaukee, Wis., with the Bucyrus people, crated ready for shipment. The other two were advised, but, owing to conditions in Russia, orders were not placed.

These are the facts in the case, and I hope you will publish them. W. E. THORNE.

Maraguta, Northern Nigeria.

The Shannon Tailings and SO_2 Leaching

Referring to Mr. van Barneveld's letter published in your issue of May 22, I desire to state on behalf of the Shannon Copper Co. that that company is in no way responsible for any statements appearing in the article on "Leaching of the Shannon Tailings," contributed by W. L. Maxson, or, therefore, for deductions based thereon, in your editorial in the issue of April 10. I desire, however, to add that Mr. Maxson had the company's sanction to write an article, for publication, on his own views of the subject.

What appears to be known as the SO_2 process was tried on Shannon tailings by Messrs. Leaver and van Barneveld. The results were encouraging. Over 90 per cent of the *oxidized* copper contents was easily extracted. I thought so well of the possibilities of this process, in solving our very difficult problem, as to obtain permission of the directors of this company and enter into an understanding with the Bureau of Mines to erect a twenty-five-ton experimental plant. The fact that such had not been constructed before closing our operations in the Clifton district had no relation whatever to my opinion of the merits of the process.

The statement made in the same editorial regarding the Slater process is also misleading. This process was the most successful, metallurgically, of all that had been applied to the treatment of the Shannon tailings and low-grade semi-oxidized ores. That no experimental plant was erected was due entirely to the fact that in my opinion it did not offer possibilities of being commercially successful under our conditions, and did not reflect on the adaptability of the process to the treatment of our ores and tailings.

J. W. BENNIE,
General Manager
Gleeson, Ariz. Shannon Copper Co.

[The editorial referred to in this and Mr. van Barneveld's letters stated that none of the processes formerly tried on the Shannon ores had been successful. What was meant was that they had not been *commercially* successful, or that the tests had not offered sufficiently attractive possibilities of commercial success to be adopted.—EDITOR.]

More Hints to the Troubled Cyanider

In reference to your article by J. A. Carpenter, entitled "The Troubles of a Cyanider," in your issue of May 29, 1920, I wrote a short article which was published in *Mining & Scientific Press* in December, 1918, in which I tried to point out the fact that a cyanide solution will attack copper phosphate, taking the copper into solution and the phosphate forming an alkaline phosphate.

The action of nascent hydrogen in the zinc box, formed at the time of precipitation of the precious metals, tends to form a phosphine from the alkaline phosphate. This phosphine attacks the gold solution, precipitating the gold in a fine amorphous state and also, in combination with phosphorus and oxygen, as a flocculent grainy precipitate.

In many plants there is a selective precipitation in the zinc boxes; i.e., at the head of the box the gold precipitates out, then the silver, next copper, antimony, arsenic and other metals, which I believe is caused by the presence of these alkaline phosphates.

In three different plants with which I have been associated there has been serious trouble with the precipitation. I know that ore from parts of each mine carried considerable copper phosphate, and whenever that was encountered, our trouble was plenty.

My tests, using these solutions in a small test plant where the pregnant solution was pumped up into a storage tank (an emulsion of zinc dust being also fed to the intake of the pump), showed that the precious metal was practically all removed, together with nearly all of the copper and most of the other base metals, and I think those having precipitation troubles will be a long way on the road to freedom from such if they try to utilize zinc dust instead of the shavings.

Phoenix, Ariz. GEO. D. DIEHL.

The Swedish Iron Mines of Kiruna and Gellivare

Large Reserves of High-Phosphorus, High-Iron, Magnetic Ores, Situated Above the Arctic Circle Offer Favorable Mining and Marketing Conditions—Open-cut and Underground Methods Followed by Crushing and Magnetic Separation

By Charles W. Boise
Written for *Engineering and Mining Journal*

In OCTOBER, 1919, it was my privilege to make a casual visit to the famous Swedish iron mines of Kiruna and Gellivare. The following summary describes the main aspects of the deposits, and presents a record of recent operations in that renowned district.

GENERAL VIEW OF THE TOWN AND DOCKS, NARVIK, NORWAY

The Kiruna and Gellivare mines are situated in northern Lapland, Sweden, above the Arctic Circle. The two deposits are analogous in many respects. The ore at both mines is principally magnetite, with small amounts of apatite. The Kiruna deposit forms a dike-like mass which lies at a steep angle between walls of quartz porphyry and syenite porphyry. The Gellivare deposit occurs under similar general conditions, except that the rocks have been metamorphosed and have developed a schistose character.

The railway connecting the port of Narvik, on the Norwegian coast, with Luleä, on the Gulf of Bothnia, passes by both mines. This line connects at Boden with the line from Stockholm to Haparanda. Gellivare lies nearer Luleä, through which the majority of its output is shipped. Narvik is the shipping point for Kiruna ore. Both mines are controlled by the same group, the Trafiktiebolaget Grängesberg-Oxelösund.

The annual output of the mines is limited by law to a maximum of 1,300,000 tons for Gellivare, and 5,000,000 tons for Kiruna. The statute was promulgated in 1907, and continues in force until 1932, unless previously repealed.

Gellivare is the older mine, having been worked first in 1869. The output has become of importance, however, only since 1902, when the present company took control. The total production is about 25,000,000 tons, practically all of which has gone to Germany. The ore is exported through the port of Luleä, which is 127 miles from the mine. The port is ice-bound for about six months, from the latter part of November to the latter part of May. The annual output before the war was the maximum permited by law, 1,300,000 tons, but since 1915 the production has been much below this figure.

The Gellivare ore occurs in a series of connected lenses inclosed in schists of igneous origin. The length of the zone is three miles, and the average width of the lenses is about 180 ft. The general trend of the orebody is east-west, and the average dip is S. 65 deg. The developed reserves are estimated at 250,000,000 tons, with a further considerable amount of ore remaining to be developed by deeper boring. The lenses are mined to an average depth of 150 ft. by open-cut methods, below which shrinkage stoping is employed. At present, 25 per cent of the output is obtained from open cuts, and 75 per cent from underground mining.

Of the total amount mined, 75 per cent is clean ore ready for shipment, 15 per cent is concentrating ore carrying 45 per cent Fe, and 10 per cent is waste.

The clean ore is divided into three classes, A, B and C, according to phosphorus content. The A grade carries from 0.8 to 1.0 per cent P and from 61 to 62 per cent Fe. C grade carries under 0.3 per cent P and contains 65 per cent Fe, and B is a grade intermediate between A and C. The concentrating ore is reduced to 2 mm. by crusher and ball and tube mills, and is concentrated by magnetic separators of the drum type. This process yields a concentrate carrying about 0.3 per cent P. To reduce further the phosphorus content of the concentrate, arrangements are being made for finer grinding. The concentrate is shipped direct, without briquetting, to Germany.

PANORAMA OF THE ORE DUMPS, NARVIK, NORWAY. THI

High-Phosphorus Ore Salable to Germany

The dependence of the iron mines on Germany for the market of certain products brings out in sharp relief a phase of German pre-war industry which sometimes passes unnoticed. Not only did German manufacturers suit the finished product to the particular demand in the country of eventual market, but German industry accepted its raw materials in whatever form they could most conveniently be delivered by the producers. Thus the German steel industry readily purchased the high-phosphorus ores of Kiruna and Gellivare, which are undesired in other countries, and it furnished a good market for the unbriquetted iron concentrate, a product salable with difficulty elsewhere.

Kiruna lies 56 miles nearly due north of Gellivare, and 105 miles from the port of Narvik. Its deposits have been known for many years, but active work dates from the opening of the railway to Narvik, the shipping point, in 1902. Narvik is an ice-free port, where extensive docks and storage yards are maintained. It has an advantage over Luleä, the shipping point for Gellivare ores, in that it is open to navigation throughout the year, and is nearer to the markets of England and America.

The Kiruna orebody outcrops in two large hills which rise prominently above the glacial plain making up this section of Lapland. The hills are separated by a small lake, on the north shore of which the railway station and town of Kiruna are located. The orebody trends in a general north-south direction. The main outcrop occurs in the southernmost hill, which rises to an elevation of 800 ft. above the lake. To the north, the deposit passes under the lake and outcrops again prominently in the second hill, about 600 ft. high, which lies northwest of the town.

The orebody is a dike-like mass of magnetite, with small amounts of apatite, about three miles long, and averaging 300 ft. in width. The deposit dips 55 to 60 deg. E. between a foot wall of syenite porphyry and a hanging wall of quartz porphyry. The consensus of recent geological opinion is that the orebody is a true igneous dike.

The deposit has been exhaustively surveyed by dip needle, observations being taken at the corners of 10-metre squares over a large area. Development has been by diamond drilling. The deepest hole penetrated

the orebody at 2,600 ft. below the level of the lake (or 1,000 ft. below sea level), and 3,400 ft. below the highest outcrop. The deposit maintains a uniform width in depth, and is reported to be appreciably freer from apatite, and consequently less in phosphorus content, in the lower levels.

The developed ore is estimated at 750,000,000 tons, but this by no means exhausts the possibilities of the deposit. Mining is carried on exclusively by open-cut methods. Operations are confined to the north slope of the main hill (called "Kiirunavaara," or Kiruna Mountain), just south of the lake and in full view from

STRUCTURE IN THE LEFT FOREGROUND IS PART OF THE ORE DOCKS

the railway station. At present, there are twelve benches of 66 ft. each. Drilling is done with hand machines using compressed air.

The ore, after blasting, is loaded into eight-ton cars by electric shovels. The main working level is 400 ft. above the lake. The loaded cars are brought to this level and dumped into vertical shafts leading to a tunnel at the lake level. The tunnel is provided with ore pockets, from which standard-gage railway cars of thirty-five ton capacity are loaded. The ore is divided, as mined, into four grades based on phosphorus content, a shaft being provided for each class. The highest grade ore carries less than 0.04 per cent P, and 68 per cent Fe; the lowest contains over 2.5 per cent P and is somewhat lower in iron.

About 15 per cent of the ore now mined is of the first grade, the remainder being about equally divided among the other classes noted.

The amount of stripping required in cutting away the hanging wall and trimming back the foot wall is comparatively small. It is estimated that, for the entire orebody above the lake level, only 35 tons of waste must be removed for every 100 tons of ore.

The first shipment of Kiruna ore was made from Narvik in January, 1913. By 1913 the output reached 3,100,000 tons, and the maximum annual output permitted by law, 5,000,000 tons, would probably soon have been reached had not the war cut off the market. During the war period, shipments were practically suspended, and for the first half of 1919 the export was only 137,000 tons.

In pre-war days, important amounts of Kiruna ore were sent to England and America, though the major portion of the production was shipped to Germany. The high-phosphorus ores found an especially favorable market in Germany, where basic converters yielded a slag which was valuable as a source of phosphorus for fertilizers.

Kiruna ranks as one of the most northern mining industries of the world, the latitude being N. 67° 50'. In spite of its situation well within the Arctic Zone, open-cut methods are employed, with comparatively little decrease in efficiency under conditions that exist during the winter period.

The aspects of the Gellivare and Kiruna mines which most impressed me are: The tremendous reserves, in excess of a billion tons; the richness of the ores; the comparatively favorable mining and marketing conditions, despite location well within the Arctic Circle, and the efficiency of the management, which is thoroughly technical and operates under a policy that is soundly progressive.

Photographs From Swedish Iron Mines

THE CAPTEN SHAFT AT GELLIVARE. THIS IS THE OLDEST MINE IN THE DISTRICT

THE MINES AT GELLIVARE FOLLOW THE RIDGE OF THE MOUNTAINS IN THE BACKGROUND

OPEN CUT AT THE CAPTEN MINE. ORE IS MILLED AND HOISTED BY SHAFT

THE KIRUNA MINE AS SEEN FROM THE RAILROAD STATION. THE OREBODY CROSSES THE SMALL LAKE IN THE FOREGROUND

Electrical Precipitation of Cyanide Solutions

Process Considered Worthy of Further Investigation, on Account of Its Simplicity and Cheapness—Lead Cathodes May Be Shipped as Base Bullion, or Paper Cathodes Used—Solutions Must Be Clear

By Douglas Lay

Written for *Engineering and Mining Journal*

THE conclusions expressed herein are based upon the results obtained from actual mill runs and "clean-ups" with electrical precipitation. They represent a somewhat exhaustive investigation of the process in its application to both unclarified and clarified solutions.

Such commercial success as has attended electrical precipitation has been in the use of the method with clarified solutions only. Attempts simultaneously to dissolve and precipitate muddy solutions during agitation, generally introduced to the mining public as "electro-cyanide" processes, have been numerous, but have not shown much evidence of commercial possibilities. In fact, many extravagant statements have been made concerning this type of precipitation, which have been followed by failures in practice. This appears to have had the effect of discrediting electrical precipitation generally, and so discouraging investigation. At any rate, electrical precipitation rather seems to lie under a cloud of suspicion, and it is generally taken for granted that it has been tried in the balance and found wanting.

As successful electrical precipitation necessitates preliminary clarification of mill solutions, either by filtration or decantation, it is obvious that in this respect it offers no advantage over standard methods of precipitation by zinc, aluminum, or charcoal. In my opinion its advantages lie in its simplicity, as it requires the minimum of skilled attention; its low cost, and the ease with which the monthly "clean-up" may be effected.

The principles underlying electrolysis of mill solutions must first be thoroughly grasped, and in this connection an ounce of fact is worth a ton of theory, because mere study of the laws of electrolysis is likely to lead to erroneous conclusions as to what may happen in the treatment of mill solutions.

Cyanide solutions constitute an extremely dilute electrolyte, as they are weak and contain a very small percentage of precious metals to be deposited. Consequently, much of the energy of the current is wasted in decomposing the water, resulting in the generation of oxygen at the anodes and hydrogen at the cathodes. As mill solutions are not electrolytes, within the textbook meaning of the word, a common mistake arises from the erroneous impression that the rate of precipitation of precious metals can be readily controlled, within wide limits, by varying the current strength. Accordingly, if it is found that a precipitation tank is not robbing the solution adequately of its precious-metal contents, the current density is frequently increased, in the largely futile expectation that precipitation will thereby be rendered more complete, whereas, for reasons subsequently given, only a weak current is necessary or permissible.

It must be borne in mind that the rate of precipitation is directly dependent upon the current strength only when the latter finds abundant metal to deposit and when the percentage of metal is kept constant in the electrolyte. Such would be the condition were soluble anodes employed that were of the same composition as the metal deposited, as in lead and copper refining; or were constant additions of the metal deposited being made to the electrolyte, if insoluble anodes were used. In the electrolysis of *mill solutions*, different conditions from those last described prevail, and for all practical purposes the percentage of the precious-metal contents of the mill solution which is precipitated depends upon the rate of flow of the solution through the tank, and also upon the cathode area, and not upon the current strength or the amount of precious metals present in the solution. The rich solution from the purely milling point of view is extremely poor from the electrolytic standpoint.

To illustrate a concrete case: Suppose a solution assaying $2 per ton in gold is passed through a precipitation tank at such a rate that the tailing solution assays $1 per ton in gold. If this tailing solution is again passed through the same tank at the same rate as before, the tailing solution from the second operation will still assay 50c. per ton in gold, and not zero, as at first might be thought. In other words, in the electrolysis of *mill solutions*, provided the rate of flow and cathode area remain constant, the percentage of precious metals in solution which is precipitated also remains practically constant, regardless of the *amount* (within the limits of ordinary mill solutions) of precious metals present.

The following empirical formula will apply to the electrical precipitation of mill solutions.

If R = the rate of flow of solution through the precipitation tank, expressed in *tons per hour*,

and K = the cathode area necessary to secure complete precipitation of precious metals, expressed in *square feet;*

then $K = 1750 \times R$.

By "complete precipitation" is meant a tailing solution such that when ten assay tons of it are taken, only a "trace," or a few cents per ton, are returned by the assayer.

The above equation will hold provided that: (1) The electrodes are connected up in multiple; (2) The anode and cathode areas are equal. (The effective area of deposition on a cathode is equal only to that of the anode opposite; consequently, no useful purpose is gained by having a cathode larger than the corresponding anode.) (3) The distance between anodes and cathodes is 1½ in. This distance will be found in practice the most convenient spacing for anodes and cathodes.

By means of this formula, the necessary cathode area to cope with any given flow of mill solutions can be calculated readily. For instance, a flow of two tons per hour will require a cathode area of 3,500 sq.ft., if pre-

cipitation is to be approximately complete. Deposition takes place on both sides of the cathode; consequently, in the formula, "*K*" signifies the sums of the areas of both sides of the cathodes. The cathode area being known, and also the spacing between anodes and cathodes, it is manifest that a simple calculation will determine the size of the tank required.

If, then, any given tank fails adequately to precipitate the precious metals, the remedy is either to decrease the rate of flow or to increase the cathode area, and not to increase the current density.

It is perhaps superfluous to say that the strength of the cyanide solution, in terms of free cyanide, has no bearing upon electrical precipitation, except as it affects the electrical resistance of the circuit. The stronger the solution, the less the resistance, and the greater the amperage with any given voltage.

Reasons for Using Only a Weak Current

As has been demonstrated, in the treatment of mill solutions, to all practical intents and purposes the percentage of precious metals deposited is independent of the strength of the electric current employed. Certain factors are, however, essential to the success of the process, which are directly dependent upon, and entirely governed by, the current strength. Careful attention must be given to them, for they constitute the reasons that only a weak current can be employed successfully. These factors are:

1. *Wear of Anodes*—The electrolyte being extremely dilute, decomposition of the water takes place. The generation of oxygen at the anodes results in the oxidation and wearing away of the latter, if they be metallic, or in disintegration, if they be non-metallic. The wearing process is slow or rapid, according as the current is weak or strong. This wear of anodes constitutes the only appreciable item in the cost of electrical precipitation, and, as it is directly dependent upon the current density, this is one good reason why only a weak current must be used.

2. *Precipitation of Calcium Carbonate on the Cathodes*—This is inseparable from electrolytic action, as lime almost certainly will be used to neutralize the acidity present in the ore. The hydrogen generated at the cathodes, in the presence of calcium hydrate and free cyanide, causes a precipitate of calcium carbonate on the cathodes, the carbon atom being taken from the cyanide. With a low current density of from 0.02 to 0.04 amperes per sq.ft. of cathode surface, the receptive quality of the cathodes, so far as the precious metals are concerned, is not impaired. Conversely, a high current density causes a heavy precipitation of calcium carbonate, closely resembling boiler scale, stopping precipitation of precious metals almost completely.

3. *Nature of Deposited Metal*—It is of the utmost importance that the precipitated metals should adhere firmly to the cathodes, and that there should be no chance of the deposit being rubbed off. The voltage must not fall below three volts, or black oxides of the precious metals may be deposited. These black oxides form a soot-like deposit, which is easily rubbed off.

For the foregoing reasons, a current density of 0.02 to 0.04 amperes per sq.ft. of cathode surface should be used, and the voltage should not fall below three or rise above five.

The commercial success of electrical precipitation undoubtedly depends in large measure upon the selection of the best material for the cathodes and anodes, more especially for the cathodes.

Obviously, base metal or carbon anodes must be employed. Only three substances, practically speaking, are suitable for the purpose: carbon, sheet iron, and lead. Of these, carbon or graphite anodes are not satisfactory, as they are somewhat fragile and cannot be procured of reasonable thickness and at the same time exposing sufficient surface area. Sheet-iron anodes have been generally used because of their cheapness, and also for the reason that they are suitable for making water-tight compartments.

It is generally good practice to baffle the flow of solution through the precipitation tank, by letting alternate anodes extend to the bottom of the tank from a point, say, one inch below the surface of the liquid. Alternate anodes again extend from a point about one inch above the level of the liquid to a point about two inches above the bottom of the tank, so that the flow is over the top of one anode and under the bottom of the next. With this arrangement, alternate anodes together form a practically water-tight compartment. Anodes are sometimes covered with cheesecloth to prevent accidental short-circuiting, but this is not strictly necessary, as, because of the weak current used, no danger can result therefrom. A short-circuit immediately stops electrolytic action, and can therefore readily be detected and remedied.

It must be bore in mind that anodes and anode connections below the level of the liquid are oxidized and gradually worn away by the action of the current. In the use of iron anodes, the anode oxidation product may be either mainly ferric hydrate or prussian blue. I have found that by keeping the protective alkalinity at about 0.03 per cent CaO, the anode product consisted almost entirely of ferric hydrate. This is desirable, because ferric hydrate floats and is readily disposed of in a manner to be described subsequently; whereas, prussian blue is heavy, and sinks to the bottom of the anode compartments. Aside from impeding the flow of solution, any accumulation of anode product is undesirable in the precipitation tanks, because it invariably contains high precious-metal values. These are loosely held and rapidly pass into solution again in the sump tank.

Metal From Oxidation of Lead Anodes May Be Recovered

Iron, once oxidized, is no longer available, and it is manifest that if iron anodes are used, their depreciation, although not a heavy item, must nevertheless be written off as a direct charge against the cost of electrical precipitation. Not so with lead. A lead oxidation product can be readily converted into lead again, at comparatively small cost. Or, if so desired, the lead anode product could be sold as such to any smelter. Whichever expedient be adopted, the cost of precipitation would receive credit. Although my experience has been confined mainly to the use of sheet-iron anodes, trial of lead anodes has convinced me of their great possibilities. Nevertheless, the thorough baffling of the flow of solution through the precipitation tanks before described, and which I adopted, could hardly be made as effectual with lead as with iron anodes. However, this could be offset readily by increasing the cathode area. It must not be understood that the use of iron anodes is detrimental to the high efficiency and low cost of electrical precipitation; I merely wish to point out that lead

anodes merit further investigation. It is possible that their use might have a beneficial action on the cyanide solutions, in increasing their solvent action upon the precious metals contained in the ore.

NATURE OF CATHODE IS IMPORTANT

The deposit must be made upon a cathode of such nature that the precious metals can be easily recovered from it. One of the reasons that electrical precipitation has not been more widely adopted is the difficulty of recovering the precious metals from the cathodes, after precipitation. Many expedients have been tried in the attempt to overcome this, among them amalgamated plates. These were unsuitable, because the amalgam, under the influence of the current, became extremely hard and brittle. Another expedient was to coat a metallic surface with graphite, so that the deposit of metal would not adhere firmly and could be scraped off for the purpose of a "clean-up." The last named operation involved too much labor to be practicable.

So far, lead is the only substance which has proved a commercial success as a cathode. In South Africa, where electrical precipitation was first tried, very thin lead sheets were used, and recovery of the precious metals was effected by cupellation, which added greatly to the cost. I once adopted the simple expedient of shipping the lead cathodes as base bullion to a custom refinery after a month's run.

The total cost of the month's "clean-up" was about $45, and 100 per cent of the gold contents was paid for. As custom refineries are fairly plentiful in America, this practice should be satisfactory for most mines, except those in remote districts. Such a "clean-up" is cheap, involves no trouble, and solves the vexed question of the recovery of the deposited precious metal from the cathodes. Incidentally, there is no danger of theft of bullion.

Lead sheets, whether for anodes or cathodes, can be readily and cheaply made at the mill, by Miller's process, which is fairly well known. The apparatus is simple, and consists of a trough at the head of an inclined slab of cast iron. Molten lead is poured into the trough, which is suddenly tipped up, causing the lead to flow down over the inclined slab of cast iron. Solidification takes place immediately, and the result is a sheet of lead, the thickness of which can be varied by varying the angle of inclination of the cast-iron slab.

Great care should be taken that the surface of the cathodes is clean and free from oxide before immersion in the precipitation tanks. They may be dipped in a solution of zinc chloride, rinsed in water, and then immediately immersed in the precipitation tanks. After immersion in zinc chloride, it is most important that the sheets should not be allowed to dry, and thus to oxidize before being placed in the precipitation tanks.

As has been mentioned previously, the precipitation of calcium carbonate on the cathodes, along with the precious metals, is inevitable. If the weak current specified is employed, the receptive qualities of the cathode will not be impaired for a period of at least thirty days. After this time there is a perceptible roughening of the surface of the cathodes, due to calcium carbonate, and it is advisable to replace them with new sheets.

I obtained most promising results from the use of paper cathodes, which gave high promise of solving the difficulty connected with recovery of precious metals from cathodes. Unfortunately, other matters engaged my attention before a conclusive test was possible, and the opportunity of further investigation has not presented itself. However, such information as I have had is given in the hope that it will be of service to others.

By employing a substance such as paper for a cathode, when the precious metals have been deposited, simple incineration and melting will result in a high-grade bullion, without the intervention of a refining process. Any reasonably stout paper of smooth surface, such as the cover of the *Engineering and Mining Journal*, serves well. It is cut into strips of the desired size, and waterproofed by momentary immersion in melted beeswax. Before the wax has solidified, the paper is dipped into Dixon's coarse flake graphite, and the latter is well rubbed in until the entire surface of the paper is covered with a uniform coating of graphite, which is, of course, a conductor of electricity. If this cathode is now placed in the precipitation tank, and suitably connected to the cathode cross-bar, it will receive a deposit of precious metal, just as though it were wholly metallic.

The following simple method of connection answered well: A small piece of copper foil about 1 in. square was doubled in half and clamped to the centre of the top of the cathode strip by an ordinary tie clip. The latter was soldered to a piece of copper wire, the other end of which was bent to form a hook, by means of which the cathode was suspended from the cross-bar. Such a cathode appeared to receive a deposit just as readily as a metallic lead cathode, and after a day or so became similar to a metallic strip in physical properties.

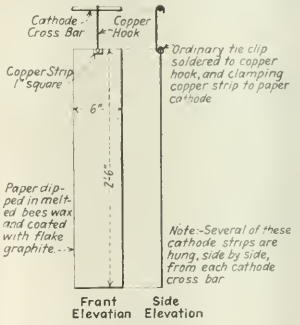

FIG. 1. DETAILS OF PAPER CATHODE

The investigation which I conducted consisted of suspending these paper cathodes at various points in a precipitation tank treating mill solutions, but in which the cathodes consisted mainly of sheet lead. Promising as were the results obtained with paper cathodes, I cannot give the results of an actual month's "clean-up," and further trial is of course necessary. They do, however, unquestionably merit investigation, and seem likely to solve what has been a somewhat knotty problem in connection with electrical precipitation.

Unless the solution contain sufficient protective alkali, there seems to be appreciable loss of free cyanide in passage through precipitation tanks. Solutions containing a trace of protective alkali, passed at the rate of two tons per hour through a tank containing 3,500 sq.ft. of cathode surface, were found to lose about 30 per cent of their free cyanide; but solutions containing a protective alkalinity of 0.03 per cent CaO disclosed no appreciable loss of free cyanide. A loss of protective alkalinity in course of passage through precipitation tanks must always occur, owing to the action of the current in precipitating calcium carbonate on the cathodes, as has been described. The regeneration of cyan-

ide caused by splitting up double cyanides prior to precipitation counterbalances the loss of cyanide caused by precipitation of calcium carbonate.

Advantages of Electrical Precipitation

Attractive features are:

1. The small amount of skilled attention required.

2. The ease and cheapness with which a "clean-up" can be effected. No stoppage of operations is entailed. Cathodes may be removed at any time and replaced by new sheets, without switching off the current. Granted

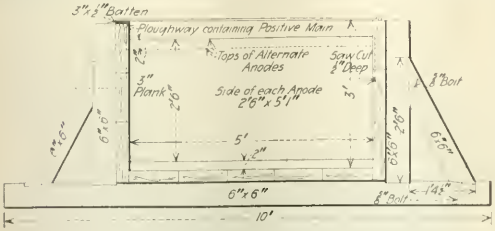

FIG. 2. CROSS-SECTION OF PRECIPITATION TANK SHOWING ANODES

that the efficiency and commercial success of such a cathode as that made of paper have not been thoroughly proved, the expedient of employing lead sheets, made by Miller's process, for cathodes, and shipping these once a month as base bullion, is an inexpensive way of making the "clean-up," and appears thoroughly sound commercially.

3. The consumption of electrical energy is very low, in fact little more than nominal. For each ton of mill solution to be precipitated per hour, 1,750 sq.ft. of cathode surface is required. With a current density of, say, 0.03 amperes per sq.ft., and a voltage of, say, 5, approximately three-eighths of one electrical horsepower will be sufficient.

The only appreciable item in the cost of the process is the wear of the anodes. Even in using iron anodes, this is not formidable. If lead anodes are used, the anode oxidation product can be readily re-converted into lead, or sold as such without reduction. This would reduce the cost of the process to small amount.

Precipitation Tanks Handled Two Tons Per Hour

The tank which I designed and used is illustrated in the accompanying sketches. Its dimensions were 35 ft. long by 5 ft. wide by 3 ft. high. It contained 3,500 sq.ft. of cathode surface, as it was designed to precipitate mill solution flowing through it at the rate of two tons per hour. Anodes were of sheet iron approximately ¼ in. thick, and were fitted into saw cuts in the sides of the tank. Every other anode extended to the bottom of the tank, the top of one anode being below the solution surface level, and the next anode to it raised 2 in. above the bottom of the tank, so that its top projected above the surface of the solution. With this arrangement the solution flowed under the bottom of one anode and over the top of the next. The distance between anodes was 3 in., and the size of each anode was 2 ft. 6 in. by 5 ft. 1 in.

The positive electric main was laid in a ploughway extending along the top of one side of the tank. Electrical connection with each anode was established through a ¼-in. hole bored vertically downward from the bottom of the ploughway to the top corner of the anode. Therefore, no anode connections were submerged and so exposed to wear. A wooden batten tacked down on top of the side of the tank covered the positive wire.

Cathodes were of sheet lead, about $\frac{1}{8}$ in. thick, and were of approximately the same size as the anodes, but, for convenience in handling, were divided into three strips. They were suspended from the cathode cross-bar by copper hooks. The distance between anode and cathode was 1½ in. Cathode cross-bars were of ¾-in. round common iron. One end was swaged to a semicircle, to engage the No. 1 gage circular ¼-in. copper negative main which was tacked on the top of the side of the tank. Paper cathodes, as mentioned, were tried in this tank, under the same conditions as the lead cathodes.

Long Tank Assures Thorough Ionization

The purpose of having a tank of great length in relation to its width is to secure as thorough ionization of solution as possible. In normal working, evidence of electrolytic action shown by evolution of oxygen at the anodes, and of hydrogen at the cathodes, is most marked at the outlet end and least noticeable at the inlet end, the reason being that as ionization becomes more complete, electric resistance is diminished and more current automatically flows.

The normal outlet for solution is by a pipe at the outlet end of the tank placed at the level of the submerged anodes. By closing the valve on this pipe, the level of the solution is raised to the level of the outlet lip of the tank, which is placed just above the level of the anodes which project above the surface of the solution in normal working. This operation causes any floating anode product to be floated off to the sump tank. The operation, which occupies only two or three minutes, was performed once a day.

The mill solutions treated averaged $2 per ton in total precious-metal values before precipitation (the weight of gold and silver per ton being about equal). After precipitation, tailing solutions assayed from a "trace" to a few cents in total per ton, the precipitation being as nearly as possible complete.

So-called electro-cyanide processes differ in details of design and equipment, but all have the same underly-

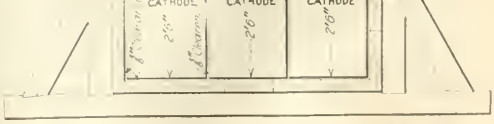

FIG. 3. CROSS-SECTION OF PRECIPITATION TANK SHOWING CATHODES

ing feature, viz., precipitation during agitation of finely ground ore and solution in a pan or agitator. An attempt is thus made simultaneously to dissolve the precious metals from the ore, and to precipitate them.

A twofold claim is generally made: (1) That precipitation is complete, or nearly so, during the period of agitation. (2) That the electric current exerts a beneficial action in aiding the dissolving of the precious

metals present in the ore. Exhaustive trials have convinced me of the impossibility of substantiating these claims, for the following reasons:

1. *Percentage of precious metals precipitated.*

Assume that an agitator, or pan, holds twenty tons of pulp and thirty tons of cyanide solution, and that the period of agitation is eight hours. To secure complete precipitation in this time, a cathode area of 30 × ¼ × 1,750, or 6,563 sq.ft., would be required. In the agitator specified it will not be practicable to suspend more than 650 sq.ft. of cathode surface, or, at most, 1,000 sq.ft. If a smaller agitator be assumed, the cathode area will be still further reduced. It follows that that proportion of the total precious metals present in solution which will be precipitated will be represented by the fraction 650/6,563, or, say, one-tenth. In fact, in my experience, the tailing solution after agitation frequently assayed more in precious metals than the feed solution, owing to solution taking place more rapidly than precipitation.

2. *Possible beneficial action exerted by electric current in aiding in the dissolving of precious metals.*

Any beneficial action must result either from generation of oxygen at the anodes, from regeneration of free cyanide caused by the splitting up of double cyanides resulting from electrolytic action, or from the simultaneous influence of both. It already has been demonstrated that only a weak current is practicable; consequently, generation of oxygen cannot be active, and therefore too much emphasis must not be laid on this factor. Again, it has been shown that only a small percentage of the precious metals present in solution can be precipitated; consequently only a small percentage of the double cyanides can be decomposed. Further, any liberation of free cyanide is counterbalanced by that destroyed by the reaction which results in the precipitation of calcium carbonate on the cathodes.

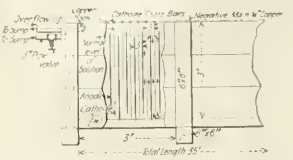

FIG. 4. SIDE ELEVATION OF PRECIPITATION TANK, OUTLET END

Frequently, the addition of salt is specified during agitation. The effect of this is of course to reduce the electric resistance, and to increase the current. Adding salt has no material effect, as has been previously pointed out, in increasing the percentage of precious metals deposited, and serves merely to cause an undue and prohibitive wear of anodes, and to deposit calcium carbonate so heavily upon the surface of the cathodes that their receptive qualities for the precious metals are seriously impaired.

Precipitation in an agitator or pan is open to serious objections:

1. The surface of the cathodes must be kept free from oxide; a surface once so prepared must not be allowed to dry. However little time is occupied in discharging and recharging an agitator or pan, the surface of the cathodes will dry and oxidize to some extent, and the receptive quality will be correspondingly impaired. The drying of any slime on a cathode might effectually insulate a part of it.

2. Anode connections below the surface of the solution are gradually eaten away by the action of the current. Precipitation in an agitator necessitates complete submergence of anode connections and renders their insulation difficult.

3. Inasmuch as there must be at some stage in the cycle of the cyanide process a separation of solid from liquid matter (otherwise there is prohibitive loss of cyanide), no justification would appear to exist for attempting to precipitate until this separation has been accomplished.

I have tried repeatedly most of the expedients usually adopted but failed to find evidence of the likelihood of the practical commercial success of precipitation during agitation.

Automobiling by Rail

Written for *Engineering and Mining Journal*

Many mining communities have good rail connections but poor automobile roads. In such cases quick transportation over short distances for from one to five persons can be obtained by mounting an automobile on trucks with flanged wheels suitable for running on a railroad track, as shown in the accompanying illustration. The car is more comfortable than the ordinary motor-driven "hand-car," and can be put back on rubber tires for ordinary use at any time. Such equipment is used on the Amador Central, in California, where, in going from the mines on the Mother Lode at Jackson and Sutter Creek to the main line at Galt, the traveler starts his railroad journey at Martel in a flivver with flanged wheels, which carries him over the first twelve- or fourteen-mile stretch. The International Nickel Co. also uses a car of this type on the Algoma Eastern Ry. to carry passengers from its Creighton mine to the O'Donnell roast yard; and over a private rail line from the Canadian Pacific Ry. at Turbine to the hydro-electric plant at High Falls. The photograph shows the car used on the latter line.

EQUIPPED FOR RAILROAD TRAVEL

Asbestos Can Be Fine Spun

The earliest industrial application of asbestos was for spinning and weaving, to make non-combustible thread, yarn, rope, and cloth, and this has continued to be the most important use of asbestos ever since the days of the Greeks and Romans. Only the best grades can be used for this purpose, according to J. S. Diller, of the U. S. Geological Survey. Thread can now be spun so fine that the fiber will run about 32,000 ft. to the pound.

Unwatering by Air Lift in Grass Valley, California

Idaho-Maryland Property Has Now Been Successfully Opened Up to the 1,000-ft. Level By Air Lifts and Pumps—Details of Installing Lift Pipes in Old Shaft And Practical Operating Suggestions

By George J. Young
Written for *Engineering and Mining Journal*

THE old Idaho-Maryland mine, slightly over a mile east of Grass Valley, Cal., inactive since 1914, is being reopened by the Idaho-Maryland Mines Co. As a preliminary to mining, the old workings are being unwatered, and the surface plant is being reconstructed and put in first-class condition. Practically all of the old buildings have been torn down, a new compressor building and shops have been constructed, and a permanent wooden headframe and hoist are being installed.

FIG. 1. TEMPORARY HEADFRAME AND SHAFT COLLAR

Two belt-driven, two-stage compressors with a combined capacity of 2,200 cu.ft. of free air per min. are in operation. The compressed air is being used for removing the water from the mine and for the operation of the temporary hoists.

Unwatering is being effected by an air lift. The capacity of the air lift averages about 900 gal. per min., but it has attained 1,400 as a maximum. The water is discharged through a drainage adit 23 ft. vertically below the collar of the shaft. The air lift, consisting of 10-in. oil-well casings, is installed in one of the hoisting compartments. A bronze foot-piece on the end of a 4-in. standard compressed-air pipe line is held in a central position in the 10-in. casing by suitable cages and lowered as the water in the mine is removed, so that proper submergence may be maintained. While the main air lift was being installed the shaft was unwatered to 208 ft. by dropping a 4-in. pipe down the old Cornish pump column, a distance of 300 ft. and drawing the water up through the pump valves. The end of the pump column is shown on the right in Fig. 2.

The method of installing the air lift is of considerable technical interest, as the details of such installations have seldom been published. The procedure, after ascertaining that the upper part of the compartment to be used was free from obstruction, was first to assemble all necessary pipe and equipment at the surface. For this purpose 900 ft. of 10-in. oil casing, 200 ft. of 12-in. machine-wound redwood stave pipe, and 1,200 ft. of 4-in. air pipe were secured and piled on the surface at a convenient distance from the shaft collar. The temporary wooden headframe, Fig. 1, was strengthened by an outer four-post frame and a single-drum, air-driven hoist placed in position. In the meantime a number of wooden crossheads were constructed. The plan was to place a crosshead every 100 ft. along the pipe line.

A crosshead, Fig. 2, consists of an upper and lower skid piece, each 7 ft. long, with curved ends, engaging with the upper and lower side of each guide; two additional skid pieces are provided for the inner faces of

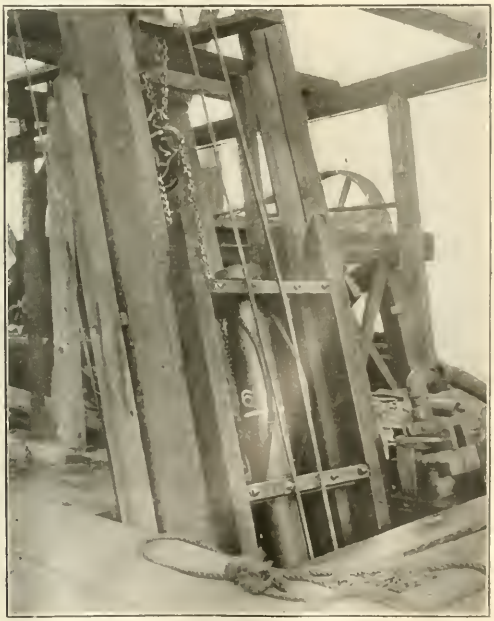

FIG. 2. CROSS-HEAD USED TO SUPPORT PIPE IN SHAFT

the guides. Thus, each shaft guide has three skid pieces on the three faces. The six skid pieces are held together by upper and lower platforms, each of which consists of two boards which are gained into the skids to hold them securely. A semicircular opening is cut in each board for the pipe. Rods extend through the boards, and four rods extend from side to side, binding the whole into a compact structure.

The crosshead is made in two parts, so that it can be slipped into place on either side of the pipe at the shaft

collar. When it is in place, the tie rods in the platform boards are inserted and tightened up. Ample clearance is allowed between all parts coming in contact with the guides. The crosshead is placed just below a pipe coupling, so that the weight of the pipe will be taken up by the coupling bearing on the upper platform of the crosshead.

To support the weight of the pipe and the attached crossheads, a piece of 1-in. wire rope is looped around the pipe, the ends of the rope being secured by a crosby clip. The loops are placed above and beneath the pipe, and below the upper and lower platforms of each crosshead, respectively. The looped rope is attached by clips to the two 1-in. cables, which are used in lowering the pipe and which must support a considerable part of the weight. Just how effective such a fastening is raises an interesting point, but inspection of the crosshead which became exposed as the water was lowered showed everything to be in good order, and no trouble of any kind was experienced with this method of fastening as further depth was reached. The illustration Fig. 2 shows one of the crossheads, the rope loop, and the two supporting cables, from which the rope clips have been removed.

The total length of the pipe that it was planned to use was 1,100 ft. With a weight of 22.75 lb. per ft., the total pipe weight of this length would be 25,000 lb. As the shaft is inclined at an angle of approximately 70 deg., the weight carried by the ropes may be roughly assumed to be the weight of the pipe, leaving the weight of the crossheads to be taken care of by the guides. The two weight-carrying ropes pass twice around a 12-in. steel shaft in the headframe and back to two heavy posts, which are wedged down in an opening between two old foundation blocks, Fig. 3. Each rope is wrapped six

FIG. 3. WIRE-ROPE ANCHORAGES FOR TAKING UP WEIGHT OF AIR LIFT PIPE

times around a single post and extends to a wooden reel, from which it is payed out as lowering necessitates. As additional depth was obtained, a greater number of wraps became necessary. One or two additional turns at a time made it possible easily to control the weight.

The method just described was successful in lowering the pipe to a depth of over 700 ft., at which point an obstruction was encountered. In spite of releasing the whole weight of the pipe, further lowering could not be accomplished, and it was decided to remove the upper portion, 160 ft. in length, connect the 12-in. stave pipe in its place, and then operate the lift, recovering as much of the mine as the submerged length would permit. To remove the upper portion, the pipe was disconnected at a flange coupling, a hoisting rope attached, and the pipe lifted, each pipe length being removed as it reached the surface. This was being done at the time the photographs accompanying this article were taken. As an upper length reached the surface, it was secured by chain and triplex block, unscrewed, swung away from the shaft, lowered onto a small carriage, and removed to the pile.

FIG. 4. MEASURING WEIR AND DRAINAGE ADIT

Although the length of pipe planned for was 1,100 ft., the greatest length used at any time was 700 ft. When the lift pipe stuck in the shaft, the water was lowered to the 400-ft. level, where a pump was installed. By air lifting to this level, the trouble point was reached at 686 ft., and the lift pipe was slid from this point to a point 1,013 ft. from the surface. From this position the 800 level was unwatered and a pump installed on this level. From the 800 level down, the mine was unwatered to a point 47 ft. above the 1,000-ft. level by means of an air lift in the 10-in. Cornish pump column extending from the 800 to the 1,000-ft. level. At this point the air lift could just handle the incoming water, so that three compressed air pumps and two weeks' time were required to remove this depth of 47 ft. and unwater the 1,000-ft. level.

The upper main air lift unwatered the mine to a point 560 ft. on the slope, or 519 ft. vertically, in just about one month's time. The maximum capacity attained was 1,450 gal. per min., with 49 per cent submergence with 97 lb. of air. The capacity dropped off to about 250 gal. per min. with 60 lb. of air with 18.3 per cent submergence. The shaft flattened from 72 deg., at surface

to 62½ deg. at the bottom of the 10-in. lift pipe. The lower air lift was unwatered from 560 ft. on the slope to 886 ft., a vertical distance of 282 ft. The capacity varied from about 1,500 gal. per min. with 77 lb. of air to about 200 gal. per min. with about 50 lb. of air and 19 per cent submergence. The shaft through this portioned flattened from 62½ deg. to 49 deg.

As has been stated, the water from 886 ft. to 1,068 ft. was removed through the 10-in. Cornish pump column, which extended from the 1,000 to the 800 level. This lift had enormous capacity, as upon starting there was a heavy submergence with small lift, and in one twenty-four hour period the water was lowered a total distance of 50 ft. on the incline.

The discharge from the shaft is measured by a weir, which is shown in Fig. 4. This weir is provided with a sliding gate, by means of which a constant height of discharge can be maintained.

The plan has worked out excellently, and the mine has been unwatered rapidly, with none of the discomforts and inconveniences incident to the use of pumps for work of this kind. A large amount of repair work was necessary, and while this was being done the water did not interfere at any time with the shaft repairs, as it was a simple matter to keep it well below the point where the work was being done. In this way alignment and grade were more easily kept, there were no pumpmen traveling up and down the shaft for supplies; and, besides, there was entire freedom from the excessive noise which accompanies most pumping operations.

For permission to visit the work and for much of the foregoing data I am indebted to John A. Fulton, manager of the Idaho-Maryland Mines Co., and I take pleasure in here making due acknowledgment.

Density Determination of Semi-Hard Ores

By R. H. McHARDY
Written for *Engineering and Mining Journal*

FOR purposes of estimating the tonnage of iron ore removed from drifts and raises at the Harold mine, Hibbing, Minn., a modified method of determining the density factor was devised. Formerly the practice in determining a density factor was to use the "oats method," which is described as follows: The floor of the drift is leveled off, a hole carefully excavated and the ore weighed as it is removed. Oats are poured into the hole, and the volume necessary to fill it is carefully measured. Having the weight of the ore removed, and the volume of the hole (or volume of oats necessary to fill it), the density of the ore may then be calculated. It has been found that the size of the sample which can be taken by this method is limited to about one hundred pounds. The reason for this is that the top of the hole is kept as small as possible, a pear-shaped excavation being made so that the error in leveling off the oats will be negligible.

Upon examination of certain drifts in the Harold mine it was apparent that the ore removed in drifting was very different from that in the bottom of the drift. This was especially true where the drifts were driven along the hanging wall, due to layers of sand lying between layers of ore. Therefore, in order to obtain accurate results, a test had to be made of the ore on the sides of the drift. After many suggestions, the following method was proposed by R. H. Bassett, chief engineer for the M. A. Hanna Co., and upon trial was found to be very satisfactory:

A box was constructed of one-inch lumber, as illustrated in Fig. 1. Channels were cut in the sides of the drift, and the box was grouted in with clay, as shown in Fig. 2. The door was then closed, and oats were poured in the top, filling the space between the rough wall of the drift and the inside of the box. The oats were carefully measured as they were poured, the door opened and the oats removed. A sample of ore was then cut from between the channels inside the box, care being taken to get the weight of all that was removed. The door was again closed, and a measured quantity of oats used to fill up the space inside the box. The difference between the volume of oats used before and after the sample was removed gives the volume of the sample. From the weight of the sample and its volume the density of the ore can be calculated.

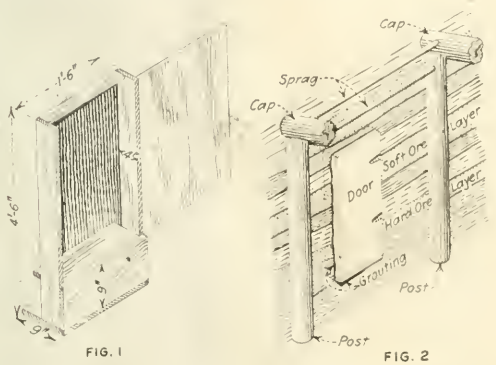

FIG. 1 FIG. 2

DEVICE USED TO DETERMINE DENSITY OF IRON ORES

For accurate results certain precautions were necessary. Three containers for measuring and pouring the oats were used—a gallon measure, a quart measure, and a small tin cup. The larger measure was for speeding up the pouring at first, the smaller ones being used toward the end, so that the error in measuring up a portion of a cup for the final pouring would be negligible.

Although the oats run freely and fill all crevices, they have a tendency to pack. There is considerable difference in the quantity a measure will hold, depending on how thoroughly the container is shaken when filled. In pouring the oats in the box, the quantity necessary to fill it increases as the box is tapped, so that to obtain accurate results a regular system of shaking the container and tapping the box was established. If the box is fixed strongly in place, the accuracy increases with the increased packing of the oats in the pouring container and box.

The advantages of this system are that a more representative sample of the ore to be tested can be taken, and the size of the sample may be increased without accompanying decrease in accuracy.

Lake Superior Iron Ore Shipments during 1919, according to official figures issued by *Iron Trade Review*, totaled 48,812,522 tons. Of these shipments, 47,177,395 tons were Lake shipments, rail shipments being 1,635,127 tons.

Government Officials Who Influence Mining

William Sloan

FAVORED with a robust constitution, and imbued with the spirit of adventure, William Sloan and three associates started for the Yukon in January, 1896, attracted by the vast and then comparatively unknown wilderness of the last Great West. The usual hardships and privations were encountered and overcome, and, after a fruitless summer spent in prospecting on the headwaters of the Stewart River, the party decided to try their fortunes on the lower Yukon. Luck was with them. The rush to the Klondike had just begun, and they were among the first to locate claims in that region, Sloan himself staking No. 15 on Eldorado Creek, one of the banner claims. Their shaft was the first to reach bed rock, and, striking "pay," they were amply rewarded for their efforts. So it is that, when Mr. Sloan, who is the present Minister of Mines of British Columbia, can be induced to talk of his Yukon experiences in the early days, he says, "the North has been good and kind to me." Sloan is one of the interesting personalities of British Columbia, and is a man of marked individuality. His early years were passed in his native Province of Ontario, where he was born, of Scotch descent, in 1867. His education was acquired in the public schools and collegiate institute at Seaforth, Ont. Upon terminating his student days he went to Shangahi, China, to join his father, Dr. R. J. Sloan, who at that time was one of the port physicians there. In 1887, the younger Sloan returned from the Orient to Canada and settled in British Columbia.

WILLIAM SLOAN

Following his big strike in the Yukon, Sloan mined for two seasons, and then returned to Nanaimo, B. C., where he built his present home. Two years later, in 1900, in the Canadian general election, he entered public life as a candidate for Parliament on the Liberal ticket, but was defeated. In 1904 he was a candidate for the district of Comox-Atlin, and was elected by acclamation and was re-elected in the same fashion in 1908. He resigned his seat in 1909. In the general elections of 1911, owing to repeated efforts of many of the influential members of his party to have him again enter the field, he issued an emphatic statement that he was not a candidate for re-election. As a member of Parliament from Comox-Atlin, the district embracing the larger portion of the coast line of British Columbia, he was successful in securing needed aids to navigation, including the hydrographic survey, as well as extension and improvement of the postal and telegraphic service. His attitude on the Oriental question has been that "Canada should control her immigration from within, and not be dictated to from without." At the general provincial elections in 1916, Mr. Sloan was elected by an overwhelming majority for Nanaimo Riding, and was confirmed by acclamation upon accepting the portfolio of Minister of Mines in the government formed under the premiership of the late H. C. Brewster. As might be expected in one who has lived so rugged a life, Mr. Sloan finds his chief recreation in hunting and fishing, in both of which he excels, and has traveled extensively in the wilds of Canada, from ocean to ocean, in pursuit of these pastimes. His home at Nanaimo contains many trophies from his hunting experiences. He is an ex-president of the Nanaimo Caledonian Society and is prominent in Masonic circles. For several years he was Liberal organizer for Vancouver Island and treasurer for the British Columbia Liberal Association, but resigned these offices on his election for Comox-Atlin. He is a member of the Rideau Club of Ottawa, the Union Club of Victoria, and the Vancouver Club of Vancouver.

For a man who is still comparatively young, Sloan has had a most interesting and varied career, as it has embraced many experiences of the pioneer, prospector, and politician. The office he holds seems a fitting climax to all that has gone before, as one traces his rise by successive steps from the prospector of the Klondike to the Minister of Mines.

The Minister of Mines and others holding similar positions should above all things have an intimate knowledge of the mining industry and the problems that confront it. The situation in British Columbia is in marked contrast with that in Ontario, and there will be few to deny that the western province is the more fortunate.

By The Way

Between Two Evils

News comes from California that Cox is the Democratic nominee. Speaking of the long deadlock between Palmer, McAdoo and Cox, Bryan said that the convention was looking for a man who would "respond without protest to every demand that comes from the White House, from Wall Street, and from the liquor interests." Not being able to get all three, they finally decided on one. With cheer leaders, shouting prolonged by prearranged plan, and other devices that school boys are familiar with, our two great conventions have been held, while Europe watched. "The Palmer people" said a dispatch, "assisted by the band and the great pipe organ, started a demonstration with a view to holding their lines fast." Were it not so comic the spectacle of the utter collapse and failure of our primary system would be seen for the national tragedy that it is.

Need for Restraint

"Don't thee think for a minute, m'son, that Jan Trembath be a fool, even though 'is affairs of tha 'eart be, as I mus' h'admit, far from brilliant," said Cap'n Dick. "Times 'e wuz smart enough for anyone, as super to tha Warrior foun' h'out one day. Jan at that time wuz workin' as shif'boss on sixth level o' tha Warrior, an' one Tuesday—or per'aps it were Wednesday—Jan 'e brings tha 'ol crew to surface baout 'leven-thirty in tha moornin'. So 'appened w'en they wuz steppin' h'off tha cage along comes tha super. 'W'ot tha 'ell do'st thee mean by comin' h'up this time o' day?" sez 'e. An' Jan sez, 'Mister 'Atch, tha h'air is so bad in nummer two stope tha bloody cannels won't burn. Mert Morcom 'ere, 'e pretty near got knocked h'out—h'asfixiated, as tha doctors say—an', dam-me, Mister 'Atch, I won't work no man in h'air as bad at that.' 'H'air 'ell,' sez 'Atch, 'You're fired. Go to tha h'office an' get your time!' An' Jan sez, 'H'all right Mister 'Atch, I'm fired, but I 'ope thee will not fire Mert Morcom—'e's got a wife an' twelve children an' 'e needs tha job.' 'I'll 'fire 'oo I damn please,' sez 'Atch. 'I naws thee will,' sez Jan, 'but I wuz jus' h'askin' thee not to fire 'e, an' please don't fire Si Johns, tha surface boss. An' there's Tommy Williams—no better blacksmith h'ever put h'iron in the fire than 'e. An' before I get my time, Mister 'Atch, will 'e do me a bit o' a favor?' 'W'ot do'st thee want?' sez 'Atch. 'Will thee please go to Tommy Williams an' h'ask 'im to take a piece o' h'iron 'alf by three an' forge a ring out'en about so big around?' 'W'ot for?' sez 'Atch. 'So thee can wear it for a 'at band an' keep your damn 'ead from bustin,' replied Jan."

It Pays To Advertise

Bulletin No. 7 of the Minnesota School of Mines Experimental Station, entitled, "The Future of the Lake Superior District as an Iron-Ore Producer," and compiled by Edward W. Davis, concludes in this pungent paragraph:

"If there is any criticism to be passed upon the mining men of the Lake Superior district it is that they have kept their achievements too much to themselves. They have been satisfied to make a large amount of worthless land extremely valuable, and have not taken the trouble to explain their work to the people at large. This is a period of great publicity and wide advertising, and the mining industry must realize this fact to keep abreast of the times."

Smelter Smoke

Miami, Ariz., led all the rest of Gila County in births registered in the month of May. Globe came second and Hayden third. Smelter towns are usually noted for their high birth rate, the sulphur fume apparently affecting only vegetation. Copper Cliff, Ont., was reputed to have the highest rate in Canada. Some interesting statistics could be gathered on this subject. To study the health and welfare of the workers is of the highest importance.

The Amateur Geologist

A report on certain lands in Texas, by Bagnall and Daniel, geological engineers, of Chillicothe, Tex., according to the version given in the *Wichita Oil Reporter*, gives several reasons why oil should be found in the area, one of which is that "Oil is always found at or near *anticlinical* domes which run parallel to mountains or hills," and another, "The surface conditions and principal earmarks as found in the same." We imagine the clinical (or anticlinical) problem has to do with the earmarks. "The structure," they say in summarizing, "is of the Permian formation, and one of the most perfect structures we have ever examined. We have found the rock exposures dipping from the structure at various angles and in all directions. The surrounding hills form a semicircle around the dome, thus completely inclosing and hermetically sealing the structure." The poetry of petroleum will seep out. We imagine the stage is set at night—yes, it must be night. In the center is the mysterious and perfect Structure, the most perfect yet dimly viewed by man—so Perfect that the rock exposures (we knew some day they would be exposed) dip and duck away from It in all directions and in confusion. And well they may, for the silent cordons of hills have formed a protective semicircle around the perfect Structure, thus completely inclosing it. When they have gathered still closer, and formed a complete circle—what shall we say? Apparently they can do no more than completely inclose it, but we feel some unthought-of climax will come. What is the dénouement? How can we wait for the continuation of the reel next Saturday night?

Variety the Spice of Life

In the long run diversified industry is best for any mining district. Occasionally, however, the mine manager whose company has to compete with other industries for its labor supply may wish that he were not so happily conditioned. Recently, operators of the Joplin-Miami district have been greatly hindered by car shortage, and to make matters worse many of the miners have left to work in the wheat fields. The result is curtailment of operations. But it is a good thing for the men, and indirectly a good thing for the companies, even though not appreciated. That which is best is not necessarily pleasing. A maternal castigation is said to be good for the soul, though painful.

CONSULTATION

Important South African Gold Mines

"Can you let me have a list of the twenty largest gold-producing companies in South Africa and figures showing the current rate of production?"

The principal gold-mining companies in South Africa rank in the following order in point of production. In each the production is given for the month of March, which is the latest month for which these figures are available. The compilation is made from figures furnished by the Transvaal Chamber of Mines:

Name of Company	Ounces of Gold Produced in March, 1920	Name of Company	Ounces of Gold Produced in March, 1920
Crown Mines	59,402	Springs	7,524
Government Areas	51,521	Robinson Deep	17,207
New Modderfontein	46,206	Consolidated Main Reef	17,033
Randfontein	40,712	Knights Deep	16,194
E.R.P.M.	33,389	Geduld Proprietary Mines	15,990
Van Ryn Deep	28,385	Nourse Mines	15,106
City Deep	25,317	Rose Deep	14,680
Modderfontein B.	23,396	New Kleinfontein	14,100
Modderfontein Deep	23,512	Village Deep	13,823
Brakpan	21,093	Geldenhuis Deep	13,060

Infusorial Earth Market Possibilities

"I have been referred to you by our State Bureau of Mines and Geology for information regarding the possibilities of marketing diatomaceous earth which I have here in large quantities. This is quite pure on analysis and contains little else than silica and water. Can you advise me of the best method of getting in touch with prospective purchasers?"

Infusorial or diatomaceous earth has many uses, all of which combine to influence the market for this product. An enumeration of these applications would include the use of the material as a cleanser and polisher in the form of a powder or mixed with soap, as a non-conductor of heat, either alone or in conjunction with other materials; as a covering for boilers, steam pipes, furnaces and stoves; and in the manufacture of fireproof cements. The great absorbent quality of infusorial or diatomaceous earth makes it suitable for water filters. Owing to this characteristic it was formerly employed in the manufacture of dynamite. It is used in the manufacture of talking-machine records when boiled with shellac. Another use is as an absorbent for liquid manures to make them more adaptable as a fertilizer. The manufacturers of water glass, various cements, tile glazing, artificial stones, pigments of alizarine, and aniline colors consume much infusorial earth. Minor uses include paper filling, for sealing wax, in fireworks, matches, papier-maché, as liquid bromine containers and other miscellaneous purposes. Its use as a building stone in California is worthy of note, as well as its employment in the manufacture of plaster.

Infusorial earth is of widespread occurrence, although we believe that the largest domestic deposits are found in the Western United States. On the other hand, the greatest demand for this material is in the East, so that the price received for the Western product is lower, because of the heavy transportation charges to the principal markets. Prices vary considerably and depend upon the quality of the infusorial earth—as in most non-metallic products—and upon the location of the deposit.

Prices range widely from $6.50 to $10 for the Western grade, and from $13 to $30 for the Eastern product, f.o.b. mines.

In marketing your product you would have the choice of using dealers or communicating directly with consumers. In the latter event it would be well to cultivate a local market as far as possible through communication with local manufacturers of products consuming infusorial earth. The list of uses given above will serve as a guide to this end. The other alternative, marketing through dealers, is easier but naturally has its disadvantages.

Western Acid Producers

"Can you tell me if there are any manufacturers of sulphuric acid extracted from sulphide ores in Arizona or other points west of Denver?"

To the best of our knowledge no sulphide ore is being mined in Arizona for its sulphur content alone. The sulphur, when recovered, as at the smelter of the Calumet & Arizona Copper Co., at Douglas, is produced as a byproduct from the smelting of copper ores. Under existing conditions the numerous pyrite deposits would undoubtedly have difficulty in marketing their product profitably, owing to heavy mining and transportation costs to the chief markets.

California has extensive pyrite deposits, but because of their great distance from the East, where sulphuric acid is chiefly consumed, their development has been retarded. California's greatest pyrite producer is the Mountain Copper, at Keswick. Manufacturers of sulphuric acid in the Far West are small in number. We believe that the Barbour Chemical Co., Stauffer Chemical Co., Union Superphosphate Co., Leona Chemical Co., and Mountain Copper Co., all of San Francisco, comprise the list.

The Molybdenum Ore Market

"Will you kindly advise me as to the price and present demand for molybdenum ore? How can I get in touch with parties who will buy this ore?"

The present demand for molybdenum ore is small, and hence the market is dull. The technology of molybdenum is not sufficiently understood to warrant alloy-steel manufacturers employing large quantities of this metal. Other uses for molybdenum, such as in electrical apparatus and the manufacture of chemicals, are too unimportant to help sustain the market. As in some other metal markets, the dealings in this class of ore are frequently attended with an inordinate amount of secrecy, inquirers and buyers alike maintaining reticence on their dealings. Owing to the small trade in the ore, accurate metal quotations are difficult to obtain, and at present the sole offerings seem to be foreign molybdenum ore at 60@65c. per pound of MoS_2 contained.

THE PETROLEUM INDUSTRY

Probable Oil Resources of New Mexico

A Summary of the Stratigraphic and Structural Geology of the State, With Particular Reference To Possible Sources of Petroleum—Some Oil Has Been Discovered, And a Few Localities Are Promising

BY JOHN K. KNOX*

THE interior of the United States west of the Mississippi River is commonly divided into three great, major topographic provinces, the Great Plains, the Cordillera, and the High Plateau. Each of the three regions is represented in New Mexico. The state is divided into three sub-equal parts by the Rio Grande and the Pecos rivers, and these three areal subdivisions correspond roughly with the topographic subdivisions. East of the Pecos are the Great Plains. Between the Pecos and the Rio Grande, and extending into the southwest corner of the state, is the Cordelleran area. To the west of the Rio Grande is the High Plateau.

The three great provinces are distinct topographically, and are well defined geologically, both in stratigraphy and structure. In the Great Plains region of New Mexico a thin covering of Tertiary formations unconformably overlies beds of early Mesozoic and Paleozoic age. The Tertiary formations lie nearly flat, and the subjacent beds normally dip gently eastward from the Cordillera into the great syncline which runs north and south through western Texas. This region may be divided conveniently into three districts: (1) an area in northeastern New Mexico where the surface formations are Tertiary or Cretaceous; (2) the area around Santa Rosa and Tucumcari, and in the Pecos Valley, where most of the surface formations are Permian or Triassic; and (3) the Llano Estacado, where the surficial beds are Tertiary.

The rocks outcropping in the Cordilleran area range in age from pre-Cambrian to Tertiary, but Pennsylvanian formations probably are most widespread. The beds are much folded and faulted and stand at angles ranging from a few degrees to more than ninety degrees from horizontal.

The High Plateau is underlain by a great thickness of nearly horizontal strata, ranging in age from Tertiary to Pennsylvanian. Streams have cut deep gorges across the plateau and have dissected it into a network of mesas of widely differing area and height. The plateau is more nearly a unit geologically than is either of the other major areas, but it may be divided conveniently into two parts, the San Juan Basin, in the north, and the Magdalena district, in the south.

The Tertiary formations of the Great Plains, consisting of poorly cemented sand, clay, and gravel, outcrop over much of eastern Union County. It is not known with certainty what formations underlie the Tertiary in this region. One hundred miles to the southeast on Canadian River, in the Texas Panhandle, similar Tertiary rocks overlie Triassic and Permian. In western Union County the Dakota sandstone appears from under the Tertiary, which lies unconformably upon it, but it is not known how far east the Dakota extends under its Tertiary cover. This is not of great importance, however, as the Dakota is not an oil-bearing horizon. The Tertiary area in northeastern New Mexico is not of great interest to the oil producer.

West of the Tertiary area in Union County, the Dakota and Purgatoire sandstones outcrop over a large tract in Union, Colfax, Mora, and San Miguel counties. These rocks have been deformed and folded, and at least one anticline of considerable size is present, but despite these facts, the area where they outcrop is not attractive as a prospective oil field.

Even more important than the character of the Dakota is the lithology of the underlying formations in which oil would be expected. If 4,000 ft. is accepted as being about the greatest depth to which a well can be drilled profitably at present, there is little chance of finding valuable petroleum deposits by drilling in the areas in northeastern New Mexico where the Dakota and Purgatoire sandstones appear at the surface, because the 4,000 ft. of beds immediately underlying the Dakota do not offer much chance of production. A number of wells have been drilled, and some are being drilled now, in the neighborhood of Des Moines, but none of them have shown signs of commercial production.

When examining structures in northeastern New Mexico with oil development in view, it is necessary to make sure that the structural form is not caused by an igneous body of the laccolithic type. Certain determination of this condition is not always possible, but the possibility must be given greater weight when evaluating a structure in this region. If the laccolith is buried deeply enough, and has not pierced the productive oil horizons, oil will collect on the structure if other conditions are favorable, and the fact that a structure is of laccolithic origin need not necessarily condemn it as a possible producer of oil. In this region, however, the chances are that if a laccolithic structure is sufficiently marked to be determinable as a structure, the igneous rock is probably so close to the surface as to make the likelihood of obtaining oil very remote.

West of the outcrop of Dakota sandstone, younger Cretaceous formations are exposed in a broad belt in the valley of the Canadian River. This Cretaceous area, sometimes spoken of as the "Raton field," is the most promising area for future oil production in northeastern New Mexico.

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The plain of the Canadian River Valley is underlain by the great shale series of the Upper Cretaceous, which includes beds ranging in age from Dakota to Pierre. The shale of the Benton and Pierre groups is of the type which commonly produces oil, and it is probable that a well drilled into these shales at almost any point would show traces. In Wyoming, where the same formations have an almost identical appearance and composition, they produce oil.

Unfortunately, a careful search of the Cretaceous section in the Canadian Valley, from the top of the Pierre to the base of the Benton, has failed to disclose a single bed of sandstone which could act as a reservoir for the oil produced by the Benton and Pierre shale. It is possible that lenses of sand are present in the area, but no such lenses are known to outcrop. The only reservoir horizons in the Cretaceous section in this district appear to be the Timpas and the Greenhorn limestones. In these formations the limestone is thin-bedded, and the individual beds of limestone are separated by thin beds of impervious shale. Such a lithologic condition does not produce a good oil sand, but it does not make the storing of oil impossible, and oil may be present in these limestones somewhere in the district. It should be noted that nowhere along their outcrop, so far as I have observed, do these limestones show traces of oil or gas, and although this fact does not prove that they are barren everywhere, they may be assumed to be so over considerable areas.

In the absence of good reservoir horizons, it becomes of the utmost importance that any well drilled be situated on a favorable structure, so that it may have some chance of success, but the absence of sandy horizons in the shale makes it difficult indeed to detect such structures. In most places the surface is mantled by from two to twenty feet of weathered shale or river deposits, which yield no information concerning the subjacent structures, and even where the unweathered shale is exposed, no definite beds can be traced. The Cretaceous area in the valley of the Canadian River is the most promising territory for oil in northeastern New Mexico, but even it does not offer good prospects of becoming an important producer.

Raton Mesa District Geologically Unfavorable

The Raton Mesa district, west of the Canadian Valley, is underlain by Tertiary formations which are not likely to produce petroleum. Beneath the Tertiary, and overlying the Pierre shale, are 525 ft. of sandstone and shale belonging to the Trinidad and Vermejo formations, which are Cretaceous in age and younger than the Pierre. The Trinidad sandstone is 100 ft. thick and lies immediately on top of the Pierre, so it is not improbable that oil which may have originated in the Pierre shale might, under favorable structural conditions, collect in this sandtone. There is no competent bed of impervious rock above the sandstone, however, and it is more than likely that any petroleum which may have migrated to the sandstone has already escaped. A well to test the Trinidad would be justified, however, if placed on an especially favorable structure.

Large anticlinal structures bring Cretaceous rocks to the surface in a number of places in the Raton Mesa district. Vermejo Park, which is probably the best known of these, is a large and well-defined anticline, and would be an attractive drilling site were it not for the doubt as to the presence of reservoir horizons in the Cretaceous formations underlying it. Structurally it is satisfactory, and it is probably the best place in which to test the Cretaceous formations of the district if anyone is willing to drill such a test in face of the unfavorable lithologic conditions. A well 3,500 ft. deep would afford a good test of the Cretaceous.

Santa Rosa-Tucumcari Region Unexplored

Throughout the Santa Rosa-Tucumcari region the surface formations belong to the great "Red Bed" series of central New Mexico. No part of this district has been studied in detail geologically, and the exact age of many of the formations is not known. The Dakota-Purgatoire sandstone at the base of the Cretaceous, and the underlying Morrison shale, are readily recognizable, and the boundary between them and the subjacent formations has been traced with approximate accuracy. The 4,000 ft. of sediments immediately underlying the Morrison belong to the Triassic, Permian, and Pennsylvanian systems. The Magdalena limestone at the base is definitely known to be Pennsylvanian, but on account of the paucity of fossils the upper beds are not readily classifiable as to age.

A massive sandstone, for which I propose the name "Pecos Canyon," divides the "Red Beds" which overlie the Magdalena into two groups: (1) the upper "Red Beds" and (2) the lower "Red Beds." The upper "Red Beds" are probably Triassic; the lower "Red Beds" are Permian or Pennsylvanian or both.

Lithologically, the "Red Beds" are unpromising as a source of petroleum. Nowhere in the series is there an appreciable thickness of marine shale or other bituminous, oil-forming lithologic type, and, except in one locality a short distance north of Santa Rosa, no evidence of the presence of petroleum in the sandstones is to be noted.

Favorable-looking structures are plentiful in all the Santa Rosa-Tucumcari region, and on account of the similarity of the formations, and of the surficial conditions, to formations and conditions at Burkburnett, operators have devoted much attention to the district within the last year. During 1919, a well was drilled on Los Estaritos dome in T. 11 N., Rs. 18 and 19 E. Judging from surface indications, this dome is almost perfect. It is regular in shape, is of good size, has ample closure, and should contain oil, if oil is present in the district. The well spudded in in "Red Beds" and drilled through "Red Beds" until it passed into granite between 1,900 and 2,000 ft., without finding oil. This well brought out two significant points: (1) that the Magdalena limestone is not present on Los Estaritos dome, although it is 1,800 ft. thick only thirty-five miles to the northwest; and (2) that the domal structure possibly owes its origin to renewed movement along an old line of granite hills which are now concealed by only a few thousand feet of Paleozoic sediments.

The presence of granite under Los Estaritos dome at the comparatively shallow depth of 1,900 ft. suggests that many, if not all, of the numerous structures lying between the Sangre de Cristo foothills and the Texas line may owe their origin to renewed movement along an old line of mountains, and that they may be as barren of oil as is Los Estaritos. It is worthy of note that the folds which are producing gas in the Texas Panhandle, due east of Santa Rosa, have a general east-west elongation, and some geologists are suggesting that a range of eroded and buried mountains extends from the Sangre de Cristo into Texas.

In view of the non-petroliferous character of the lower and upper "Red Beds," the probable absence of the Magdalena limestone from much of the disturbed area east of Los Estaritos dome, the non-bituminous character of the Magdalena even where found, and the probability that the observed anticlinal structures in this district are underlain at shallow depths by granite or very old metamorphic rocks, the "Red Beds" area in the Santa Rosa-Tucumcari region is not an attractive oil prospect.

The Lower Pecos Valley Not Commercially Productive

Oil in less than commercial quantities has been found for many years in shallow wells in the Pecos Valley between Roswell and Carlsbad. The central part of the valley is floored by a thick mantle of Quaternary river deposits, flanked on the east by "Red Beds" and on the west by porous limestone of Permian age. The "Red Beds" are so unfossiliferous that certain determination of their age is difficult, but some part of the series is Permian, and part is possibly Triassic. Under the "Red Beds" is an immensely thick series of Pennsylvanian and Permian limestone.

The regional dip of the sedimentary series is to the east, decreasing from more than ten degrees at the crest of the Sacramento Mountains to nearly zero on the plains. Small anticlinal folds are not plentiful where the consolidated rocks can be studied on the long slope from the mountains to the Pecos, and in the central part of the valley, floored by Quaternary formations, it is not possible to determine by surface indications whether such structures exist or not.

A considerable number of wells have been drilled in the Pecos Valley during the last fifteen years, and, although none have been commercially profitable, enough oil has been found to keep hope alive, and interest and drilling still continue. The wide area west of the Pecos where limestone is the surface formation is unpromising territory, because any oil that may have been in the limestone has probably escaped, and the limestone itself is so thick that it cannot be pierced. The area mantled by Quaternary deposits is difficult prospecting ground, and, apparently, most of the drilling has been done blindly. Old methods can probably be improved, however, for a careful study of the logs of the numerous water wells that have been drilled in the valley should make possible a fairly close approximation to the sub-surface structure.

A favorable structure can be more easily located in the "Red Beds" area east of the river, and a favorable structure in this district would certainly be worth a test. The present small production is obtained from porous beds in the upper part of the limestone series which underlies the "Red Beds," and if even a small production could be maintained it would be profitable, as the wells are shallow and inexpensive to drill. Oil is a widely distributed mineral, however, and nothing so far found proves that commercial deposits of it are present in the Pecos Valley.

Llano Estacado Region Unfavorable

The surface formations of the Llano Estacado are Tertiary in age, and beneath them lie the Triassic, Permian, and Pennsylvanian beds, which outcrop to the east and west of the Staked Plains. The continuity of the older rocks is fairly well established.

There is no reason to suppose that oil will be found in the Tertiary deposits themselves, and before drilling is undertaken in an effort to discover sub-Tertiary structures, it should at least be known that the sub-Tertiary formations contain oil. Nothing indicating the possibility of commercial production from these beds has yet been found, and at the present time the Llano Estacado must be regarded as one of the least favorable regions in New Mexico in which to prospect for oil.

The High Cordillera Probably Barren

The High Cordilleran area of New Mexico is a region of high mountains, in which the predominating rock type is Pre-Cambrian granite. At the south end of the Sangre de Cristo Range Magdalena limestone lies on the granite, and the younger formations appear in their respective order and dipping gently to the south. The chances of obtaining oil in the High Cordilleran area or on its immediate borders are so small that the district may be considered as valueless as a prospective oil field.

The southern Cordilleran area of New Mexico comprises the mountainous region which extends through the centre of the state from the main line of the Santa Fe south to the boundary of Texas and Mexico, and southwest to the boundary of Arizona. This region is characterized by the "bolsom-fault-block" type of structure, which sharply differentiates it from the higher Cordillera to the north. The northern ranges are, commonly, great anticlinal folds modified by faulting. The sedimentary beds are steeply upturned in many places, and are altered where deformation has been most intense. In southern New Mexico there are no long ranges, the mountains are monoclinal rather than anticlinal, in only a few places are the beds steeply tilted, and metamorphism is rarely seen. The southern Cordillera consists of a series of short, relatively low mountain blocks which owe their origin to faulting, arranged in three fairly continuous north-south lines east of the Rio Grande. Except in the disturbed blocks, the formations dip gently to the east or southeast or lie nearly horizontal.

As possibly productive areas, the fault-block ranges themselves are not of interest, for in most of these blocks granite is exposed at the foot of the fault scarp, and the broken and upturned edges of the sedimentary formations outcrop. Oil is found elsewhere in mountainous areas where the rocks are closely folded, as in Ventura County, Cal., but the monoclinal fault-block structure of the New Mexican ranges has afforded no opportunity for oil accumulation.

West of the mountains is the debris-filled plain of the Rio Grande. Between the individual mountain blocks lies a series of shallow undrained basins known as "bolsoms," of which the larger and more important are Tularosa Basin, Estancia Basin, and Jornada del Muerto. These basins, and the valley of the Rio Grande, were once rather deep, but now they are filled to a depth of hundreds of feet by loose, unconsolidated Quaternary gravels and sands washed from the surrounding hills. However, if oil is found anywhere in south-central New Mexico, it is most likely to be found on minor anticlinal folds or along the fault line in the down-thrown and buried fault-blocks which lie concealed beneath the Tertiary valley fill.

Formations ranging from Pre-Cambrian to Quaternary outcrop in the southern Cordilleran region, but Pennsylvanian and Tertiary rocks are most widely distributed at the surface. In the El Paso region rocks

representing parts of Cambrian, Ordovician, Silurian, Devonian, Mississipian, and Pennsylvanian time are present.

The outstanding difference in the Paleozoic series in the northern and southern parts of the region is one of lithology. North of Socorro the Paleozoic section contains many thousands of feet of sandstone and shale, and a relatively small thickness of limestone. South of Socorro the thickness of sandstone and shale decreases rapidly and the limestone content increases even more rapidly as progressively older rocks appear below the Pennsylvanian.

The sandstone, shale, and gypsum which outcrop north of and around Socorro belong to the Manzano group of the Pennsylvanian. The rocks are for the most part red in color, and give absolutely no evidence of included bituminous materials. A careful study of the whole Manzano group has convinced me that it offers little or no chance of being an original source of petroleum.

The limestone which is present in great thickness at the base of the Paleozoic section in southern New Mexico does not contain an appreciable amount of bituminous material except in a few thin beds in isolated localities, but the future of this region as a producer of petroleum appears to be bound up with the limestone series. Structures favorable for the accumulation of oil exist in the basins, although they will be hard to find, and if the limestone or the shale included in it is an original source of petroleum, the probabilities for a large production of oil are good. On the other hand, if the limestone beds have not themselves produced petroleum, and serve merely as storage for oil which has migrated from some outside source, the prospects are discouraging. Most observers consider that marine shale is the original source of the greater part of the world's petroleum, and marine shale is conspicuously absent from the Paleozoic section in south-central New Mexico.

Comparison With Oil Fields of Mexico

Lithologic conditions in southern New Mexico are in some measure analogous to those in the oil fields of the Mexican coast. The Tamasopo limestone of Mexico is an immensely thick series, and enormous quantities of oil have been produced from the upper beds of this formation. The rock itself is not more bituminous than are many of the Paleozoic limestones of southern New Mexico, and it is reasonable to suppose, if the Tamasopo limestone produced the oil which is found in it, that oil may be found in the Magdalena or underlying limestone in New Mexico.

The important question is, Did the oil found in the Tamasopo limestone originate in the limestone itself? Over the Tamasopo limestone in Mexico lies a thick series of marine shales such as produce oil in many regions of the earth. The solution of the question as to the origin of the oil is dependent on determination of whether oil ever migrates downward from a superjacent shale to an underlying porous horizon. Opinion is divided on this subject, and proof, one way or the other, is difficult to establish, but it is certain that evidence of downward migration is rare. Probably the majority of operators believe that the oil found in the Tamasopo limestone originated in the overlying shales, but although this implies downward migration in a stratigraphic sense, it is doubtful whether it also implies downward migration gravitatively. The theory of the migration of oil is in a state of change at present, and many geologists are accepting the conclusion that petroleum does not migrate long distances, either horizontally or vertically, and that, in most instances, it is found not far from where it originated.

If those observers who believe that oil originates only in shales are correct, there is little hope that southern New Mexico will ever produce an oil field. In this region there is no marine shale lying over the limestone, but in its place there is a thick series of "Red Beds," which are not bituminous.

Conversely, if it were definitely known that oil originates in limestones, southern New Mexico would be well worth prospecting. The presence of small quantities of oil in the porous beds at the top of the thick series of limestones in the Pecos Valley has an important bearing on the prospects of the Cordilleran region farther west. If this oil did not originate in the limestone itself, no source for it is evident, and, whatever be its origin, it is reasonable to expect oil at least in similar quantity in south-central New Mexico, where lithologic conditions are entirely comparable.

A number of wells have been drilled in the basins of southern New Mexico, but most of them appear to have been located on acreage rather than on a favorable structure. Tularosa Basin recently has been a favorite haunt of the wildcatter, but as the valley fill is hundreds of feet thick over much of that basin, most of the wildcats are doomed to failure. I have made a rather careful examination of the Paleozoic section in southern New Mexico, but so little bituminous material was found in the rocks that I am inclined not to be optimistic over the possibilities of finding oil in commercial quantities in this region.

Plateau Province Should Prove Productive

In my opinion, the Plateau Province, west of longitude 106 deg. and north of latitude 34 deg., is the most promising region in the State of New Mexico in which to prospect for oil and gas. It is essentially an area of Cretaceous rocks. Pennsylvanian formations outcrop in many places, and Permian and early Mosozoic formations have a more limited distribution, but Cretaceous rocks predominate. When measured over long distances, the sedimentary beds are found to lie flat, or nearly so. Small faults with a moderate throw are numerous, and locally small well-defined anticlines afford excellent collecting areas for petroleum contained in the deformed beds.

If oil is found in the Plateau region it will probably be discovered in Cretaceous rocks, and chances of finding oil in these formations are bright. Great quantities of oil are being obtained from Cretaceous rocks in Wyoming, and the Wyoming Cretaceous is similar in all important respects to the Cretaceous of northwestern New Mexico. The Cretaceous areas in the San Juan Basin and the smaller Cretaceous areas northwest and west of Magdalena are probably the most favorable localities in the state.

The oldest rocks found in the district around Magdalena are Mississippian in age, and they are exposed over only a limited area. The Pennsylvanian formations are similar lithologically to the Pennsylvanian formations east of the Rio Grande, and the probability of finding oil on structures in the Paleozoic in this district is neither greater nor less than of finding it on structures in the Tertiary-filled valleys of south-central New Mexico. The surface of the Plateau is not

everywhere buried under a mantle of Tertiary debris, however, and chances of locating a favorable structure are much better than in the basins to the east and south. The Manzano group is probably considerably thinner than it is in the Rio Grande Valley, and on many structures a well 3,500 ft. deep would test the lower Pennsylvanian and the Mississippian. Operators who wish to test the Paleozoic horizons in this region should devote careful attention to the areas of Pennsylvanian outcrop around Puertecito and Magdalena.

The Cretaceous rocks exposed in the Magdalena district belong to the older formations of the Cretaceous group, no beds younger than Mesaverde probably being present. The rocks are similar to the corresponding formations in the San Juan Basin, and the district where they outcrop should share attention with the Cretaceous areas to the north.

San Juan Basin Worth Investigation

The San Juan Basin region includes the San Juan Basin and a fringe of territory extending on the east nearly to the Rio Grande and on the south to Mount Taylor Mesa and the Zuni Mountains. The northern boundary lies along the San Juan Mountains in southwestern Colorado, and to the west the basin extends into Arizona. The basin comprises the area drained by the San Juan River. In New Mexico this includes a circular area lying immediately west of the Continental Divide, and embraces the whole of San Juan County and parts of Rio Arriba and McKinley counties.

South of Gallup is another small basin, bounded by the Zuni Mountains on the east and drained to the west by Zuni River. This area, known as Zuni Basin, is geologically similar to the larger basin to the north and is commonly associated with it. The combined areas of the two basins is about 140,000 square miles.

The San Juan Basin is a basin both structurally and topographically, and on all sides the formations dip gently inward from the borders toward the centre. In the center of the basin is a broad outcrop of Tertiary rocks, approximately circular in outline, and around the Tertiary in bands of varying width and completeness are the Cretaceous and Pre-Cretaceous formations. Not all of the formations outcrop in complete rings around the Tertiary, but the similarity of the formations to a nest of decreasingly smaller saucers, piled one inside the other, holds. The Pre-Cretaceous formations in the San Juan Basin do not offer great promise of being productive of oil, and although they range in thickness from 1,300 to nearly 6,000 ft., they are of little interest to the oil producer.

The Cretaceous formations, on the other hand, give promise of yielding petroleum and merit careful study. They are commonly divided into five formations, the Dakota, Mancos, Mesaverde, Lewis, and Laramie. The Dakota sandstone commonly consists of a heavy band of sandstone at the bottom, a similar band at the top, with alternating beds of sandstone and shale and some poor coal between.

The Mancos is a marine shale of considerable thickness and wide distribution, similar in many ways to the Benton-Pierre shale series east of the Front Range. In many places the Mancos is very black, and in general is more carbonaceous than the Pierre, although less so than the Benton. Oil is found in many places in the Benton-Pierre series, and under structural conditions favorable for accumulation the Mancos ought to be as promising a primary source of oil as the Benton-Pierre group. In its type locality the Mancos shows no sand. In the neighborhood of Gallup the upper part of the Mancos consists of several hundred feet of alternating beds of sandstone and shale, with some coal, but the main body of the shale below shows no sandy members that can be traced, although lenses are found.

In its type locality on Mesaverde, in southwestern Colorado, the Mesaverde formation consists of a heavy sandstone at the base, a similar heavy sandstone at the top, and between these a thick series of alternating beds of sandstone, shale, and coal. The formation becomes thicker, more arenaceous, and coarser grained as it is traced southward across the San Juan Basin from its type locality, but it maintains the same general lithologic character. The whole series of upper Mancos and Mesaverde sediments indicate rapidly oscillating conditions of sedimentation in the lagoon or littoral zone of the sea in which the beds were laid down.

The Lewis shale is a greenish or greenish-gray sandy shale about 1,000 ft. thick in southwestern Colorado, but less than 100 ft. thick in the central part of the San Juan Basin. The shale is of marine origin, but does not appear to be highly carbonaceous.

The Laramie consists of a series of soft, friable, brown, tan, or buff sandstones and some shale and coal of both fresh-water and brackish-water origin. The Tertiary also consists of sandstone and shale. The rocks are coarse grained, soft, and friable, and have a characteristic greenish-white, greenish, or gray color, with some shade of tan in the sandstones.

If oil is found in the San Juan Basin it will probably be in the Cretaceous formations, because the Pre-Cretaceous formations do not exhibit any of the common evidences of oil, and are too deeply buried over most of the basin. Farther west, in the San Juan River field of northern Arizona, Pre-Cretaceous formations are yielding oil, and the Pre-Cretaceous section of that district merits a closer study than it has yet received.

Character of Prospective Oil Territory

It has been shown that two types of horizons are necessary before an area can be considered good prospective oil territory: bituminous horizons which supply the petroleum, and porous horizons in which the petroleum may be stored. The Cretaceous area in northeastern New Mexico is rich in shale which might be expected to produce oil, but it is almost destitute of storage horizons. The Pennsylvanian area of south-central New Mexico has a wealth of storage horizons, but bituminous oil-producing horizons are unknown. The San Juan Basin does not possess ideal conditions for the production and storage of petroleum, but conditions are more promising there than in any other part of the State of New Mexico.

Included in the Mancos, Mesaverde, and Lewis formations in the San Juan Basin there is from 800 to 4,000 ft. of marine shale, much of it black carbonaceous shale such as is abundantly petroliferous elsewhere in the Rocky Mountain region. The upper part of the Mancos and the Mesaverde together contain from 400 to 800 ft. of sandstone sufficiently porous to form admirable storage for migrating petroleum. Anticlinal structures favorable for the accumulation of petroleum are by no means rare, and it might be expected that, with both shale and sandstone present in adequate amount, oil will be found in commercial quantity under some of the best of these structures.

The chief infelicity in conditions lies in the dis-

tribution of the sandstones, which are all concentrated near the middle of the area, and it has been argued that the Cretaceous of the San Juan Basin will be unproductive, because no continuous and widespread beds of sandstone have been found in either the Mancos or Lewis.

A similar condition exists in Wyoming, where the chief production is obtained from the Wall Creek sandstone member of the Benton. The Wall Creek sand lies above a thick bed of Benton shale similar to the Mancos, and is overlain by an even thicker series of Pierre shale, which does not differ in any essential respect from the Lewis. The sandstone varies in thickness from less than 100 to more than 500 ft., but the best production has been obtained in areas where the Wall Creek is of moderate thickness. The Wall Creek is divided into a number of productive horizons—known in the oil fields as the First Wall Creek, Second Wall Creek, Third Wall Creek—by beds of shale which separate the sandstone beds from one another.

Even a brief examination will indicate that the situation in the San Juan Basin closely resembles that in Wyoming. At the base of the Mesaverde is a bed of sandstone nearly 200 ft. thick and sufficiently porous in most places to form a good storage horizon. A similar sandstone lies at the top of the Mesaverde immediately underneath the Lewis, and separated from the lower sandstone by a considerable thickness of shale. Even if no oil has migrated downward from the Lewis into the underlying sand, the shale serves as an adequate and impervious seal for the possible oil horizons below.

Enough oil has been found in the Mesaverde along the south side of the San Juan Basin to encourage further drilling. The Mancos shale may never have produced large quantities of oil, and the overlying sandstones may be barren, but until this has been conclusively proved by several tests drilled on good structures, I am inclined to regard the San Juan Basin as the best prospective oil territory in the State of New Mexico.

The Boulder, Col., Oil Field

Extensive Exploration of Old Petroleum District Planned—Improper Methods Caused Declining Production—Oil Is of Good Quality

SPECIAL CORRESPONDENCE

THE Boulder oil field, which in 1902 and 1903 was the scene of great activity, and the source of a considerable production during succeeding years, is to be extensively explored during the coming summer by some of the larger oil companies whose geologists have been studying the formations and the records of the old wells.

Oil was first struck in paying quantities in January, 1902, about three miles northwest of Boulder. Following this discovery, the usual excitement incident to the opening up of a new district is recorded. During the year over one hundred wells were sunk in various parts of the county, but most of them in the immediate vicinity of the first well. The wells brought in the first year were all small producers, probably none exceeding 20 bbl. per day.

Oil was struck at varying depths, ranging from a little less than 1,000 ft. to about 2,300 ft. The production the first year was 1,100 bbl. During the following years, until 1908, the production continued to increase. That year the output reached 75,000 bbl. Drilling was carried on extensively, but results seemed to indicate that the producing area was confined to a narrow strip extending parallel with the foothills and comprising a territory about three miles long and one mile wide.

The largest producing wells were found in the northern part of the field, some of them yielding over 100 bbl. daily and one over 200 bbl. daily for several years. Since 1908 there has been a gradual decrease in production, last year the output being less than 2,500 bbl.

Development of this oil field from the start was almost without exception conducted in a haphazard way, with absolutely no regard for the future life of the field. In the absence of legal requirements regarding the plugging or capping of abandoned wells, water was permitted to flood the oil measures, and gas escaped unrestrained, with the inevitable disastrous results.

The oil is of a high grade, with a paraffine base. Bulletin No. 265 of the U. S. Geological Survey says: "The quality of the petroleum from the Boulder field is superior to that of any west of the Mississippi River."

For some time the Midwest Refining Co. has been securing leases on acreage in and adjoining the old producing field, and the company has announced that it will begin sinking a well in the northern end of the old field.

It is the theory of the company's geologists that the oil hitherto produced in this district has been migratory from an undeveloped source. The records of early wells would indicate that this source might underlie the limestone strata encountered in previous wells at about 3,000 ft. It is the purpose of the Midwest company to sink through the limestone formation, where it is believed a more prolific source will be found.

North of the old field, the Frantz Corporation has leased over 3,000 acres in Townships One and Two, and its geologists estimate that the oil strata here will be encountered between 2,200 and 3,500 ft. Both tests to be made this summer are for the purpose of seeking the primary source of the oil found in the old field.

Evaporation of Crude Oil in the Mid-Continent Field*

The evaporation of crude oil causes one of the largest single losses to which the oil is subjected after it is taken from the ground. The few days during which crude oil is stored on the lease before being taken by the pipe line involves an aggregate loss per year from evaporation estimated at 122,100,000 gal. of gasoline in the Mid-Continent field alone. This has a value, at 22c. per gal., of $26,880,000 and represents about 3 per cent of the total gasoline produced in the United States from all fields and all sources.

Companies handling crude oil have always realized that losses take place, but the proportion lost under any given condition has not been even approximately known. Sporadic efforts have been made to determine this loss, but no co-ordinated results have been published. In order to gain some definite information as to the magnitude and the causes of these losses, this problem was taken up at the Bartlesville experimental station and at the San Francisco office of the Bureau of Mines. In a bulletin which will be published soon, the results of investigations at the Bartlesville station will be presented in detail.

*U. S. Bureau of Mines, "Reports of Investigations."

NEWS FROM THE OIL FIELDS

Gulf Production Disposes of Holdings in Somerset Field

Sales in Burkburnett District and Morgan's Point—North Extension of Homer, Louisiana, Field Indicated

From Our Special Correspondent

The Grayburg Oil Co., of San Antonio has obtained an option on all the holdings of the Gulf Production Co. in the Somerset field near San Antonio. The property consists of about five thousand acres in the heart of the field, and on which are twenty small producing wells. In addition, there are rigs, camp buildings and power plant. The consideration, it is stated, is about $500,000. The Grayburg Co. already has over fifty wells on its own ground in this field, making an average production of 10 bbl. daily.

The Texhoma Oil & Refining Co., of Wichita Falls, has filed an amendment to its charter increasing its capitalization from $3,000,000 to $6,000,000.

On the Texas Gulf Coast, a large well was brought in during the fourth week in June, the Morris-Phillips No. 4, at Hull, Liberty County, drilled jointly by the Texas and Gulf Production companies. It came in making an initial output of 4,000 bbl. daily from 2,550 ft.

Two large sales of property in the Burkburnett district have been made recently. The Montrose Oil and Refining Co., of Ft. Worth, has purchased the oil property of the Touman Oil Co., of Okla., in Block 96, Northwest Burkburnett field. There are eight producing wells on this land. A one-half interest in 23 acres in Block 18 was sold by H. P. Pennington to T. O. Shappel for $23,000. This tract is near the Borg-and-Maer well, about two miles south of the Kemp-Munger-Allen discovery well area.

It was announced in Houston that Howard Walker had disposed of his entire holdings in the Walker Oil and Refining Co. to Eastern interests. The refinery is at Morgan's Point, on the Houston Ship Channel, and is in operation. The officials of the company have made no formal statement of changes in ownership or policy. Walker has taken an option on 35 acres above Morgan's Point, and, it is stated, will commence the construction of a 1,500-bbl. refinery in July. This will treat Gulf Coast and Mexican crude oils and manufacture lubricating oils and asphalt.

In the Homer district, Louisiana, six wells were completed on June 25 on the Garrett lease, making a total initial production of 3,950 bbl. In addition to these a new well on the Smith land, two and one-half miles north of the lease, is reported making oil by swabbing. This indicates an important northerly extension of the Homer field.

Deep Drilling Near Old Gainesville Pool, Kentucky

From Our Special Correspondent

An unverified report is current among oil men here that an 800-bbl. well has been found at a depth of 1,900 ft. on the old Jake Moulder lease on the Warren-Allen County line three miles north of the Gainesville pool. This pool was abandoned a year ago after it had produced lavishly from a shallow depth, few of the wells being over 150 ft. deep. Recently the Swiss Oil Corp. began work there, announcing they would drill to considerable depth. Their operations, as usual, have been conducted in secrecy, with a high board wall built entirely around the drilling rig. It is understood they have been successful, one estimate placing the production of the new well at 840 bbl.

Well No. 13 on the George Sledge lease in Warren County has been completed and a test made showing it to be good for 120 bbl. a day. No. 6 on the Willoughby lease a half mile east of the Sledge wells has been completed at 435 ft., 13 ft. under the shale. The well filled nearly to the top, and is reported good for 200 bbl. a day.

In Allen County, Holder & Parker have completed No. 3 on the Brown lease, estimated to be equal to No. 2, which filled two tanks of 250 bbl. each in 48 hours, and is pumping 100 bbl. at the present time.

Peace River Field

From Our Special Correspondent

Following a visit of inspection by W. C. Goffat and Thomas A. Cain of Toronto, to the western properties of the Peace River Petroleums Ltd., it is reported that as a result of the progress made crude oil will be delivered to purchasing companies before the end of the season. At well No. 1 in Peace River town, the operation of enlarging the bore from 6 to 8 in. has progressed for over 1,000 ft. Everything is in readiness to begin drilling at well No. 2 situated 2½ miles below Tar Island. Three new drilling equipments will be operated at Hudson's Hope, the Upper Smoky, and the Lower Smoky. Applications have been received from two Alberta companies for a supply of 20,000 bbl. of crude oil per month. The plans of the directors include the production of both gas and gasoline as well as oil. It is estimated that there is at this time 20,000,000 cu.ft. of gas per day blowing out of the wells in the district and going to waste. As this gas is wet it is possible to separate the gasoline from the gas, leaving a burning gas suitable for light, heat and power purposes. It is proposed to undertake this work and in the meantime a casing-head plant will be installed.

Oil Shipments to Georgia To Be Inspected

From Our Special Correspondent

The Federal District Court has refused the Texas Co. an injunction to prohibit the State of Georgia from inspecting oil shipments and collecting fees on such inspections. It was held that inspection could not be made on shipments of oil to Georgia consumers when delivered in the original containers, but that the state could inspect, and charge, therefore, all shipments for indefinite storage or sold in other than the original packages. If the Supreme Court sustains this decision, the annual fees collectable by the state will be approximately $600,000.

Coast District of British Columbia To Be Drilled

From Our Special Correspondent

There is considerable prospecting for oil and drilling in the coast districts of British Columbia. The oil shales of the Queen Charlotte group of islands long have inclined many to the belief that oil exists there in commercial quantities. George Clothier, resident mining engineer, made a superficial examination two years ago and recommended that a specialist should be engaged to make an inspection and submit a report. Prior to that one or more Canadian geologists had been over some of the ground but their reports were more or less indecisive. A company was organized recently and drilling has commenced near Lawn Hill, Graham Island. It was closed down temporarily owing to labor trouble, but, no doubt, will be resumed as soon as conditions are more favorable. It is announced that a company has been incorporated at Ottawa, known as the British Controlled Oil Fields, Ltd., with a capital of $40,000,000, which will begin an investigation of various Canadian properties. British Columbia oil possibilities will be given attention, it being stated that expert oil engineers are being sent West to look into the conditions on Graham Island.

The Kamloops Natural Gas and Oil Co. has recently been incorporated to prospect and drill for oil in the Kamloops district of British Columbia. Its capitalization is $500,000. The purpose is to undertake the search for and development of possible oil and coal fields.

A commission is to be appointed by the Department of Labor and Industry of Mexico to study the oil problem in conjunction with a commission representing American interests, according to the New York Times. The recommendations of these bodies will probably provide an amicable settlement of the present difficulties.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

MONTANA

Appeals Court Sustains Day and Finley

Judgment for Return of Properties Denied—Defendants Doing Important Development Work

The Circuit Court of Appeals, Ninth Circuit, has affirmed the judgment of the District Court of the United States in the suit brought by the McCaffreys against Harry L. Day, J. D. Finley and others for rescission of a mining contract. The bill alleged failure and refusal of Day to comply with the terms of the contract, and that such refusal by him was arbitrary and in bad faith. The trial court found for defendants, and plaintiffs appealed.

The contract related to the mining property consisting of the Heron lode mining claim, the Cabinet lode mining claim, the Galena lode mining claim and the Cabinet Mill site, situated on Callahan Creek, in the Troy mining district, Lincoln County, Mont. This property belonged to the Big Eight Mining Co., but during 1910 it was leased to R. C. McCaffrey by the company, with an option to purchase for $50,000, deeds therefor being deposited in escrow, to be delivered upon the payment of the purchase price.

McCaffrey was a prospector and miner, and began working the property under the lease, shipping a number of cars of lead and zinc ore. The McCaffreys opened negotiations, through Mr. Finley, vice-president of the Exchange National Bank of Spokane, Wash., with the Grasselli Chemical Co., for the advance of the $50,000 with which to make the purchase, and for development work. But it appears that defendant Day was preferred by Finley, for the reason that he was an experienced and competent mining man, as well as one of abundant means, and the contract sued upon resulted.

Day had been manager of the large Hercules mines. He went to examine the property, and regarded it as a good prospect and agreed with Finley to advance $50,000 to make the purchase, and $50,000 more for development of the mines. The McCaffreys made deeds passing the property from the Big Eight Mining Co. through them to Day and Finley, in the proportion of 51 per cent to Day, 14 per cent to Finley, retaining 35 per cent in themselves. There was an additional contract executed by the parties for the purpose of putting up the money for development. Day and Finley retained an option to purchase the McCaffrey interests, and it was provided that Day, or some person designated by him, should, at all times, have the general management and control of the property.

The McCaffreys insisted that this contract was an essential part of the consideration for the deeds from the McCaffreys, which failed in a material part by reason of Day's refusal "arbitrarily and in bad faith, and not in the exercise of his judgment or of any discretion conferred upon him by the agreement," to advance the money or to do anything required of him thereby, in consequence of which the McCaffreys should have the contract rescinded and reconveyance of the property.

The court found the evidence insufficient to show the contract was part of the consideration for the deeds and that Day acted in bad faith or arbitrarily. Proof shows both Finley and the McCaffreys insisted that he proceed promptly to install machinery and erect a mill. The court said the complete answer to such suggestions was that by the agreement the development and operation was left to the honest judgment of Day. And Day testified to important and necessary preliminary development work. To save heavy costs for the production of power, independently, for mill operation, he had made arrangements for electric power through a near-by friendly operator who had erected a plant costing $350,000. All these things were good and sufficient reason for any delay, and judgment in his favor was sustained.

COLORADO

Ward Recovers Possession of Calamity Lodes

Court Holds That Location Certificate of Nos. 2 and 8 May Be Perfected by Additional Certificate

In the various actions brought by A. H. Ward and another against Andrew Nylund and another, claiming location and ownership of Calamity Lode No. 2, situated in the Blue Creek mining district, in Mesa County, Col., the Supreme Court of Colorado has affirmed the judgment against defendants, who had ousted the plaintiffs and claimed ownership of the ground by location of their Sunrise lode. Dispute over Calamity Lode No. 8 and the Cracker Jack lode has been determined in favor of plaintiffs.

The defendants contended that the original location certificate of Ward and the other did not purport to tie the claim to any natural object or monument, and for such reason was void, and that the additional location certificate correcting the original did not cure the defect. In deciding the question, the Supreme Court of the state held that an imperfect certificate was not void, but that when it is amended it has full life, the amendment taking effect with the original.

WASHINGTON

Relocation Notice Must Cite Facts

Newport Mining Co. Wins Suit Against Bead Lake Gold-Copper Mining Co. — Abandoned Property Not Properly Relocated

The Supreme Court of Washington has affirmed judgment in favor of the Newport Mining Co. in its action against the Bead Lake Gold-Copper Mining Co. These parties were rival claimants to a tract of mining ground located in the Newport mining district, in Pend Oreille County, Wash. The former company claims the Snowbird mining claim, which overlaps to the extent of about three acres the Comstock Fraction lode mining claim, owned by the latter.

The Newport Mining Co. claimed the right to the disputed territory under a relocation notice dating from April 25, 1907, and through having held adverse possession, doing the annual assessment work for a period of more than eleven years. The rival company claimed under a location notice of prior date, and under an amended and relocation notice that had been issued under date of Oct. 24, 1914.

The court said that a location notice which fails to recite that the property is located as abandoned property does not comply with the statute requiring that, when quartz or lode mining claims are located as forfeited or abandoned property, the location certificates shall state if the whole or any part of the new location is located as abandoned property; and that such notice is therefore invalid and insufficient.

Both parties were at fault in this regard, and the Newport company's contention was upheld through its claim of adverse possession of eleven years.

OREGON

Powder River Gold Dredging Co. Again Denied Redress

For the third time the case of Thomas Bessler against the Powder River Gold Dredging Co. has been brought before the Supreme Court of Oregon and the judgment in favor of Bessler upheld.

Plaintiff brought this suit to recover possession of three acres of land, claiming title by having held adverse possession for ten years. In a supplemental complaint he alleged that since the commencement of the action the gold-dredging company wrongfully entered upon the land, dredged and mined therefrom all the gold deposits, and entirely destroyed the property. Damages of $15,000 were awarded Bessler.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Production Must Be Increased by Preventing Accidents

Standardized Methods Efficient—Accidents Prevent Regularity—Safety Inspection Saves

At the meeting of the National Safety Council in Chicago recently, Sidney J. Williams, secretary and chief engineer, addressed the Engineering Section on the subject "How Can We Increase Production?" He spoke in part as follows:

"Production depends primarily on two factors—machines and men. Production also requires materials and capital; but machines and men are the immediate producers. They and they only can increase or decrease production. The things that cause them to do the one or the other are the things that we must study.

"The basis of modern production, with respect to both machines and men, is standardization. But we do not stop with standardizing machine operations. We standardize also the operations of men. The motion study specialist determines the one best way to do a job, and we find that by following his method we not only increase production but we decrease fatigue. Anything which interferes with absolute regularity of operation is inefficient and uneconomical, and it is one of the chief functions of the engineer and the executive to hunt out these disturbing influences and eliminate them.

"The things which thus interfere with regular production are many and varied. Some of them are external to the plant itself—such as a war, or a nation-wide strike, or a railroad tie-up. The prevention of these is largely a function of government.

"Then there are catastrophes within the plant: a strike, a disabling fire, a break-down in the power plant. Everyone knows that it is the function of management to prevent such occurrences and that a management which does not in general prevent them cannot be permanently successful.

"Then there is a third group of apparently minor disturbances. A laborer pushing a truck strikes an uneven place in the floor, a casting falls off the top of the load, and a resulting chain of delays wastes twenty minutes of the shop's day. The up-to-date foreman realizes that when his laborers each lose twenty-five cents' worth of time a day it is up to him not to bawl them out for it but to find out what is wrong and correct it. The superintendent and higher executive officers also must supply what the foreman may lack in this regard.

"In machine operations it is even more obvious that regularity is the essence of modern production. The greater part of present losses is positively preventable through the use of simple and inexpensive automatic or semi-automatic devices for placing and removing the material. The fact is that, with comparatively few exceptions, even in the most efficient plants, we have not had time to study these little things—the castings falling off the truck, the material sticking to the punch press—causing in the aggregate a loss running undoubtedly into many millions of hours and many millions of dollars. Modern production is built absolutely on standardized regularity of operation, and anything which happens unexpectedly, whether it is a coal strike or a casting falling off the truck, or other accident, is bound to interfere with our regular program and therefore to cut down our production.

"Some of the 'accidents' which I have mentioned result in personal injury. From the standpoint of the man interested only in production, the accidents which happen to injure someone are no more and no less important than those which do not. It is true that from other standpoints the accidents causing personal injury are much more important. No engineer or executive living can afford to say 'I am not interested in accident prevention' unless he is willing to say 'I am not interested in efficiency.' Every accident is an indication that there is something wrong with men, methods, equipment, or material. Those which cause injury have for the engineer a peculiar importance, because they serve as danger signals to warn him of the inefficiency that is undermining his output.

"The manager of one of the largest paper mills included in the membership of the National Safety Council once said to me, 'Before we had a safety committee, every little while we would have to shut down our machines because of a belt breaking or something of that sort. Now our safety inspection catches these things before they happen, and we have no more shutdowns. Our safety work has more than paid for itself through the increase in production, aside from cutting down our compensation costs.'

"On the human value of safety, I leave each of you to judge for himself. The rough-shod methods of American industry a generation ago, which left a trail of human wreckage, were not only inhuman—they were inefficient. They and the men who stood for them are gone on the scrap heap, and will never return."

Six hundred graduates and undergraduates of the Missouri School of Mines entered active service during the great war, 38 per cent of them going across. Nine made the supreme sacrifice.

Handling Explosives Underground and in Open Pits

Misfires, Lightning Risk and Liquid Oxygen Discussed

An address on "Safe and Dangerous Practices in the Use and Care of Explosives Underground and in Open Pits," was made by S. P. Howell, explosives engineer, U. S. Bureau of Mines, at the second annual meeting of the Lake Superior Prevention of Accidents Conference, held at Duluth, Minn., on June 24.

Mr. Howell stated that accidents due to explosives are not frequent, but include a high fatality rate which is due to the fact that many accidents claim two or more victims. In setting forth some of the precautions to be observed in the storage, handling and use of explosives and blasting supplies, he dealt in particular with the following:

1. How should misfires be handled?
2. Accidents due to lightning setting off explosives.
3. Liquid oxygen explosives.

In addition, the necessity for well-ventilated storage magazines, situated at prescribed distances from buildings, roads and railroads; proper practice in transportation of explosives, and the correct manner of charging and firing blasts were emphasized.

The name, "liquid oxygen explosive," is applied to a mixture of carbonaceous and absorbent materials with liquid oxygen, and the whole partly enclosed in a heat-resisting cartridge. The carbonaceous material may be crude oil, petroleum, paraffin, charcoal, cork dust, coal dust, wood pulp and many other substances. All of the carbonaceous materials mentioned, except coal dust, crude oil, petroleum and paraffin, are also absorbing materials, but the most efficient material for its absorbing properties alone is diatomaceous earth (kieselguhr), and it is a non-combustible material.

Liquid oxygen is produced in a special apparatus, the units of which may be small, is transported in spherical shaped, double-wall containers, the space between the walls being a vacuum and the materials of construction of brass.

The Germans used liquid oxygen explosives extensively in non-gaseous coal mines, quarries, iron mines, as well as for destructive purposes in French steel plants, and installed equipment for the production of liquid oxygen at several Lorraine minette iron ore mines. In Bureau of Mines Technical Paper 243, "Development of Liquid Oxygen Explosives During the War," George S. Rice has reviewed the literature and the results of a number of tests made at the Pittsburgh Experiment Station.

Low Prices of Copper and Zinc Part of the General Post-War Trend

Recent declines in the prices of a few commodities are not to be regarded as isolated instances, but are part of a gradual and general movement that has been under way for a considerable time, the National Bank of Commerce in New York says in a discussion of current business conditions. The statement continues:

"It has generally been conceded that prices would ultimately seek a lower level than that maintained during the war and immediately thereafter. Such decline has always followed the overstimulation of commerce and industry produced by war. Under these circumstances, a downward price movement, if gradual and orderly, is to be welcomed, both as an evidence of the return of more orderly conditions and as a factor in accomplishing that return. Such a movement in the prices of basic commodities is now clearly evident. Sharp recent declines in a few commodities, however, are likely to cause the business public to lose sight of the fact that in a number of other commodities a gradual decline has been under way for a considerable time. The prices of copper and zinc have been at low levels ever since the armistice."

Ainsworth Mining Camp, B. C., Surveyed and Described

"Geology and Ore Deposits of Ainsworth Mining Camp" is the title of a well-illustrated report by S. J. Schofield, just issued by the Canadian Geological Survey. The area covered is about fifteen square miles, bounded by Woodbury Creek on the north, Coffee Creek on the south, Kootenay Lake on the east, and the contact between the sedimentary rocks and the Nelson granite on the west.

Despite poor transportation over tortuous trails and roads in the early days, this camp, since 1896, has produced more than 100,000,000 lb. of lead, 5,000,000 lb. of zinc, and 6,000,000 oz. of silver. Prior to 1909 the zinc was not only not saved but was considered detrimental to the ore.

Mr. Schofield finds two classes of ore deposits in the Ainsworth camp, namely, true fissure veins, and replacement deposits in limestone. Most of the silver-lead deposits are associated with the limestone bands in the Ainsworth and Slocan series, although some of the important mines are in the schists, and others are in quartzites. The ores consist of galena and zinc-blende, associated with pyrite, pyrrhotite, occasionally chalcopyrite, and, in the Highland, marcasite, in a gangue of calcite, siderite, quartz, and fluorite. The fissure veins and replacement deposits are held to be contemporaneous.

A colored geological map, a contour map on a scale of 2,000 ft. to the inch, and sixteen colored diagrams showing the underground workings and local geology are in a pocket at the end.

Developments in Lake Superior Copper Mining Practice

"The outstanding feature of the situation in the Michigan copper district is the fact that the market price of copper is insufficient to more than barely meet operating costs, leaving nothing with which to meet depletion, depreciation, etc., or to attempt a much needed program of mining development, exploration or new territory and improvement in mechanical equipment." This statement was made by Ocha Potter of the Calumet & Hecla Mining Co., in a paper read by him at the second annual Lake Superior Safety Conference, held at Duluth, Minn., on June 25.

A careful analysis of conditions, said Mr. Potter, leads to the inevitable conclusion that leaving aside the question of the decrease in the selling price of copper, the best chances for remaining a factor in the business of producing copper lie in the possibility of the economy and greater production due to improvement of underground methods.

The greatest improvement during the last ten years was the development of the so-called one-man drilling machine. The co-operation of the Calumet and Hecla underground organization and the Ingersoll-Rand Co. in 1911 and 1912 resulted in the almost complete abandonment of the use of reciprocating drills and solid drill steel, and the substitution therefor of the various types of the so-called hammer drills and hollow drill steel that has followed. Had the efficiency of the drilling machine runners been as low in 1918 as it was in 1912 with the old-type piston drill, approximately 3,000 more miners would have been required in the district in order to secure the production which was finally obtained. Stope miners of the Calumet and Hecla mines produced 11.42 tons per man per shift in 1912, at a cost of 35c. per ton for supplies and labor. In 1919, this same class of labor produced 26.29 tons per man per shift, at a cost of 34c. per ton, with an increase in wages and supplies of over 100 per cent.

The following is a brief summary of Copper Country methods with respect to drilling practice: Drilling machines are of the mounted hammer type, using water, and weighing from 125 to 150 lb.; hollow hexagon drill steel of ⅞-in. and one-inch diameter is almost universally used; bits are of the Carr type, either single or double; maximum length of drill steel varies from 10 ft. to 16 ft.; air pressure varies from 70 lb. to 100 lb.; most of the mines pipe water for drilling purposes directly to the machines, the water lines being laid with the air pipes; ammonia explosives are used almost entirely, and for stoping purposes 40 per cent to 45 per cent is most common. Some of the mines make a practice of using 60 per cent powder for drifting and shaft sinking.

Haulage practice includes the use of trolley locomotives, rope haulage and storage battery locomotives. As far as practicable large cars have been adopted and these dump directly into the skip by means of air lifts.

The use of chute loading from stopes has become general with the adoption of larger cars. Mr. Potter states that probably 60 per cent of all ore hoisted at the present time in the district is loaded by means of some type of chute or high collar.

Several of the mechanical loaders now on the market have been tried out but with little success, owing to the fact that the limited tonnage available at any one level makes a large expensive machine impracticable, while the coarseness of the broken ore is such that the smaller types cannot handle it.

Slushers of various designs are being given an extensive trial and they appear to be successful in high, flat stopes, where the broken ore will not run freely to the level.

The practice of exercising close supervision over the drilling of the individual holes in the ordinary process of stoping has resulted in an increase in the average recovery of the rock mined and it is probable that better results may be obtained by a more rigid application of this method.

Contract prices and bonus requirements have been the subject of careful study and today practically all mining and tramming is done either on a contract or bonus system, the old Cornish fathom basis for stoping contracts being abandoned in favor of the ton. For drifting the foot of drift is, of course, the unit and for tramming, the pay is usually based on the number of cars filled.

It is an interesting observation that the fact that conditions in the copper industry are unsatisfactory, has led to a closer co-operation among the engineers and executives and this may prove somewhat of a blessing in disguise. There are enormous tonnages of low-grade copper rock just as there are of low-grade iron ore, which may some day be made available through an application of some of the methods now being evolved by the pressure of stern necessity.

Officials Start Federal Club in Washington

Over a hundred members of the Government service who are in responsible administrative and technical positions met on June 17 and perfected a tentative organization which is to be known as "The Federal Club." The purpose of the organization is to care for many of the general service problems which are common to several departments by facilitating interchange of views, and, where appropriate, by joint action. Franklin D. Roosevelt, Assistant Secretary of the Navy, and Democratic nominee for Vice-President, is the chairman of the temporary body and Dr. E. B. Rosa, chief physicist of the Bureau of Standards, is chairman of the committee on organization and constitution.

Among the problems suggested for the action of the club are: Classification and salaries of the technical services of the Government, and budget matters affecting the executives of the various bureaus.

Book Reviews

Sources of Industrial Potash in Western Australia. By Edward S. Simpson, I. H. Boas, and T. Blatchford. Western Australia Geological Survey, Bull. No. 77, 46 + VIII pages, 2 plates, 4 figures, 8¼ x 5½ in. Perth, 1919.

A definition of terms and a brief account of potash as a plant food and its minor uses is followed by a review of the pre-war sources of world supply. This discussion of well-known data is introductory to Part III, devoted to the sources of potash in Western Australia. Wood ashes, it is pointed out, constitute a potential source of considerable potash, but no recovery has yet been attempted. Pegmatite feldspars (microcline) are also abundant, and have a K_2O content of 10.65 to 12.56 per cent. A large deposit of glauconite occurs at Gingin, but its low content of K_2O (2 to 3 per cent) discourages its utilization. A rather unusual source of supply noted by the author consists of the minerals jarosite and natrojarosite, which occur in sufficient abundance to promise a commercial source of potash. The potash is rendered soluble by roasting, and the iron residue may be utilized as a pigment. Alunite and natroalunite are possible sources.

In Appendix I analyses are given of kelps found on the coast of Western Australia. Calculated on the basis of dry matter in the weeds, the potash content varies from 2.81 to 7.97 per cent being somewhat poorer in potash than American kelps and about equal to those in Scotland. The Australian kelps are, however, comparatively rich in iodine.

Appendix II is devoted to a description of the alunite deposits of Kanowna. The mineral occurs in horizontal or flatly-inclined veins, varying from mere threads to two feet in thickness. The potash content varies from 3.1 to 9.3 per cent. That the material is present in commercial quantities still remains to be demonstrated. O. B.

Final Report of the Munition Resources Commission, Canada. By Thomas Cantley, chairman. 7 x 10; cloth; pp. 260. Published by the Canadian government.

This commission was formed to enquire into the supply of raw materials in Canada required for the production of munitions of war, and the best methods of conserving them. The subjects covered include 25 pages on aluminum, 47 on manganese, 29 on molybdenum, and 60 on platinum. The chapter on aluminum is devoted to a description of the field work carried on in British Columbia, and is beautifully illustrated. No bauxite deposits have yet been discovered in Canada, but the work done shows attractive possibilities for the future. Chromium deposits in the Black Lake district of Quebec are described briefly. Magnesite deposits near Grenville, Que., offer attractive possibilities if developed. Canadian magnesite has a high lime content, but shippers can turn out a product containing 85 per cent $MgCO_3$ with less than 13 per cent CaO, which has been found to be satisfactory for furnace linings. The numerous manganese deposits are carefully described. The bog ores found in New Brunswick are of particular interest.

Canada was of considerable prominence as a producer of molybdenum during the war. In 1918 she produced about 15 per cent of the world's supply, as did Norway and Australia, the United States producing a little over 50 per cent. Deposits have been found in Ontario, Quebec, British Columbia, and Nova Scotia. The first two named are of most importance. The possibilities of British Columbia as a platinum producer are discussed in considerable detail, and those interested in this metal will find some of the remarks particularly illuminating. No important tungsten developments have been made since the publication of Dr. Walker's bulletin on the subject in 1909.

An appendix to the book contains an interesting article on the planning and cost of construction and operation of an electrolytic copper refinery with a capacity of 50,000 tons per year. This refinery was never built. The result of an investigation of Nicu steel is also given.

The commission has produced a highly creditable report. E. H. R.

The Magnesite Deposits of Bulong, Northeast Coolgardie Goldfield, by F. R. Feldtmann. Western Australia Geological Survey, Bull. No. 82. 38 + VIII pages, 7 figures, 2 maps, 8¼ x 5½ in. Perth, 1919.

In the introduction a brief history is given of developments in the magnesite deposits of Western Australia, where chief activity dates from 1913. A description of the properties and uses of magnesite is followed by a discussion of the magnesite deposits of other countries, but no reference is made to the deposits in the State of Washington, U. S. A. Australian production in 1917 included over 9,000 tons from New South Wales, and nearly 200 tons from Victoria. Small deposits exist in Queensland, Tasmania, and South Australia. Although magnesite occurs in several localities in Western Australia, particular study was given to that in the Bulong area.

The magnesite is associated with greenstones, porphyries, and breccias, and is confined chiefly to an area about 2¼ miles long and covering about 359 acres. The mineral occurs in serpentine in the form of irregular veins varying from mere threads to a maximum width of two feet. In certain decomposed areas the veins are sufficiently numerous to occupy a greater volume than the enclosing serpentine. Hand picking of the rock would probably be necessary. The magnesite is comparatively free of lime and contains moderate amounts of silica and iron.

Present development is confined to three quarries and several test pits. Total production from 1914 to the time of writing was about 1,344 tons. No attempt is made to estimate the extent of the deposits except the general statement that a large tonnage of material carrying 90 to 95 per cent magnesium carbonate evidently is present. O. B.

Technical Papers

Sand Dune Tunneling—A paper, "Tunneling in the Sand Dunes of the Belgian Coast," by Capt. H. Tatham, published in the *Bulletin of the Institution of Mining and Metallurgy* for May, 1920, (1, Finsbury Circus, London, E. C. 2) outlines the methods used by English army engineers during the war for the purpose of establishing numerous observation posts in the described sections. The dunes in which the excavations were made consisted of dry sand, so that although the actual excavating entailed little work, considerable care was required in timbering and otherwise keeping the workings open. The caisson method and the spiling system, both of which are described, do not differ greatly from methods in general use, but the description of the sinking of "elephant" shelters, or trench cupolas, includes some interesting differentiation from regular tunneling practice.

Mining Education — The Federal Board for Vocational Education, Washington, D.C., has issued Bulletin No. 38, 168 pages, entitled "General Mining" (free). More than a million men in the continental United States are employed in mines and quarries. Many of the jobs require specialized knowledge to secure the best results. This book is an interesting résumé of what is being done and what should be done to educate those who expect to make their living in the mining industry.

Assaying Chrome Ores and Brick—The American Society for Testing Materials, 1315 Spruce St., Philadelphia, has issued a "Report of Committee C-8 on Refractories," which contains the details of a tentative method for the ultimate chemical analysis of chrome ores and chrome brick. Criticisms of the method are invited.

Government Control Over Prices. By P. W. Garrett. Published as W. I. B. Price Bulletin No. 3, by the War Industries Board, Washington, D. C. Paper, pp. 834, 5½ x 9. This voluminous book sets forth the complete history of prices during the war. It will be chiefly of interest to statisticians and to students of the subject covered.

Mine Dust—The U. S. Bureau of Mines in its *Reports of Investigations* for May, issued a 7-page mimeographed pamphlet on the method of collecting and examining samples of dust-laden air from metal mines.

MEN YOU SHOULD KNOW ABOUT

J. Leonard Replogle, president of Replogle Steel Co., sailed for England on July 1.

E. R. Bennett, of the Tonopah, Nev., School of Mines, will spend the summer in professional work.

Bruce White is at the head of a geological party that will do oil work in central Montana this summer.

Geo. R. Koik, has been examining silver properties in the Lordsburg, N. M., district for Arizona capitalists.

A. E. Fath has been assigned to oil and gas geologic work in the Lost Soldier and Ferris mountains of Wyoming.

Edwin E. Chase, of Chase & Sons, mining and geological engineers, Denver, Col., is in Wyoming on professional work.

Roy Hatch, mining man of Juneau, Alaska, has returned to Salt Lake City, Utah, after a four years' absence in the north.

George E. Easley, mining engineer, of La Paz, Bolivia, was in New York on June 26, on his way home to Lee Summit, Mo.

Bruce C. Yates, superintendent of the Homestake Mining Co., at Lead, S. D., is in New York City on company business.

John Kiddie, division superintendent of the Arizona Copper Co. has returned to Clifton, Ariz., much improved in health.

R. C. Wells, of the U. S. Geological Survey, will examine the deposits of natural soda in Western states during the summer.

C. E. Van Orstrand will devote the remainder of the summer to observing deep-well temperatures in the oil fields of various states.

A. E. Sargent, formerly superintendent of the Mogul Mining Co., Terry, S. D., has accepted the position of general superintendent of the Akron mines, White Pine, Col.

F. G. Cottrell, director of the Bureau of Mines, has been designated to succeed Van. H. Manning as a member of the Interdepartmental Defense Board of the Council of National Defense.

Lewis G. Westgate will spend two months studying the gold lodes recently discovered on the Alaska side of the international boundary in the Portland Canal region of southeastern Alaska.

Edward Sampson will continue J. S. Diller's work on the asbestos deposits of the Apache and San Carlos Indian reservations. Mr. Diller is now able to resume his office duties at Washington, D. C.

Charles Butts has returned from a field trip to the Appalachian valley, where he has been gathering paleontologic and stratigraphic data for the better correlation of the Mississippian and Devonian formations of eastern Kentucky.

Clive Seymour Newcomb, metallurgical engineer, has resigned his position with the Dorr Co., to become consulting engineer with the Mutual Chemical Company of America and, the Phosphate Mining Co. His address is No. 55 John St., New York city.

George Otis Smith, director of the U. S. Geological Survey, has been given the honorary degree of LL.D. by his alma mater, Colby College, Waterville, Me. The degree was awarded in recognition of his services as Director of the U. S. Geological Survey.

ELMER ALLEN HOLBROOK

Elmer Allen Holbrook, who succeeds Dr. F. G. Cottrell as Assistant Director of the U. S. Bureau of Mines, is a native of Pittsfield, Mass., and a graduate in mining engineering of the Massachusetts Institute of Technology. Prior to his graduation in 1904 he worked in mines in Montana and was a member of one of the locals of the Western Federation of Miners. Mr. Holbrook's first position after leaving college was as sampler and underground surveyor with the Standard Ore Co. in Montana. After serving as superintendent at Zortman and at Gould, Mont., he was made general superintendent of the Daly Reduction Co., at Hedley, B. C., in 1907 when the Daly company was the largest gold producer in the Dominion of Canada. After three years with this company, Mr. Holbrook took up general practice and also for a time was in charge of the Mining Department of the Nova Scotia Technical College. In 1913 he became associate professor with the mining department of the University of Illinois and remained until 1917, when he was made supervising mining engineer of the U. S. Bureau of Mines in charge of the station at Urbana, Ill.

Mr. Holbrook was acting chief engineer of the Bureau of Mines during the first half of 1919. In July of that year he was made superintendent of the Pittsburgh Experiment Station, and had been in charge of that work until called to Washington to assume the duties of assistant director as of July 1.

Guy C. Riddell, consulting metallurgist, formerly in charge of metallurgical and mining problems for the U. S. Tariff Commission, is now secretary and consulting engineer of the Wah Chang Trading Corporation, 233 Broadway, New York, N. Y.

Alfred H. Brooks will accompany the Secretary of the Navy and the Secretary of the Interior on their Alaskan trip. Dr. Brooks will not return with the Secretarial party, but will remain in Alaska to do geologic work in the Prince William Sound region and in southeastern Alaska.

J. P. Buwalda, of the staff of the U. S. Geological Survey, has been assigned to the co-operative work with the Idaho State Bureau of Mines and Geology in the study of the Tertiary basins of the western part of that state. He will give particular attention to the areas more favorable for the occurrence of oil and gas.

F. H. Newell, head of the department of civil engineering, University of Illinois, Urbana, Ill., has been appointed director of field forces by the directors of American Association of Engineers. Dr. Newell is also delegate from A. A. E. to the Great Lakes-St. Lawrence-Tidewater Congress meeting at Detroit, Mich., July 22-24.

OBITUARY

Judd Stewart, of the accounting department, American Smelting & Refining Co., died July 3 in his 54th year, at Watkins Glen, N. Y.

John Albert Percival, a former president of the Consolidated Interstate-Callahan Mining Co., died suddenly of apoplexy at the home of Fred E. Stillman in Bridgeport, Conn., on July 4. Mr. Percival was a native of Jericho, Vt., and will be buried there.

Thomas Sneddon, superintendent of the Anaconda Copper Co.'s mines at Diamondville for the last 21 years, died suddenly from an aneurism at his home in Diamondville, Wyo., on June 3.

Mr. Sneddon was born 64 years ago in Scotland, and had been identified with coal mines about 54 years. Forty years ago, Mr. Sneddon brought his family to this country and settled at Almy, Wyo. In 1893 he went to Diamondville and in 1898, when the Anaconda Copper Mining Company bought out the Diamond Coal & Coke Company, Mr. Sneddon was kept on as mine foreman. He was made superintendent in 1899. Mr. Sneddon was a leader of men, fair and impartial in all his dealings and of unquestioned integrity. The Anaconda company has lost an official whose place it will be hard to fill.

THE MINING NEWS

LEADING EVENTS

U. S. Mining Experiment Station In Colorado Ousted

Action of State Officials Causes Indignation—Station May Be Moved To Nevada

The Golden Experiment Station of the Bureau of Mines has been forced to move from its quarters in the Colorado School of Mines by the action of the school board. No notice of the intention of the school to remove the station was given until a few weeks ago when the board paid a visit to Dr. Lind, superintendent of the station, and inspected the whole building. Dr. Lind states he thought it was simply a friendly official visit such as had never been made before. It was only on leaving that a member of the board intimated that they would probably need some of the space in the building for the new courses in chemical, electrical, mechanical and civil engineering which had been decided upon.

It seems that the Bureau of Mines had a contract with the school for the space which they occupied on the school grounds and that this contract expired July 1. Regarding the renewal of the contract, the school trustees took the stand outlined as follows:

Superintendent U. S. Bureau of Mines,
Golden, Col., June 11, 1920.

Dear Sir:

At a meeting of the board of trustees held this day, it was decided that the contract between the Bureau of Mines and the Colorado School of Mines would not be renewed with the inclusion of the use of Engineering Hall. We shall be very glad to renew the contract, offering you the use of our metallurgical research plant for your headquarters to be used in conjunction with the Metallurgical Research Department.

Prof. Low will confer with you and arrange the details so that the vacating of Engineering Hall will discommode you as little as possible.

Very truly yours,
I. A. PALMER, Acting President.

The contract which was sent over to Dr. Lind and which the board stated they would approve involved moving to the Experimental Mill, a building unsuited to the requirements of the station, and further specified that all work done by the Colorado Station of the Bureau of Mines would have to be done in Golden. It is believed that the latter clause was prompted through the jealousy of the School of Mines toward the University of Colorado, the institution at which the U. S. Bureau of Mines has been conducting its oil-shale investigations, fostered by appropriations made by Governor Shoup.

The U. S. Bureau of Mines at Washington, D. C., has decided to move the Colorado station, and the Colorado School of Mines officials, notably Dr. Alderson and the board, are being sharply criticised for their summary action. Colorado loses a valuable experiment station by this action—one that expends about $150,000 annually in the interests of mining research in the state, particularly in complex and rare ores. The station is being taken out of the State of Colorado entirely and will be moved to some other locality, where the work will be more welcome. It is very likely that Reno, Nev., will be the place of transfer. Reno has offered to float $30,000 of State Bonds in order to erect a building for the Nevada Bureau of Mines Station. It is a good location for the continuation of the rare-metal work initiated in Colorado.

The mining men of Colorado have resented the action of the School Board and severely condemned the body for the action which it has taken in forcing the Bureau elsewhere.

WEEKLY RÉSUMÉ

The Golden Station of the U. S. Bureau of Mines has been ousted by the action of officials of the Colorado School of Mines, and will be moved to another state. The American Bankers' Association, in a report just made, opposes the McFadden Gold bill as inimical to the gold standard. An investigation has disclosed that Salt Lake Valley smelter smoke is not a factor in the local smoke problem. The Desert Power & Water Co., of Kingman, Ariz., has asked for an increase in its rates on the plea of higher costs. A continued car shortage is hampering iron-ore shipments in the Lake Superior district. The Interstate Commerce Commission upholds freight rate increases that were contested by the Anaconda Copper Mining Co. and others. The War Department will furnish aeroplanes for Alaskan survey work by the U. S. G. S. Plans are being perfected for North Atlantic seaboard power survey. The progress of new mining legislation is outlined in this week's pages.

The bill now before the Ontario Legislature to amend the Workmen's Compensation Act, and which it is expected will pass, will raise the rates of compensation for injuries to 66⅔ per cent instead of 55 per cent as at present. Pensions will also be increased and in the case of widows will be made retroactive to the commencement of the present act. An attempt was made to have the retroactive feature apply to all pensions, but the labor members were unable to get this through.

Gold Miners' Bonus Opposed

American Bankers' Association Says McFadden Bill Would Menace Gold Standard

The McFadden gold bill has been studied by a committee appointed by the American Bankers' Association for that purpose, and a report made public expressing the unalterable opposition of the committee to the legislation favoring a bonus of $10 per ounce on newly mined gold. The committee consists of George M. Reynolds, Lawrence E. Sands, and A. Barton Hepburn, who state that one objection to the McFadden bill is the possibility of fraud being practiced upon the Government through the difficulty of distinguishing virgin gold from old gold melted down. "Gold which differs from other gold merely in having a special history, and which, by virtue of that special history rather than its intrinsic qualities, commands a high premium, presents an anomaly inconsistent with the normal functioning of a free gold market and the normal functioning of the gold standard. The temptation to manufacture history instead of mining gold would be very great.

"Again, the provisions in the McFadden bill introducing the index number of commodity prices as a basis for fixing the rate of taxes on gold manufacture and of premium on gold mining constitutes an opening wedge for the general introduction of the index number as a standard of value in the United States in accordance with Professor Irving Fisher's plan for 'stabilizing the dollar.' It is beyond the province of this paper to deal with that plan in extenso. Your committee believes in the gold standard and does not believe in tampering with it or interfering with it in the present critical condition of the world's monetary affairs. There is, moreover, another committee of the American Bankers' Association which is to make a detailed report upon the project. We shall content ourselves for the present with pointing out that if this index number standard is to be adopted it should be considered on its own merits and not introduced 'by the back door' as a feature of the McFadden bill.

"The greatest objection of all, however, lies in the danger which this measure would involve for the gold standard itself. Nearly all of the European states are on a paper basis. Only a few of the smaller countries of Europe are even approximately maintaining the gold standard. The United States, par excellence, and Japan as well, stand out conspicuously as nations

maintaining the gold standard. All the world believes that our dollars are as good as gold. All the other nations of the world are struggling and hoping to get back to the gold standard. We enjoy a proud pre-eminence in this respect, and it should be zealously guarded and maintained. The belief which obtains in the world today that our dollars are as good as gold must be maintained. The whole world must be convinced that money can be deposited in this country at any time and withdrawn at any time in any form which the depositor may elect.

"Increase of gold mining will return with normal conditions. It must not be forgotten, however, that part of the automatic working of the gold standard depends upon an increase in gold production when prices are low and upon a decrease in gold production when prices are high. Increased gold production in a period of low prices and low costs makes it easier for prices to rise again, while diminished gold production in periods of high prices and high costs tends to reduce prices and costs again.

"Moreover, the industrial consumption of gold tends to increase in a period of high prices, since the price of gold does not rise as other prices rise, while in a period of low prices the prices of gold manufactures are relatively high, and purchases of gold manufactures consequently tend to diminish. Variations in the consumption of gold thus also work toward diminishing the supply of free gold when prices are too high, and toward increasing the supply when prices are too low, thus tending to correct both the rise and the fall of prices. In this feature of gold production and consumption we have one of the stabilizing factors in the gold standard. The McFadden bill proposes to strike at this automatic regulator and corrective. It would aggravate the very conditions which it seeks to remedy."

Utah Deposits To Be Utilized for Paints

The Mineral Paint Products Co. has been organized and will take over the holdings and business of the Utah Wall Tint Co. Directors and officers of the new company are Michael Morrissey, president and general manager; Jacob Karlen, Jr., treasurer and vice-president; Canute Peterson, secretary and general manager. The capitalization of the company is $300,000, divided into 300,000 equal shares.

The new corporation will operate a four-story factory situated in North Salt Lake near the Utah Oil Refining Co. plant, and will secure their raw materials from the deposits of talc and red iron oxide near Clear Lake, Millard County. The talc is used in making calcimines, chalks and paints. The red oxide is used for making mineral paints. Both of these deposits, which are but a short distance from the Salt Lake & San Pedro railroads and which are easy of access, can be worked at a small expense on a large scale.

Smelter Smoke Diffused Before Reaching City

Engineers' Investigation Finds Smoke Nuisance Attributable to Local Causes and Not to Smelters

That smoke from Salt Lake Valley smelters is not a factor in the smoke problem, which confronts Salt Lake City in the winter months is announced by the U. S. Bureau of Mines, which, in co-operation with Osborn Monett, a fuel engineer of Chicago, has been investigating the smoke situation here. Smoke from the smelters is diffused before it reaches this city, and so the problem becomes a purely local one. The problem here differs from that in other places inasmuch as the topography of the region enters largely into the question. Smoke clouds are held fast in the valley between the mountains in the winter time, unable to escape owing to the low velocity of the wind at that season. Smoke from furnaces starting before daylight, and in most places dispelled in the early morning hours continues to hang over the city, when the smaller plants and household furnaces are starting up. The first step toward betterment recommended is the elimination, as far as possible, of this particular blanket of smoke,—by better firing methods, the elimination of out-of-date and run-down plants, and the introduction of smoke-reducing apparatus. The problem is largely one of education, and the investigators state that if their recommendations are followed the nuisance will be largely reduced in two years. The yearly cost of this work is estimated at $15,000.

Car Shortage Hampering Iron Ore Shipments

The coal situation in the Lake Superior districts is much better than it was, but the mine operators are proceeding cautiously in order that fuel may be conserved. The Oliver Iron Mining Co. stopped all stripping on the Mesabi range and is only operating those shovels which are working in ore. The ore loading is not going ahead very rapidly, due to the congestion at lower lake ports, and it is now certain that the 1920 shipments will be below the average. The chief difficulty is in moving ore from the Lake Erie docks to the furnaces, there being a shortage of cars, and likewise it is difficult to get coal from the mines to the lake ports. Vesselmen complain that they are frequently forced to wait for a week at some Lake Erie port before the boats are unloaded, as it is not the practice to place ore in stock at the docks at this season of the year. There are plenty of boats to take care of the ore that the mines desire to move, but shipments will not be increased until conditions are improved in the East. The operators have made large contracts for 1920 delivery which cannot be filled unless a change for the better takes place soon. Now is the time of the year when the lake fleet should be making its best record as many of the vessels will be diverted to the grain trade in the fall.

Power Company Seeks Permit To Charge Higher Rates

Increasing Difficulties in Securing Materials and High Costs of Operation Demand Adjustment

The Desert Power & Water Co. of Kingman, Ariz., has asked the Arizona Corporation Commission for a large increase in its rates. It has been charging the mines of Oatman, Chloride and other Mohave County camps 1.09c. per kw. hour and alleges that the present actual cost, with consideration of higher wages, increased cost of fuel oil and material, combined with depreciation, is not less than 3.3 cents. In Arizona considerable power for mining operations is secured from commercial electric lines. Jerome, Clarkdale and the districts near Prescott and Mayer and in the Bradshaw Mountains are served by the Arizona Power Co., which lately extended its lines to Phoenix past the Kay and other central Arizona mines. Its power has generation at two hydro-electric plants on Fossil Creek and in a large oil-fuel plant near Clarksdale. The Inspiration, at Miami, secures much power from the Roosevelt hydro-electric system, as does the Magma. Ray has its central power generating system at Hayden and Bisbee at Douglas, in connection with smelting plants. It is understood that the wires of the Southern Sierras Co. are to be extended from Yuma to Gila Bend and Ajo, to the New Cornelia works. Large power development is promised, possibly to the extent of 50,000 kw., in connection with the Verde River water conservation plans lately approved by the Interior Department. Power development of this sort is considered of large importance to mining industry in Arizona, owing to the rising difficulty in securing fuel for power at whatever cost.

Interstate-Callahan Purchases Coeur D'Alene Properties

John A. Percival, late president of the Consolidated Interstate-Callahan Mining Co., announced prior to his death on July 4 that the company has completed the purchase of controlling interest in the Chicago-Boston Mining Co. and the Killbuck Mining Company, both of which own large silver and lead properties in the Coeur D'Alene district, near Wallace, Idaho.

Officers and directors of the new additions will be chosen from the personnel of the Callahan company, and an aggressive development campaign is planned to place the properties on a production basis as soon as possible.

The Nevada Attorney General has rendered a decision to the effect that construction costs cannot be deducted from the gross income of mines in arriving at the net profits, for the purpose of levying taxes. Most of the heavier producers in the state have refused to pay their taxes on this basis and a test case is now before the courts in Nye County.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Interstate Commerce Commission Uphold Freight Rate Increases

Voluminous Opinion Rendered—Rates on Smelter Products from Washington and Idaho Unduly Prejudicial

With certain exceptions, the complaint of the Anaconda Copper Mining Co. and other corporations engaged in mining, concentrating and smelting copper, lead, zinc and other ores, against the all-rail and rail-and-water rates from numerous Western points of origin was not upheld by the Interstate Commerce Commission. A voluminous opinion in the case has just been handed down. The Commission found, however, that rates on smelter products from points in Washington and Idaho have been unduly prejudical. The same is true of the rates on smelter products from points in Arizona and Texas to Galveston, Texas. Reasonable rates were prescribed. The Commission also ruled that failure on the part of the carriers to establish a refining-in-transit arrangement at Baltimore, Md., was not unreasonable. In the course of its opinion, the Commission says:

"Complainants in the instant cases deny that the increased price was intended to cover the increases in transportation charges and claim reparation from the date when the increased rates were established. There are no figures of record which give the cost of producing a unit quantity of copper or other smelter product. In any event it must be presumed that the price-fixing activities of the government were fairly conducted, and the presumption is strengthened by the fact that there is no showing that the price fixed for copper did not cover the cost of production plus a reasonable profit. It may also be observed that while an increase of more than 25 per cent was imposed upon the bullion traffic, smelter products were not alone in taking increases, in many instances, of more than 25 per cent under General Order No. 28. Low-grade commodities such as coal and coke, moving for short distances, were subjected to increases of more than that percentage and the application of the provisions of the general order referred to resulted in increases of 80 to 100 per cent on sugar and more than 100 per cent on certain commodities of less value than bullion that move for substantial distances, notably corn, oats, rye and barley. Many other articles of commerce have been subjected to successive increases of 5, 15 and 25 per cent and complainants' argument that the bullion rates should not have been increased a greater percentage than were the rates on other commodities would lead logically to a holding that bullion should have been subjected at least to those successive increases instead of having been maintained on substantially the same level for more than 10 years."

In connection with the shipments of smelter products from Arizona and Texas points to Galveston, the Commission prescribes the following maximum rates:

To Galveston, Tex., from:

Hayden, Ariz.	$11.50
Miami, Ariz.	10.25
El Paso, Tex.	8.75
Eagle Pass., Tex.	7.00
Laredo, Tex.	7.00
Brownsville, Tex.	7.00

Another extract states:

"We are of opinion, and find, that under all the circumstances the maintenance of rates on smelter products, including pig lead and lead bullion, from points in the states of Washington and Idaho to points on and east of the Missouri and Mississippi Rivers higher than the rates contemporaneously maintained from points in Montana, Utah, and Arizona to the same points of destination was and is unduly prejudicial to such points in Washington and Idaho."

With regard to the matter of refining in transit, the Commission says:

"The evidence fails to show that the rates from points of origin to Baltimore, or on refined copper from Baltimore are or have been unreasonable. Reasonable routes now exist in connection with which transit services are accorded on the basis of the through rates, and in the absence of any violation of the requirements of the act to regulate commerce or the federal control act complainants' prayer for transit service at Baltimore must be denied."

War-Minerals Relief Awards

Awards recommended by the War Minerals Relief Commission during the week ended June 26 are as follows: (The name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed, are shown) Pillsbury, Crowder and Kay, chrome, $3,682.35, 66 per cent; James A. Drennan, chrome, $412, 49 per cent; A. C. Epperly, chrome, $496.86, 49 per cent; Helen Hildredth, chrome, $252, 88 per cent; Daniel Wilson, chrome, $265.20, 91 per cent; Franklin Mining Co., manganese, $2,074.44, 30 per cent; Elberg, Mills and Maine, chrome, $1,489.80, 41 per cent; Watson, Williams and Wadleigh, chrome, $1,682.92, 25 per cent; Olympic Smelters Co., manganese, $5,437.05, 21 per cent; Emily M. Pletz, chrome, $100, 100 per cent.

Government Aeroplanes For Alaskan Survey Work

In announcing a flight from New York City to Nome, Alaska, the War Department gives as one of the reasons for the utility of this expedition co-operation with the Geological Survey in the photographing of inaccessible areas in Alaska which have not been mapped heretofore. A paragraph from the War Department announcement is as follows:

One area in particular which the Geological Survey especially desires to have photographed from the air comprises 3,500 square miles, lying north of the 66th parallel between Fort Hamlin and Circle. This area includes the upper Yukon flats and is a district which can only be surveyed by ground methods with extreme difficulty. Representatives of the United States Geological Survey have estimated that it would cost as an absolute minimum over $10,000 and would take one surveying party at least three seasons which would mean three years to accomplish this work by the present ground methods and it would then only be partially accurate. Allowing for a 50 per cent overlap of the photographs from the air this area can be photographed from one airplane in ten hours of flying or approximately three days' time at a cost of about $1,500 and the data assembled from such a photographic map would be more accurate than could be obtained from the ground in the short time available each year.

North Atlantic Seaboard Power Survey

Plans are taking shape rapidly for the power survey of the North Atlantic seaboard between Boston and Washington, which is to be conducted by the United States Geological Survey. William S. Murray, of New York, has been appointed chairman of the engineering staff which is to make the investigation and the report. In addition to the engineering staff, there will be an advisory board. Professor L. P. Breckenridge, head of the Department of Mechanical Engineering of Yale University, will be chairman of the advisory board. E. G. Buckland, vice-president of the New York, New Haven and Hartford Railroad, and James H. McGraw, president of the McGraw-Hill Publishing Co., Inc., are the other members of the committee selected. Other appointments will be announced later.

In order to direct the work more effectively, the Geological Survey has opened New York offices which will be the headquarters of the engineering staff. The officers are in the Buckley-Newhall building at 709 Sixth Avenue.

Progress of New Mining Legislation

Bills of direct interest to the mining industry, which were enacted into law during the Sixty-sixth Congress, the second session of which recently adjourned, are as follows:

Mineral Leasing Act (Public Law No. 146); assessment work on mining claims suspended during 1919, Public Resolution No. 10; assessment work suspension extended to Alaska for 1919, Public Resolution No. 20; mining on Indian reservations, Public Law No. 3. In addition, there were a few laws enacted of minor interest, such as authorizing the detailing of medical officers of the Public Health Service to the Bureau of Mines; the sale of the mine rescue station site at Billings, Mont.; and legislation pertaining to Government fuel yards. Much important legislation of a mining nature is carried in the appropriation bills. These measures, which were duly enacted into law during the Congress, provided the funds with which the government work on mining subjects is conducted and provides for two new mine experiment stations.

While no great amount of mining legislation was enacted into law, numerous mining bills made progress along the tortuous legislative course. Since the recent adjournment did not mark the end of the Congress, but only of one of its component sessions, such progress as was made by these bills is retained.

The status of mining legislation, which was pending at the time of the adjournment, is as follows: Tariff on magnesite ores, passed the House, October 7, reported favorably to the Senate, March 2; Senate refused to consider, June 3; tungsten tariff, passed House, August 21, reported favorably to the Senate, March 23; zinc tariff, passed House, September 2, reported favorably to the Senate, April 9; War Minerals Relief Act liberalization bill, passed Senate, May 31, reported favorably to the House, March 25; mining for metalliferous metals on Indian reservations, reported favorably to the Senate, September 22; bill authorizing cutting of timber for mining purposes, by corporations organized in one state and operating in another, passed Senate, October 8, reported favorably to the House, April 30.

The trip of the Secretary of the Navy and the Secretary of the Interior to Alaska, while primarily for the purpose of looking into the coal situation, will include a visit to the metalliferous area centering at Fairbanks. The Bureau of Mines experiment station at that point will be visited. Despite the fact that the experiment station had to be closed for a time during the influenza epidemic, it will be able to show an extended record of work done on Alaskan mineral problems.

New California Assignment By Geological Survey

For a long time, there has been a demand for a geologist in the San Francisco branch office of the United States Geological Survey. Many requests for examinations and reports are received from the Pacific Coast which hardly justify the dispatch of a geologist from Washington across the continent. By having a geologist in the San Francisco office, more attention can be given to this class of requests. This need has been met by assigning J. M. Hill to the San Francisco office, where he will be associated with Charles G. Yale.

It is stated at the Geological Survey that no duplication of work being done by a state organization such as is the California State Mining Bureau will be permitted. The work will be carried on in full co-operation with the local organizations in the states in which Mr. Hill will work. It even is regarded as probable that the reports on field investigations will be turned over to the state mining bureaus or surveys for publication. This is in line with the publicity policy announced by the Director of the Survey in his last annual report, in which he said, "The guiding test in choosing the place of publication is where promptest issue and widest circulation can be given the results of federal scientific work. Publicity under the best auspices is the sole aim."

NEWS BY MINING DISTRICTS

ALASKA

Anchorage—The Gold Bullion Mine in the Willow Creek District has a crew of men engaged in the construction of a cyanide mill. It has been necessary to remove an excessive amount of snow preparatory to excavation work. The mill site is now excavated and the thickeners and agitating tanks are being placed.

ARIZONA

Bisbee—The new Copper Queen mill near Don Luis will have an ample water supply from a strike just made on the 1,700 level of the Calumet & Cochise at Warren, at a point 400 ft. southeast of the shaft that was sunk from the 1,000-ft. level for water. The flow has been bulkheaded till proper pumping provision has been made. The main pumping station will be on the 1,800-ft. level and is to be in operation by December 1. There also is to be drifting at depth in the hope of finding an orebody.

Calumet & Arizona will sink its Junction shaft down 500 ft. from the present 1,800-ft. level. The work, including concreting, installation of ore pockets on the several new levels and the cutting of stations, is expected to take two years. A heavy safety platform is to be placed at the 1,600-ft. level and below that depth there will be no mining until the completion of the new work. The deepest shafts in the district are the Junction 1,800, Denn 1,800, Sacramento 1,700, Oliver 1,600, Briggs 1,500 and Cole 1,400 ft. There is to be connection of the Junction and Denn on the 1,800-ft. level.

Hayden—Three trucks are hauling ore to the Hayden smelter from the Magma Chief property, formerly the old Sombrero Butte, in the Mammoth section on the San Pedro. The ore-testing plant of the University of Arizona at Tucson is engaged in the study of samples of Magma Chief ore, to determine methods for a mill the management is preparing to erect. Frank T. Pomeroy is in charge.

Wolverine has suspended work in new ground and is retimbering old workings, which are to be extended into proven ground. No ore has been shipped for ten months past.

Douglas—Peace in Mexico is having its effect upon the mining industry of Sonora. There now are being received at this port of entry about ten carloads a day of concentrates and ores. Two-thirds of the imports are from the Moctezuma Copper Co. of Nacozari, billed to the Phelps-Dodge smelter, though the Tigre is averaging nearly a carload a day. At Nacozari the Phelps-Dodge interests are spending about $1,000,000 in improvements on the Moctezuma reduction and power plants. The present 2,000-ton mill is being doubled in capacity. Seven new Diesels are being installed in the Nacozari power house to provide for the new demands. H. T. Hamilton is general manager at Nacozari and Frank Ayer is in charge at Pilares.

The North Tigre Leasing Co., operating the North Tigre mine in northern Sonora, has a new 50-ton mill in operation. Frank Holmes is manager and J. A. Hobbs in charge at the mine. In Ures district a cyanide mill is handling about 50 tons a day from the Progresso mine, a gold-silver property. A. McFarland is manager. One hundred men are employed. The Santa Barbara mines, near the Cananea railroad, again are being worked and two shipments of high-grade silver ore have been made to El Paso. The old Providencia silver mine, near the Sultana, is to be unwatered and worked, after years of idleness. W. R. Beatty, of Patagonia, has been placed in charge.

Johnson—The Mammoth, owned by the Arizona United Mining Co., is being equipped with a 40-hp. Western hoist and an Ingersoll-Rand compressor. The Keystone Copper Mining Co. have finished two large concrete tanks for water, to be used by the concentrator. This company has unwatered the O. K. shaft and started sinking. H. S. Wien, who recently took a lease on the old Hagin-Hearst property in the Winchester Mountains, twelve miles north of Johnson, is shipping a car a week of ore assaying twenty ounces in silver. The property has been closed down since 1885. The orebody recently struck in the Arizona-Texas still continues to increase in value, the last car shipped showing 50 per cent lead and 50 oz. in silver.

Oatman—United American is drifting east and west on the 500 level on the hanging wall of the Aztec ledge.

PART OF TOWN OF OATMAN, ARIZ., SHOWING MILLS IN BACKGROUND

Crosscutting from the shaft showed the vein to be about 38 ft. wide. West face is in 180 ft. with $15 milling ore showing the entire distance. Present face has considerable high-grade ore from which selected samples have run as high as $400. New east face just breaking into another shoot of good milling ore. Crosscutting to footwall from the west drift will be started soon.

Stockton Hill—C. O. D. shaft down 376 ft. on the vein, has opened up three feet of $45 rock. From this is being sorted a high grade of ore for test shipment. Raising on the vein is being continued north and south of the shaft from the 300 level. The 100-ton pilot mill will be in readiness for operation about October 1. New road to Berry, nine miles distant is completed. General progress underground somewhat handicapped by shortage of satisfactory labor.

The I. X. L. south drift on the 250 level is in high-grade shipping ore. This ore carries 200 oz. silver, 29 per cent lead, $2 gold with no zinc. Mine making about 10,000 gal. of water daily which is handled by jack head pump.

Duncan—It was the intention of the Ash Peak mine to contract for electric power from the Arizona Copper Co. at Clifton, a distance of about 18 miles. In view, however, of the fact that the latter have a deal pending that may mean eventually the taking over of their interests by the Phelps-Dodge Corp., the Ash Peak company declined to enter into any long-time power contracts at this time. As a consequence the American Smelting & Refining Co. did not exercise their option to purchase the property.

The Duncan Mining & Milling Co. are showing up some good orebodies recently encountered in their development work, and are working the mill steadily. J. S. Johnson, superintendent, has resigned.

The New Year's Gift group are contemplating building a 100-ton mill. Jesse Hardy is manager.

Patagonia — The Bachman-Merritt Metals Co. has purchased and is now operating the World's Fair mine. The mine is being unwatered and the new 150-ton concentration and flotation plant will be placed in operation as soon as possible.

CALIFORNIA

Grass Valley—The ten-stamp mill recently acquired by the Alcalde Mining Co. from the Golden Gate Exploration Co., has been transferred to its new location, and will soon be placed in commission. The plans of the Alcalde management is to increase the capacity of the mill to twenty stamps, in order to expedite underground developments that are planned.

Colorado operators have interested themselves in the Red Ledge mine in the Grass Valley district. They plan to explore the wide areas of country adjacent to the productive belt, and will also continue development of orebodies, already proven, to greater depth.

The Penn-California gravel mine has driven its tunnel to 1,300 ft. and it is expected that the main channel will be struck soon. A raise recently driven from the tunnel, opened up gravel deposits showing considerable gold values. A fifteen-stamp mill is on the property, and ample water for the working of the mill is available.

Jackson City—The consolidation of the Boston, Easy Bird and Mosher mines in the Mokelumne Hill district has been announced. It is reported that New York interests are responsible for the consolidation and that extensive developments are planned.

The de-watering of the Fremont Consolidated near Amador City is proceeding rapidly, and mining will soon be resumed. Plans are to sink the shaft deeper, and electric equipment has already been installed. The property was once a ranking producer of the Mother Lode, but for the past two years has been idle.

COLORADO

Telluride—The Smuggler-Union Mining Co. lost its new flotation mill at Pandora, three dwellings, a grocery store and several carloads of mine supplies, by a fire on June 24, which is believed to have started at a short-circuited switch in the mill. General Manager Bulkeley Wells was on the ground and so directed the efforts of the firefighters that the crushing plant and ball mill were saved. He estimates the total loss at about $150,000, covered by $120,000, and has already begun preparations to rebuild in the form of a concrete fireproof oil-flotation installation at an estimated cost of $250,000.

IDAHO

Coeur d'Alene District

Wallace—The Silver Triumph Mining company, near Hailey has found a body of ore 6 to 15 feet wide. A foot to two feet is solid galena containing high values in silver. The first samples contained $140 in silver and lead to the ton. The ore was disclosed in clearing an old cave, and has been found to a height of 70 feet above the upper tunnel and its dip indicates it can be found in a raise of 200 feet from the main tunnel. Three parallel veins lie in a zone 100 ft. wide.

The Bear Creek Mining Company, in the Cœur d'Alenes, is rapidly removing ore from its workings. The first carload of concentrates contained 61 per cent lead and six ounces of silver to the ton. Shipments will be made at the rate of a carload a week.

The Swastika Mining Company, in the Dixie camp of central Idaho, has widened its orebody from a fraction of an inch to six feet of good ore at a 150-foot point in the new drift. The major portion of the six feet of ore carries paying values.

Field parties from the State Bureau of Mines and Geology will be at work in many parts of the state this summer, according to Francis A. Thomson, dean of the school of mines at the University of Idaho, Moscow. Examination of ore deposits and the treatments of ore will be made.

The Montana-Idaho Copper Company, operating at Adair, has reached the

6,800-point in its drive into the mountain range. At this point the tunnel lacks less than 3,000 feet of its objective which is a point under the Monitor shaft. The mine is operating two shifts and advancing 9 to 10 feet a day. The tunnel is being driven outside of the vein. Ground is good and needs no timbering, although considerable timbering was done before this point was reached.

Kellogg — The Highland-Surprise Consolidated Mining Co. expects to be shipping again before the summer is over. The company has been idle for the past two years, but prior to that time had shipped concentrates that netted the company $78,435. There is a mill of 125-ton capacity and all necessary equipment for operation. A few men are now employed in the mine and this number will be increased as rapidly as conditions permit. The property is on Pine Creek.

ILLINOIS

Fairview—The Fairview Fluorspar & Lead Co. have almost completed the overhauling of their mill in which a number of changes in machinery and equipment have been made.

They are in the market for a 500- to 600-hp. Heine water tube boiler.

Cave in Rock—The Cave in Rock Fluorspar Co. has just sold and loaded out part of 700 tons of washed gravel fluorspar. The mine is located just outside the city limits of Cave in Rock and one-half mile from river loading point. Total cost to tow, haul and load this ore on cars is $1.75 per ton, which includes hauling from mine to river loading point. F. W. D. truck is now being used to haul from mine to river loading point.

The Spar Mountain Co. moved about sixteen thousand tons of ore from their works about five miles west of Cave in Rock, Ill. The ore occurs in a blanket formation and is from 3 to 15 ft. thick, outcropping on the surface.

MICHIGAN

Gogebic Range

Rains Impede Process of Open-Pit Operations

Heavy rains recently interrupted operations in the open pit of the Wakefield mine for a few days. Two of the steam shovels were drowned out and in places the water was about fifteen feet deep.

The Palms-Anvil mine between Bessemer and Wakefield has in the last year or two come to the front as one of the largest producers on the range. In May they established a new record for themselves, hoisting 103,000 tons.

At the Davis mine the shaft has reached the 26 level and the station is being cut out. This will be the bottom level and will be extended to intercept the orebody which is believed to follow down the dyke from the Newport mine. A considerable flow of water is expected, so a large pump house to accommodate four 400 gallon plunger pumps will be constructed on this level.

Menominee Range

Iron River—Cleveland-Cliffs Iron Co. has added a night shift at the Spies mine. One shift was inadequate to get out sufficient ore to meet the mine's contracts for 1920.

Escanaba—The Escanaba Iron Range Development Co. has discontinued drilling operations on its lands near Escanaba. Three holes were put down and the formation was cut, but no ore was encountered. It is believed by many that the Escanaba field is an extension of the Menominee range, but Wauceda, some miles away, is the nearest point to Escanaba where ore was found.

MINNESOTA

Cuyuna Range

Former Open-Pit Property Deepens Shaft and Employs Underground Methods

Cuyuna—The Rowe shaft at Riverton is being deepened 125 ft. from the present 220-ft. level and is now being worked by underground methods. Last year the milling system was employed and electric haulage replaced by the use of mules underground. Hoisting and pumping are done by steam. One hundred men are employed and shipments of 150,000 tons are scheduled for the year. Property is being operated by Pickands-Mather Co. for the Pittsburgh Steel Ore Co.

At the Sagamore pit at Riverton, a John A. Savage property, Winston-Dear and Co. are loading manganiferous ore with a dragline excavator. Shipments will be increased. The new drainage shaft to 150 ft. depth has been completed and is handling water in the pit. One shovel has started on pit clean-up.

M. A. Hanna and Co. are shipping from the Cuyuna-Sultana stockpile at Ironton and expect to load the entire pile of 40,000 tons this season. The Hanna company had a lein on the ore against the Oneida Mines Co., the former operators. The property has been idle since the winter of 1918-1919 and the Oneida Mines Co. has been in serious financial difficulties.

The Northern Minnesota Ore Co. is pumping at the Northland mine north of Cuyuna. Bulkheads have lately been put in the drifts and the probabilities are that the drifts at least will be allowed to fill. The company is contemplating entering the Batesville manganese field, and has an option on a property east of Cushman, Ark.

MONTANA

Metal Trades Threaten Wage Advance —Anaconda Slightly Increases Production

Butte—Metal trades employed in the mines are threatening to demand a wage increase, but they are not extending the threat to the point of a strike, and labor leaders are of the opinion there will be no walkout. A year ago the metal trades struck, but lost their strike. Outside electricians may cause trouble, but the mines are well prepared to continue operations despite this craft, which is in a small minority and their efforts can be dispensed with for a period without any serious trouble resulting, and it is considered doubtful if any trouble at all would result of a character serious enough to embarrass mine operation. Butte gradually appears to be drifting toward the open shop, or the American plan as it is designated here. At the present time non-union mechanics are working alongside of union men and radicalism has received a decided setback. The I. W. W. are endeavoring to dispel their responsibility for the riot on Anaconda road last April, in which 16 men were wounded and one died from the wounds received, alleging that the persons who fired the shots were in the employ of the company. A suit for $125,400 has been brought by one of the wounded men against the company and in the case of the man who died it is stated in the application for letters of administration of the estate that the estate consists of an action against the murderers of the man. At the coroner's inquest nothing whatever was brought out to show who fired the shots, except that deputy sheriffs were present and some of them fired shots into the air.

ORE CHUTE AND BINS AT BOSTON & MONTANA PROPERTY

Production of the Anaconda Copper Mining Company is being slightly increased, orders having been given to some of the mine foremen to spur up output somewhat. Washoe reduction works at Anaconda have been operating at a little more than one-third of capacity with the Boston and Montana plant at Great Falls, Mont., less than this. Labor situation as it pertains to miners is showing an improvement.

The group insurance plan started at the Elm Orlu, the first trial in the Butte district, is believed to be exercising a potent influence upon the miners, the Elm Orlu enjoying a larger shift comparatively than any other mine, despite its remote location from the city.

NEVADA

Mina—Jack Anderson has shipped by express 19 sacks of ore that carried 5,000 oz. of silver to the ton. This property, located on the south slope of Mount Mono, was discovered two years ago while he was prospecting on a grubstake furnished by Mrs. A. B. Crownore, assistant postmistress at Mina. They have refused a large amount of cash for the claims.

SIMON SILVER-LEAD MINE, MINA, NEV., SHOWING SHAFT EQUIPMENT AND EXPERIMENTAL FLOTATION PLANT

The Simon Contact mine has entered a body of ore in a crosscut from the 350-ft. level that carries values in silver and lead of $145 a ton. This shoot was also found on the 200-ft. level, but the values were not so high.

The Simon Silver-Lead Co. has found the ore on the 700-ft. level. It is claimed that between the fourth and sixth levels more than 500,000 tons of commercially profitable ore are now blocked out.

Austin—Last summer William Easton and J. B. Dinston located some claims in San Jean canyon of the Toyaba range, 30 miles south of Austin. Recently in running a tunnel, 160 ft. from the portal, a three-foot ledge was cut that carries 100 oz. of silver. This is a new district in which no mining has been done heretofore.

Arrowhead—Every day strikes of more or less importance are reported in this youngest Nevada silver camp. The latest and most sensational is that in a drift from the 100-ft. level of the Arrowhead mine, after going through 33 ft. of ore 3 ft. wide running 130 oz. to the ton, an 18-in. shoot was encountered that "goes as high as" 1,000 oz. in silver and 7 oz. in gold.

NEW MEXICO

Lordsburg—The Calumet & Arizona (85 branch) are sinking the main shaft 300 ft deeper which will give a total depth of 1,000 ft. below the zero level. Shipments are going forward regularly to Calumet & Arizona smelter at Douglas.

The Octo has commenced shaft work, sinking from the present 270-ft. depth to 300 ft. where crosscuts will be driven and the main shaft carried to 400 ft. at an early date. W. T. Bill and E. E. Forrester of El Centro, J. E. Davis of Long Beach and Geo. W. Foreman, of Los Angeles, Cal., all directors, visited the property recently. Fred C. Semmek is manager.

J. W. Jackson, formerly mine superintendent of the 85 mine, will continue to work his lease on the Superior claim of that property.

M. M. Crocker has a car of high grade silver ore ready for shipment from the Bonanza vein on the J. B. Foster property, which lies on the south side of the Bonney.

The Parks-Allen-Lurky silver property is under examination by Messrs. Koik and Wilson for Arizona interests.

Mogollon—Operations of the American Silver Corpn. have been unexpectedly suspended by orders from the eastern office. About two months ago this company took over the property and assets of the Socorro Mining & Milling Co., which had been in receivership, and commenced operations. D. B. Scott, general manager of the old company, continued in the same capacity with the American Silver Corp. The sudden shut-down came as a surprise and was followed by the resignation of Mr. Scott and the entire office force. Considerable difficulty had been experienced in building up a mining force on account of the inaccessibility of the camp.

SOUTH DAKOTA

Homestake Company Makes Changes in Hoisting Equipment

Lead—The Ellison hoist of the Homestake Mining Co. is being changed from steam to electric power. The cages will be replaced by skips. Room has been made for the new installations, but it is not expected that the new equipment will be in operation before 1921.

Hill City—The Golden Summit mine is being unwatered. Work has been started on the first level and will be extended to the other levels as soon as the water is lowered. The First National Gold Mining Co., with offices at Detroit, Mich., have taken an option on the property and the work is being done under their direction.

The National Tin Corp. have started the development of the Manitowac, which is near the concentrator and has railroad connections. The Cowboy has been closed down. At the Tin Boom the shaft has been sunk to 100 ft. and lateral work was started. The work at this mine has also been temporarily suspended. At the Mohawk, stoping has been started. The concentrator has again been placed in commission but the transportation facilities are such that the plant is operated at greatly reduced capacity.

Pringle—The Kirk quarries have been reopened under lease to Edward Manion. The limestone is shipped to the sugar refineries and a daily output of 100 tons will be maintained as soon as a full crew is obtained.

Deadwood—The Cutting Mining Co. have completed the sinking of the shaft to 500 ft. and lateral work is now under way.

The Echo Gold Mining Co. at Maitland have completed their shaft to a depth of 400 ft. and drifting has been started on this level.

UTAH

Juab County—Tintic shipments for the week ended June 26 amounted to 149 cars, as compared with 122 cars the week preceding.

The southern end of the Eureka Hill property, which is under lease to the recently organized Keystone Leasing Company is being opened through the adjoining Centennial Eureka, work starting from the 900 level of this mine. At the Plutus—now a part of the Chief Consolidated holdings—drifting is being done at a depth of 1,750 ft., starting from the winze sunk from the 1,000, where some time ago, mineralization was encountered warranting further work. Better ore is expected to be opened by deeper work. At the Chief itself, the new concrete-lined double-compartment shaft has reached the 1,400 level.

Bingham—Utah Consolidated will immediately begin work on the construction of a 1,000-ton milling plant to treat low-grade ores. For some time the company has been making experiments at a small mill leased for the purpose. The mill will be at Tooele, four miles distant, and the ore will be transported over the tramway at present in use. Recent development work is opening low-grade copper ore on the lower levels.

Toquerville—It is reported that control of the Silver Reef Consolidated Co., which owns the Silver Reef mines, has been secured by the Alvarado Mining & Milling Co.

WASHINGTON

Mining Activity in Okanogan County —Aerial Tram from Northwest Magnesite Co.

Nighthawk—There is considerable mining activity this summer in the Oroville-Nighthawk District of northern Okanogan County. At the Kaaba mine, a crew of men, under the direction of J. W. Douglas, are carrying on extensive development work on the vein in order to block out extensive reserves for future milling. The Four Metals Mining Company has deepened its shaft on the Alice claim to 150 ft. and on the Shamrock claim now has a shaft down 100 ft. and expects to soon encounter the vein on its dip.

Newport—The Bead Lake Mining Company has a crew of 20 men engaged in the construction of a 100-ton mill. The company is operating its own sawmill to supply lumber for the construction work.

Boundary—The Electric Point Mining Company reported that it has opened a new chimney of high-grade galena. The new ore is located just on the line between the Electric Point and Gladstone mines, it was encountered in a drift from the 150 ft. level of the Electric Point workings.

Chewelah—The Northwest Magnesite Company, at Chewelah, Stevens County, is building six miles more of aerial tram, adding approximately $100,000 to the million-dollar plant now producing 8,000 tons of calcined product monthly.

CANADA

British Columbia

Low-Grade Prospects in Salmon River District To Be Diamond Drilled— Placer Miners Active in Cariboo

Stewart—Contract diamond drilling has been commenced by Boyle Bros. on the Province claim of the Big Missouri group. Last year the same form of development took place on the E Pluribus claim of the same group. This property is one of the most extensive of the low-grade prospects of the Salmon River section, Portland Canal district.

Col. T. A. Hiam, the representative at Stewart of Sir Donald Mann, expects the Northwestern Railway up the Bear River to be in operation this season. The bridges and right-of-way are being repaired and the gasoline locomotive to be used has arrived. As there are a number of properties up the valley to be developed, Col. Hiam is confident that the road will be kept very busy.

Alice Arm—The Taylor Engineering Co. is reported to have awarded a contract for the installation at the Dolly Varden Mine of a hydro-electric power plant. The cost is said to be $65,000.

Hazelton—The Kitselas Mountain Copper Co.'s concentrator at Usk has been successfully operated since early in June.

Ontario

Cobalt—The Nipissing has declared a dividend of five per cent payable July 20, to shareholders of record as of June 20.

The past few weeks have shown a decided improvement in the labor situation in Cobalt. Men are coming in from many districts and there is now no trouble in getting sufficient labor. Closing down of the big Chippewa power project at Niagara Falls, and laying off men in the automobile centers, has released a considerable amount of labor, which is drifting back to Northern Ontario.

All men at the Dome Lake mine in Porcupine have been laid off and the mine is being allowed to fill with water.

The Miracle mine near Porcupine plans several thousand feet of diamond drilling this summer. The property was developed and financed by a group of spiritualists.

The Kirkland Lake camp is showing more activity than any other part of Northern Ontario. A number of new operations are starting up and the producing properties are working to capacity. Excavation has been started for the Ontario Kirkland mill although the machinery has not yet been ordered. Development on the 400 foot level is stated to be very satisfactory and the oreshoot is longer than on the 300 foot level. The Lake Shore is sinking a new three compartment shaft to the 800 foot level and cutting stations every 200 feet. The Wright-Hargraves is suffering from a shortage of power and is carrying on mining operations by steam. The machinery for the mill is on the ground and construction is proceeding. The Granby Kirkland and the Chapat Hughes have both started development near Gull Lake and the Munroe Kirkland has started work to the North. Development on the Bidgood is stated to be very satisfactory and in the immediate vicinity, the Wood Kirkland and Lebel Oro have started work.

Manitoba

Herb Lake—Work on the Rex which had been discontinued since the fall of 1918 has been resumed.

At the Bingo a shaft is being sunk in the center of a mineralized belt 60 ft. wide, containing five veins. Rich ore, showing free gold, is being taken out and stored for treatment at the Rex mill.

CHRONOLOGY OF MINING

June, 1920

June 1.—Calumet & Arizona Mining Co. formally took over the Eighty-five mine at Lordsburg, N. M.—Senate amended the War Minerals Relief Act by conferring jurisdiction on the Court of Claims; this failed to pass the House of Representatives.—Judge Bourquin dismissed the Minerals Separation, Ltd., proceedings against Butte & Superior Co. for contempt, in the U. S. District Court at Butte, Mont.

June 7—Miami Copper Co. cited before the U. S. District Court at Wilmington, Del., to answer contempt charges brought by Minerals Separation, Ltd.

June 10—Secretary of the Interior promulgated regulations for operating in oil lands under the "Land Leasing Law."

June 11—Conference of State and Public Utility officials at Washington approved the resolution adopted by the National Committee on Natural Gas Conservation.

June 12—Secretary of the Interior declared void the first leases of the Welch Mining Co., on Indian-owned lands near Douthat, Okla.—Metals Extraction Corporation started their new-process zinc oxide plant near Joplin, Mo.

June 14—Union Mine Workers held their State convention at Birmingham, Ala.

June 15—Hearing of Minerals Separation, Ltd., contempt proceedings against Miami Copper Co. at Philadelphia, Pa.

June 16—Third sale of Choctaw and Chickasaw coal and asphalt deposits.

June 18—U. S. Circuit Court of Appeals, Philadelphia, Pa., denied petition by Miami Copper Co. to re-open its case with Minerals Separation, Ltd., in order to admit new evidence.

June 19—The Salt Lake Valley smelters raised their week-long embargo on shipments of certain kinds of ores.

June 23—Lake Superior Prevention of Accidents Conference opened at Duluth, Minn.

June 24—Mason Valley smelter-rates hearing began before the Interstate Commerce Commission at Reno, Nev.—Smuggler-Union Mining Co.'s new flotation mill at Pandora, Col., destroyed by fire.—Leading zinc mine operators met at Miami, Okla., and decided on a two-weeks' shut down of the leading zinc ore mines of the Kansas-Missouri-Oklahoma district, beginning June 26.—"Midsummer Day" celebrations among the Gogebic range miners caused most of the mines there to close on this day.

June 26—Kansas-Missouri-Oklahoma zinc mines shut down until July 10.

Recent Production Reports

Chile Copper produced 10,300,000 lb. copper in May against 8,172,000 in April.

Granby Con. M. S. & P. Co. produced 2,131,219 lb. copper in May against 2,105,400 in April.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

July	Sterling Exchange	Silver: New York, Domestic Origin	Silver: New York, Foreign Origin	Silver: London	July	Sterling Exchange	Silver: New York, Domestic Origin	Silver: New York, Foreign Origin	Silver: London
1	394	99½	90½	....	5	....	....	....	52
2	395	99½	89⅝	51⅛	6	393	99½	90	51½
3	394½	99½	89⅝	51⅛	7	393½	99½	91⅞	52½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Daily Prices of Metals in New York

July	Copper: Electrolytic	Tin: 99 Per Cent	Tin: Straits	Lead: N. Y	Lead: St L.	Zinc: St L.
1	18.20	46.00	49.00	8.25	8.10	7.60
2	18.35	46.75	50.00	8.10	8.00	7.60
3	18.35	46.75	50.00	8.10	8.00	7.65
5	....	....	....	....	....	....
6	18.50	45.50	48.25	8.10	8.00	7.75
7	18.60	45.50	48.00	8.10	8.00	7.70

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

July	Copper: Standard Spot	Copper: Standard 3 M	Copper: Electrolytic	Tin: Spot	Tin: 3 M	Lead: Spot	Lead: 3 M	Zinc: Spot	Zinc: 3 M
1	87	89½	103	249½	254	34¼	35	41½	43½
2	89¾	91¾	105	260	264	35¼	35¾	43¾	45¼
3	....	....	....	....	....	....	....	....	....
5	88¼	90¼	105	250½	256	34½	35½	44	45½
6	87	89¼	105	246¼	253½	34¼	35¼	42½	43¾
7	87¼	89½	105	247½	255	33¼	34½	41¾	43

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, July 7, 1920

Business continues of small volume, though with a firm undertone. The week-end holiday depressed sales considerably, almost no metal being sold on Friday or Saturday. Yesterday and today inquiries have been more numerous, but current industrial conditions prevent consumers from contracting for large lots of any kind of metal. The railroad situation continues gradually to improve, but prompt shipment does not yet mean delivery within any reasonable time in the majority of cases. Mexican conditions under the new government are reported improved.

Copper

The long-awaited buying movement does not yet seem to have begun, the large producers reporting only the usual insignificant sales, as has been the case for two or three months. The amount of metal in the hands of outside interests has dwindled considerably, and nothing is now heard of the Japanese copper which was offered at low prices two or three weeks ago. The price has therefore shown a pronounced tendency to approach that asked by the large interests, and almost nothing can be had at less than 18¾c., delivered. It is improbable that any buying movement as large as that of the early spring will occur. Rather, under present uncertain conditions, consumers are likely to buy comparatively small lots and more often. Nothing new is taking place in the export market, as far as can be learned.

Lead

The demand for lead for July delivery or shipment which existed last week, and, in conjunction with an improved London market, caused a rather sharp rise here, seems to have died down, and practically all the metal sold since last Wednesday has been for August delivery. Spot metal still commands a premium, as little is on the market. On the other hand, consumers are, in general, well supplied for current requirements. Lead for late July and early August delivery can be obtained at the prices which we quote, and late August metal at slightly under our prices.

The scarcity of prompt lead in the West and Middle West, the reduced production in that section, and the fact that New York is now a port of entry for Mexican lead, combine to bring the New York price approximately to the same figure as that quoted for St. Louis. In fact, it is not impossible for the New York price to fall even below that quoted for Middle Western delivery.

Consumption continues good, paint and storage-battery makers using large quantities.

Zinc

Prices continued to trend firmer during the last week, although little buying took place. A considerable amount of cheap spelter found its way into strong hands recently, when the price was less than 7½c., and it is unlikely that this will be unloaded at less than 8c. The fact that production has been curtailed at the mines will have a bullish influence, and, also, conditions in Europe seem to be somewhat improved.

Tin

Tin has been absolutely dead the past week. When the London market advanced on Thursday and Friday, some inquiries developed on the part of consumers who did not wish to have the price get away from them. The European market has again weakened, however, so that prospective buyers feel that they can wait a while longer. Quotations are nominal. Banca tin continues to be sold at a marked reduction over the price for Straits, the difference being about 1c.

Straits tin for future delivery: July 1st, 47½@48c.; 2d, 48¾@49c.; 3d, 49@49¼c.; 6th, 47@47½c.; 7th, 48c.

Arrivals of tin in long tons: Total for June, 4,730. July 1st, Hongkong, 125; 6th, Liverpool, 65; London, 165.

Silver

The London market has been comparatively steady but quiet over the holiday period. Limited supplies from the Continent seem to be sufficient so far to satisfy the requirements of the London market. It is an open question whether the supplies will continue to meet the English demand, and there does not yet seem to be any way of developing that fact. The Continental accumulations are in large part in the hands of the peasants, and it would take time to gather in the hoardings in quantity.

Mexican Dollars—July 1, 67⅞; 2d, 67⅞; 3d, 67⅞; 5th, holiday; 6th, 67⅞; 7th, 69½.

Gold

Gold in London on July 1st, 2d, and 5th, 104s.; 6th and 7th, 104s. 1d.

Foreign Exchange

Price changes were narrow again during the last week, no fluctuations of any moment taking place, though sterling has been slightly weaker. In units to the dollar, francs were quoted on Tuesday at 11.70 and lire at 16.20. German marks were 2.63c. New York funds in Montreal were quoted at $130.87 premium per $1,000.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32@32½c. open market for 98@99 per cent virgin; unchanged.

Antimony—Market continues weak. Spot, 7¾c. per lb.; Cookson's "C" grade, 16@17c. Chinese and Japanese brands, 7¾c. W. C. C. brand, 8½c.

[1]**Antimony, Needle**—Chinese needle antimony, lump, firm at 9½c. per lb. Standard powdered needle antimony (200 mesh), 12 to 15c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Unchanged.

[1]**Cerium Metal**—Ingot form, $8@$9 per lb.

Cobalt—Metal, $2.50 to $3 per lb., black oxide, $2 per lb.

Iridium—Nominal, $300 per oz. No business.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$75@$80 per oz.

Platinum—Market weak at $80@$85 per oz.

Quicksilver—Market weaker; $90@$92 per 75-lb. flask. San Francisco wires $85. Firm.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $1.75@$2 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $18@$20 per lb.

Metallic Ores

Bauxite—Unchanged from last issue.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 72@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Shipping condition is getting serious with respect to ores, but coal conditions are improving.

Manganese Ore—85@90c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 85c. per lb. of contained sulphide.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO_2, 2c. per lb. for ore. Rutile, 95 per cent TiO_2, 20@25c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6.50@$7.50 f.o.b. mines.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1 to $2.50 per lb. of metallic vanadium content.

Zircon—Washed, iron free, 10c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., July 3—Zinc blende, per ton, high $48.90; basis 60 per cent zinc, premium, $46; Prime Western, $45; fines and slimes $45@$40; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $42.87; calamine, $36; all zinc ores, $42.62.

Lead, high, $101.35; basis 80 per cent lead, $100@$90; average settling prices, all grades of lead, $100.73 per ton.

Shipments for the week: Blende, 10,919; calamine, 387; lead, 1,634 tons. Value, all ores the week, $646,650.

The mine close-down may be considered complete. Sellers claim the production is lessened 95 per cent and buyers concede 85 per cent. In thirty years' endeavor to get together on a proposition this is the first time over 50 per cent have complied. Most sellers have sold on the market, but a few are withholding ore. One company has 15,000 tons holding since the price declined below $60, and one company has 600 tons holding since the price dropped under $65 per ton. Outside these two lots the unsold ore aggregates approximately 6,000 tons, most of it simply withheld. Salable ore is about cleaned up. Cars were a little easier and the shipment was increased. The purchase this week was under 3,500 tons.

Platteville, Wis., July 3—Blende, basis 60 per cent zinc, $48 per ton for high-grade. Lead ore, basis 80 per cent lead, $90 per ton. Shipments for the week: blende, 1,454; calamine, 60; lead, 40; sulphur ore, 45 tons. Shipments for the year: blende, 36,027; calamine, 2,240; lead, 3,334, sulphur ore, 988 tons. Shipped during week to separating plants, 2,997 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $1,800@$2,500; No. 2, $1,100@$1,500; spinning fibres, $400@$700; magnesia and compressed sheet fibres, $300@$400; shingle stock, $100@$150; paper stock, $60@$80; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes—Crude, 88 to 94 per cent barium content, $8@$10 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra; per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

points; $7.50@$10 f.o.b. Maine; ground, $22@$25, car lots, f.o.b. Baltimore; ground, $16@$20, f.o.b. North Carolina points; $16 to $20 per ton, No. 1 ground, f.o.b. New York State.

Fluorspar—Standard grade, domestic washed gravel, f.o.b. Illinois and Kentucky mines, $25 per ton; lump, $17.50, f.o.b. Tonuco, N. M.

Fuller's Earth—Domestic, granular, $25; powdered, $18, f.o.b. mines, Florida; imported, powdered, $35@$40 per ton.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9¼c.; 90 per cent, 10¼c., all f.o.b. New York; 80 per cent, 5c.; 90 per cent, 10c.; 30 per cent (dust polish grade), 1c.; 50 per cent (dust facing grade) 2c.; f.o.b. Ashland, Ala. Mexican, amorphous, $45 @$55 per short ton; Korean, 3¼c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c.

Gypsum—Raw crushed rock, $3.50@ $4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—For fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa. Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.

Magnesite. Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $50@$60, Chester, Pa. Magnesite brick—See Refractories.

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $42 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports, 68 per cent tricalcium phosphate, $6.85; 70 per cent, $7.35; 74 to 75 per cent, $10; 75 per cent minimum, $10.50; 77 per cent minimum, $12.50.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines; unchanged.

Talc—Paper making, $9.50@$14 per ton; roofing grades, $8@$9; rubber grades, $9@$15, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, carload lots, $12 per ton; less than carload, $15, f.o.b. cars. Freight to New York, $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70.

Mineral Products

Arsenic—White arsenic, 14@15c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]**Ferrocerium**—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 19@20c. per lb. of chromium contained; 4 to 6 per cent carbon, 20@21c.

Ferromanganese—For 76@80 per cent, $250 spot; $225 prompt; $200 contract, freight allowed; Spiegeleisen, 18 to 22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$90; 75 per cent, $150 @$160.

Ferrotungsten—70 to 80 per cent W, 90c.@$1.10 per lb. of contained tungsten.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained.

Ferrovanadium—Basis 30-40 per cent, $6.50@$7.75 per lb. of V contained.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22¼@22½c.

Lead Sheets—Full lead sheets, 12¼c.; cut lead sheets, 12¼c. in quantity, mill lots. Unchanged.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c. Unchanged.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb. Unchanged.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Chrome Brick—$90@$100 per net ton, Chester, Pa., carload lots.

Chrome Cement—45 to 50 per cent Cr_2O_3, in sacks, $50 per net ton, Chester, Pa., carload lots.

Clay Brick — First-quality fire clay, 9-in. shapes, $45@$53 per thousand, f.o.b. Pennsylvania, Ohio, and Kentucky works; second quality, $40. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$90@$100 per ton, f.o.b. Chester, Pa.; 9-in. straights, $90 per net ton, Baltimore; 9-in. sizes and shapes larger than 9 in., regular extras.

Silica Brick—Nine in. and 9-in. sizes, per 1,000, $51@$55, Birmingham, Ala.; $50@$55, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, July 6, 1920

The sheet and tin-plate tonnage wage scales, governing the sheet and tin mills that are operated as union, have been settled between the manufacturers involved and the Amalgamated Association, a few minor concessions being made to the men. As to the general organizing campaign for the iron and steel industry, the present prospect is that none will occur, at least in the near future.

Car supplies for shipping pig-iron and steel products have been poorer in the past fortnight than formerly, owing to the diversion of many open top cars to the coal movement. The industry is better supplied with coal, for fuel and byproduct coking, and hopes soon to have some of the cars back.

Pig Iron—Relatively small sales of bessemer and basic iron have been made, for early delivery, at $1 advance, or $45, Valley, and this seems to be the market. There is no interest in deliveries for late in the year, buyers apparently expecting a decline. We quote bessemer, basic and foundry all at $45, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40. W. P. Snyder & Co. report average prices in June, computed from tonnage sales reported, at $43.494 for bessemer and $44.0075 for basic, Valley furnaces. Foundry was quoted at $45, Valley, throughout the month.

Steel—The market is quiet. Quotations, largely nominal, are: Billets, $60@$65; small billets, $65@$70; sheet bars, $75.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17.50@ $18.50; foundry, $18@$19.

New River — Furnace, $12.50@$15, and foundry, $12.50@$14 per ton.

Pocahontas—Furnace, $12.50@$13.50 per ton.

Wise County — Furnace, $12.50@$15 per ton; foundry, $12.50@$14 per ton.

The Relief of the South African Gold Mines

What the Rand Low-Grade Mines Commission Recommends To Ease the Critical Situation in The World's Leading Gold-Producing Center

IN VIEW of the strenuous attempt being made to help the gold miner out of his difficulties in the United States, an important contribution to the subject of relief for the industry elsewhere is contained in the report of the Rand Low-Grade Mines Commission presented to the Union Houses of Parliament, and issued the latter part of May. This is the commission that was appointed about one year ago by the South African government to study the critical situation in the low-grade gold mines of the Rand—the most important gold producing area in the world—due to the steady rise in working costs since the beginning of the war. Although preliminary statements were frequently made by the commission, the final report has just recently been issued.

Recommendations Summarized

The report contains no startling or unexpected recommendation or suggestion, the principal advocation being the importation of cheap colored labor from the tropics north of 22 deg. S. latitude to help reduce the high labor costs. The report deals at length with the disposal of gold, the procedure necessary to obviate the closing down of the mines, and the steps to be taken should abandonment of the work actually occur.

The effect of the vanishing gold premium was not as marked at the time the report was printed and issued (April of this year) as it is at the present time and the situation is continually becoming more acute.

Greatly Increased Costs

It is estimated that during the first half of 1915 working costs on the Witwatersrand mines averaged 17s. 5d. per ton; in the third quarter of 1919 they had advanced to 22s. 7d. and in the final quarter to 23s. 9d. An allowance of 1s. 8d. is made to bring the cost up to date, which indicates the steady upward trend.

The following comparative table reflects the increase in white and black labor costs, in general commodities, and the decrease in efficiency.

	First Half of 1914		First Quarter of 1919	
	Per Ton Milled			
White salaries and wages	5s.	1d.	7s.	1d.
Native wages	3	9	4	2
Stores and materials	5	5	7	10
Administration	0	5 7	0	6 3
Gold realization	0	3 1	0	6 3
Cost of development per foot	54	1	81	5
Tons handled per white employee	115 2	0	101 2	0
Tons handled per native employee	15 5	0	13 7	0

Elimination of Group Control

Opinion had been frequently expressed that costs could be materially lowered by elimination of group control—a feature of the South African gold mining industry—and that several shillings per ton could be economized in that manner. Evidence which the commission has gathered controverts this idea—the total administrative costs due to this arrangement being only about 6.3d. per ton milled. Economies to be effected in this direction "cannot possibly affect the position of the low-grade mines."

The charge that undue or hidden profits were being made by companies through the purchase of supplies for the mines and an overcharge for the service was unsubstantiated by the investigation.

Gold Marketing Costs

The commission deals at length with the gold premium the effect of which was first felt just after the commission had been appointed and a free gold market established. It recommends that the Union government approach the Imperial and Indian governments with a view to the free sale of South African gold in India—a great gold as well as silver consuming country. By this means it is hoped to compensate for the heavy discount—amounting to some 7 per cent—which under present arrangements is exacted by the banks in return for their service in marketing the gold. The seven per cent discount rate cuts heavily into the gold premium. The commission emphasizes the merely temporary nature of the premium and the transient respite given to the industry and is strongly in favor of the establishment of a mint in the union, rendering the producers less dependent upon outside assistance, and avoiding excessive refining charges in disposing of bullion through one channel.

The Abandonment of Operations

The effect of the closure of the mines and a curtailment of the industry is carefully considered, and that it would be a national calamity is well understood. The direct consequences would mean that some 250,000 white and a like number of blacks would be thrown out of employment and a means of livelihood. The loss in general revenue is estimated at £1,800,000 per month while that to the railways and harbors would at least be equally great.

On the other hand, it is assumed that a partial closing down of the mines will, to a certain extent, aid the operating ones by relieving the chronic shortage of native labor, enabling them to run at greater capacity. However, the exact extent to which such a step can be taken with beneficial results is a question, and can be easily overdone. It is a natural tendency for the low-grade mines in the most vulnerable condition to shut down first under the prevailing adverse conditions—just as in the United States those gold mines which were producing at or below cost were the first to close.

Government Subsidy

The matter of subsidizing the gold mines has been repeatedly advanced and as many times rejected. Save in exceptional circumstances the commission disfavors such subsidies. This recommendation is made on the grounds that support of a struggling gold mine would entitle the support of a struggling copper mine in a similar position, an argument that may be extended ad infinitum. It is held that economical principles regard unsound a policy which supports unpayable industries, diverting funds from profitable and permanent enterprises.

The Commission suggests exhaustive inquiry into general native labor policy and states that the well being of the native is not being sufficiently considered by the white population. The chief consideration is the profit and convenience of the European and the native is beginning to feel, and to say with considerable justice, that he is being exploited. The sooner such a feeling is eradicated the better for all concerned.

Notification of Closure

In the interests of maintaining mining operations wherever possible, it is suggested that at least three months' notice be given before shutting down a mine so that government inquiry may determine the merits of the individual case and assist operations as far as possible, and when mining operations are to be continued with a certain measure of government control, it is assumed that economy and efficiency of working require the utilization of the existing administration as far as possible.

On the whole the report has gone rather thoroughly into the handicaps which the South African gold mining industry is sustaining. All the measures of relief that are suggested remain to be tried out and what full measure of the burden will be removed by thorough action upon the recommendations is problematical. In the meantime the situation is continually becoming more critical.

COMPANY REPORTS

West End Consolidated Mining Company

Silver; Nevada

The thirteenth annual report of the West End Consolidated Mining Co. for 1919 summarizes operations at Tonopah as follows:

		Total	Per Ton
Dry tons ore to mill		33,140	
Containing: Fine ounces gold	6,114 61		
Fine ounces silver	580,445 10		
Total ounces	586,559 71		
Average value per ounce	$1.33		
Gross value West End ore milled		$780,786 49	$23 54
Mill costs, direct and indirect	130,106.53		3 93
Mill losses	64,483 44		1 93
Bullion marketing costs	11,452 83		34
Mining cost, direct and indirect	167,971.41		5 07
Mine development costs	57,371.29		1 73
Ore transportation costs	8,285.00		25
Written off for depreciation	11,868 38		35
Total costs and losses		451,538 88	13 60
Profit from mining and milling ore from West End mine		$329,247 61	$9 94
Profit from West End operations in Jim Butler ground, under lease		5,217 39	
Profit from milling sand tails, custom ore and miscellaneous rents and earnings		17,534 73	
Interest		3,000.000	
Profit from West End operations in Jim Butler territory under "Fraction" vein agreement		33,000 00	
		$387,999 73	
Deduct: Strike expense	$20,072 38		
Loss on motor-truck operations	260 73		
Mine examinations outside Tonopah	457.56		
Deferred charges of years prior to 1919, writtenoff in 1919	4,031.98	24,822 65	
Net operating profit, 1919		363,177 08	

The balance of receipts over disbursements amounted to $17,838.67. Disbursements included dividends to stockholders amounting to $162,538.98 on the 1,788,486 shares of $5 par value outstanding. On Dec. 3, 1919, assets totaled $7,750,188.50 and liabilities $2,855,590.77 exclusive of depletion and adjustment accounts; surplus totaled $957,029.83.

On April 1, 1920, the West End Chemical Co., operating at Searles Lake, California, and the West End Opoteca Mines Co. operating in Honduras, C. A., were formed from the parent company by the distribution of one share of stock in each company as a dividend to stockholders in the property owning and parent company, the West End Consolidated Mining Co.

Poderosa Mining Co., Ltd.

Copper; Chile

The eleventh annual report of the Poderosa Mining Co., Ltd., a British corporation, shows a debit balance of £21,977 2s. 1d. for the year's operation. The net receipts from the sales of ore, interest, and transfer fees, amounted to £58,003 9s. 4d., and, after providing for mining, management, and general expense in Chile, London office expenses, depreciation of investments, and income tax amounting to £59,602 17s. 8d., there is a resulting debit balance of £1,599 8s. 4d., to which have to be added the following items: depreciation of building, machinery and plant, £3,208 10s. 4d.; mine development, £12,169 3s., 5d.; Bolivian property, £5,000, thus increasing the debit balance for the year to £21,977 2s. 1d. Deducting this amount from the balance of £29,266 11s. 3d. at credit of revenue account, there remains to that account a credit balance of £7,289 9s. 2d.

During the year 1,498 tons of copper ore of an average assay of 31 per cent copper and 12.97 oz. of silver per ton was shipped to the smelters, as compared to 3,309 tons, assaying 30.7 per cent copper and 12.45 oz. of silver per ton, in 1918.

Buena Tierra Mining Co., Ltd.

Silver-Lead; Mexico

The annual report of the Buena Tierra Mining Co., Ltd., a British corporation, for the year ending Dec. 31, 1919, shows a loss for the period of £11,507 9s. 6d. During the year 9,067 tons of ore was sent for treatment to the smelter, the average content of which was 11.73 oz. of silver and 12.92 per cent of lead, the net smelter return being $97,587, an average of $10.76 per ton. Working costs amounted to $143,611, or $15.40 per ton, which, however, includes $7.48 per ton for development. The profit and loss account for the year shows a net deficit of £4,727 4s. 3d. on Dec. 31, 1919.

Granite Gold Mining Co.

Gold; Colorado

The annual report of the Granite Gold Mining Co. shows a loss of $24,674.22 incurred by operation during 1919. Income from ore sales, royalties, leases, and interest amounted to $56,187.15. Mine expense was $28,123.22, leaving a profit on mine operations of $28,063.93. General expenses totaled $16,760.90 and depreciation charges were $35,977.25, giving a loss chargeable to surplus account of $24,674.22.

June, 1920, Mining Dividends

The following is a partial list of mining dividends paid during June, 1920:

U. S. Mining and Metallurgical Companies	Situation	Per Share	Total
Ahmeek Mining, c	Mich.	$0 50 q.	$100,000 00
Amer. Sm. & Ref., com.	U. S.-Mex.	1 00 q.	609,980 00
Amer. Sm. & Ref., pfd	U. S.-Mex.	1 75 q.	875,000 00
Caledonia Mining, l. a	Idaho	01 m.	26,050.00
Callahan Zinc & Lead	Idaho	.50 q.	161,651.50
Calumet & Arizona, c	Ariz.	1 C0 q.	642,520 00
Calumet & Hecla, c	Mich.	5 00 q.	500,000.00
Chino Copper	N. M.	37½ q.	326,242 50
Copper Range, c	Mich.	50 q.	200,000.00
Cresson Consol. Gold	Col.	10 q.	122,000 00
Federal M. & S., pfd	Idaho	1 75 q.	210,000 00
Grand Central, g. s	Utah	01	15,000 00
Hecla Mining, l. a	Idaho	20 q.-x.	200,000 00
Kennecott Copper	Alaska, etc	50 q -c.	1,393,530 00
Nevada Consol. Copper	Nev.	25 q.	499,864 25
Oroville Dredging, g	Cal.-S. A	9 d.	£25,745.175
Osceola Consol., c	Mich.	50 q.	48,075 00
Ray Consol., c	Ariz.	25 q.	394,294 50
St. Joseph Lead	Mo.	50 q.-x.	704,734 00
Tintic Standard, l. c	Utah	10 q.	117,470 00
United Verde Copper	Ariz.	1 50 q.	450,000.00
Utah Copper	Utah	1 50 q.	2,436.735.00
Yellow Pine, z. l. s.	Nov.	.03 q.	30,000.00

Canadian, Mexican and South American Companies	Situation	Per Share	Total
Cerro de Pasco Copper	Peru	$1 00 q.	$898,229.00
Hollinger Consol. Gold	Ont.	05 bm.	246,000.00
Lake Shore, g	Ont.	.02	40,000.00
Mexico El Oro, g	Mex.	4 sh.	£36,000
Mining Corp. Canada, a Holding Company	Ont.	12½	$207,506.00
St. Mary's Min. Land	Mich.	2 00	320,000 00

Rand Mines, Ltd., which is now listed on the New York Exchange, declared its thirty-fourth dividend of 60 per cent on its common 5s. shares. The Caledonia Mining and the Golden Cycle companies announced a change from monthly to quarterly dividends beginning this month, and Calumet & Hecla has this month resumed the quarterly payments, dropped in December, 1919. Federal Mining & Smelting resumes with this month's disbursement the old rate, dropped a year and a half ago, of $7 per annum. Isle Royale Copper Co. again passed its dividend. The last one was 50c., in September, 1919. New Jersey Zinc Co. stockholders authorized an increase in the capital stock to $50,000,000, and on June 10 received a stock dividend of 20 per cent on $35,000,000.

National Lead Co., of New Jersey, paid its regular quarterly dividends of $1.75 on the preferred and $1.50 on the common stock.

MINING STOCKS

Week Ended July 3, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	*75	*75	*75	
Ahmeek	Boston			61½	June '20, Q .50
Alaska-B.C.	N. Y. Curb	1⅛	⅛	1⅛	
Allouez	Boston			28½	Mar. '19, 1.00
Anaconda	N. Y.	56¾	54¼	56¼	Feb. '20, Q 1.00
Ariz. Com'l	Boston	10	10	Oct. '18,	.50
Big Ledge	N. Y. Curb	⅛			
Bingham Mines	Boston	9	9	9	Sept. '19, Q .25
Calumet & Ariz.	Boston	59	58¼	58½	June '20, Q 1.00
Calumet & Hecla	Boston	320	300	310	June '20, Q 5.00
Can. Copper	N. Y. Curb	1⅛	⅛		
Centennial	Boston			12	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	42¼	41¼	42¼	June '20, Q 1.00
Chief Consol.	Boston Curb	3¼	3⅛	3⅛	Feb. '20, Q .10
Chile Cop	N. Y.	15¼	14⅞	15⅛	
Chino	N. Y.	30	27¼	30	June '20, Q .37½
Columbus Rexall	Salt Lake	*47	*44	*44	
Con. Ariz	N. Y. Curb			⅝	Dec. '18, Q .05
Con. Copper M.	N. Y. Curb			3¼	
Cop. Range	Boston	39	37½	39	June '20, Q .50
Crystal Cop. (new)	Boston Curb	*39	*26	*32	
Davis-Daly	Boston	9	8	9	Mar. '20, Q .25
East Butte	Boston	13	12	12½	Dec. '19, A .50
First Nat'l	Boston Curb	*95	*95	*95	Feb. '19, SA .15
Franklin	Boston	2	1½	2	
Gadsden Copper	N. Y. Curb	*72	*70	*71	
Granby Consol.	N. Y.	35	35	35	May '19, Q 1.25
Greene-Can.	N. Y.	30½	30	30	Feb. '19, Q 1.50
Hancock	Boston	4¼	4¼	4¼	
Houghton	Boston Curb	*60	*60	*60	
Howe Sound	N. Y. Curb			5¼	Apr. '20, Q .05
Inspiration Con.	N. Y.	50	47⅛	50	Apr. '20, Q 1.50
Iron Cap	Boston Curb	9	8½	8½	Feb. '19, M .25
Isle Royale	Boston	30½	30	30⅛	Sept. '19, SA .50
Kennecott	N. Y.	26⅛	24½	26⅛	June '20, Q .50
Keweenaw	Boston			1⅞	
Lake Copper	Boston			3¼	
La Salle	Boston	3¼	2⅞	3	
Magma Chief	N. Y. Curb			*21	
Magma Copper	N. Y. Curb			29	Jan. '19, Q .50
Majestic	Boston Curb	*18	*18	*18	
Mason Valley	N. Y. Curb			2⅛	
Mass. Con	Boston			3⅛	Nov. '17, Q 1.00
Mayflower-O.C.,	Boston	5⅛	5⅛	5⅛	
Miami	N. Y.	20⅛	20	20⅛	May '20, Q .50
Michigan	Boston	4¼	4¼	4¼	
Mohawk	Boston	62	61	61⅞	Feb. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	6	5⅛	5⅞	
Nevada Con.	N. Y.	12⅞	12¼	12½	June '20, Q .25
New Arcadian	Boston	3	2⅞	3	
New Baltic	Boston Curb			3	
New Cornelia	Boston	16⅛	16	16	May '20, .25
Nixon Nev.	N. Y. Curb			*9	
North Butte	Boston	17⅛	16	17	Oct. '18, Q .25
North Lake	Boston			*75	
Ohio Copper	N. Y. Curb			1⅜	
Ojibway	Boston			1⅛	
Old Dominion	Boston	24½	24½	24½	Dec. '18, Q 1.00
Osceola	Boston	39	37½	39	June '20, Q .50
Phelps Dodge	Open Mar.	†195	†180		Apr. '20, Q 2.50
Quincy	Boston	50	49	50	Mar. '20, Q 1.00
Ray Con.	N. Y.	16½	16	16½	June '20, Q .25
Ray Hercules	Boston Curb			*75	
St. Mary's M. L.	Boston	40	39	39	June '20, K 2.00
Seneca	Boston	13½	13⅛	13⅛	
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q .25
Shattuck Ariz.	N. Y.			8½	Jan. '20, Q .25
South Lake	Boston			2¾	
South Utah	Boston	*14	*14	*14	
Superior	Boston			5	Apr. '17, 1.00
Superior & Boston	Boston	3⅞	3⅞	3⅞	
Tenn. C. & C.	N. Y.	10	9⅛	10	May '18, I 1.00
Tuolumne	Boston	*75	*65	*65	May '13, .10
United Verde Ex.	Boston Curb	32	31	31⅛	June '20, Q 1.50
Utah Con	Boston	6⅛	6	6	Sept. '18, .25
Utah Copper	N. Y.	67	64⅛	67	June '20, Q 1.50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17, .30
Victoria	Boston			2¼	
Winona	Boston			*40	
Wolverine	Boston	16	15	15	Jan. '20, Q .50
LEAD					
Hecla	N. Y. Curb	4⅛	4	4⅛	June '20, QX .20
St. Joseph Lead	N. Y.	15⅜	15⅛	15¼	June '20, QX .50
Stewart	Boston Curb	†*18		*16	Dec. '15, .05
Utah Apex	Boston	1⅛	1⅛	1⅛	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	14	13⅛	14	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	48	47	48	May '20, Q 1.50
Butte C. & Z.	N. Y.	7⅞	7⅛	7⅛	July, '18, I .50
Butte & Superior	N. Y.	22⅛	21⅛	21⅛	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	13⅞	13⅛	13⅜	June '20, Q .50
New Jersey Z.	N. Y. Curb	200⅛	196	197	May '20, SA 4.00
Success	N. Y. Curb	*6	*4⅛	*5⅛	July '16, .03
Yellow Pine	Los Angeles	‡		1 02	June '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	
Alaska Juneau	N. Y.	2⅛	2⅛	2⅛	
Carson Hill	N. Y. Curb	28	27⅛	27⅛	
Cresson Consol. G.	N. Y. Curb			1⅛	June '20, Q .10
Dome Ex.	Toronto	*24	*23⅛	*23⅛	
Dome Mines	N. Y.	9⅛	9⅛	9⅛	Apr. '20, Q .25
Golden Cycle	Colo. Sprgs.			*73	May '20, Q .02
Goldfield Con.	N. Y. Curb	*10	*9	*9⅛	Dec. '19, .05
Hedley	Boston			4⅛	June '19, .10
Hollinger Con.	Toronto	5 70	5 61	5 61	June '20, BM .05
Homestake	N. Y			55	Sept. '19, .50
Kirkland Lake	Toronto	*46	*45	*45	
Lake Shore	Toronto	1 18	1 17	1 18	Oct. '19, 02½
McIntyre-Porcupine	Toronto	1 81	1 80	1 81	May '20, K .05
Porcupine Crown	Colo. Sprgs. ‡	*27	*26½	*27	July '12, .03
Portland	Colo. Sprgs. ‡			*60	Apr. '20, Q .01½
Reorgan. Booth	N. Y. Curb	*6	*4⅛	*4⅛	May '19, .05
Silver Pick	N. Y. Curb	*7	*5	*5⅛	
Teck Hughes	Toronto	*8½	*8½	*8½	
Tom Reed	Los Angeles ‡			1.32	Dec. '19, .02
United Eastern	N. Y. Curb	3	2⅛	2⅛	Apr. '20, Q .21
Vindicator Consol.	Colo. Sprgs. ‡			*18	Jan. '20, Q .01
West Dome	Toronto			*6½	
White Caps Min.	N. Y. Curb	*10	*9	*10	
Yukon Gold	Boston Curb			1	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*37	*13	*15	Apr. '20, M .03
Beaver Con.	Toronto	*41	*40½	*40½	May '20, K .03
Casapalca	Toronto	†2 55	†2 90		May '20, Q .25
Crown Reserve	Toronto	*19	*19	*19	Jan. '17, .05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept. '19, 1.00
La Rose	Toronto	†*37	†*33	*33	Apr. '18, .02
McKinley-Dar.	N. Y. Curb			*48	Apr. '20, Q .03
Mining Corp.	Toronto			1.90	June '20, Q .12½
Nipissing	N. Y. Curb	9	8⅛	8⅛	Apr. '20, Q .25
Ontario Silver	N. Y.	6⅛	6	6⅛	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12, .10
Peterson Lake	Toronto	*12⅛	*12¼	*12¼	Jan. '17, .01½
Sil. King Ariz.	N. Y. Curb	*48	*38	*48	
Temiskaming	Toronto	*34	*33	*34	Jan. '20, K .04
Trethewey	Toronto	*29½	*29½	*29½	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2	*1	*2	
Barnes-King	Butte	‡		1 28	Nov. '19, Q .05
Bost. & Mont.	N. Y. Curb	*63	*60	*62	
Cashboy	N. Y. Curb	*7	*6	*6½	
El Salvador	N. Y. Curb	2⅛	2	2⅛	
Jim Butler	N. Y. Curb	*13	*12	*13	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*6	*4⅛	*5⅛	June '16, .05
Louisiana Con.	N. Y. Curb	⅛	⅛	⅛	
MacNamara M.	N. Y. Curb	1⅛	⅛	1⅛	May '10, .02½
N.Y. Hond. Rosar.	Open Mar.	†13⅛	†12⅛		Apr. '20, Q .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	1⅛	1⅛	
Tonnpah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	Apr. '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '19, SA .15
West End Con.	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*24	*22	*23	June, '20, M .01
Consol. M. & S.	Montreal	26	25	25⅛	Apr. '20, Q .62½
Daly-West	Boston			4⅛	Apr. '20, Q .15
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q .10
Electric Point	Spokane	36	35	35	May '20, SA .03
Fed. M. & S.	N. Y.			13⅛	Jan. '09, 1.50
Fed. M. & S. pf.	N. Y.	36⅜	36	36	Juqe, '20, Q 1.75
Florence Silver	Spokane			*45	Apr. '19, .01½
Iron Blossom	N. Y. Curb	⅜	⅛	⅛	Apr. '20, Q .02½
Judge M. & S.	Salt Lake			4 00	Apr. '20, A .12½
Marsh Mines	N. Y. Curb	*13	*10	*11	
Prince Consol.	N. Y. Curb	⅜	⅛	⅛	Nov. '17, .02½
Rambler-Cariboo	Spokane			*12½	Feb. '19, .01
Rex Con.	N. Y. Curb	*7	*6	*7	
Salt Lake	Salt Lake			*94	Sept. '19, K 0.15
Stand. S. L.	N. Y. Curb	⅛	⅛	⅛	Oct. '17, .05
Tamarack-Custer	Spokane	2.55	2.50	2.55	Dec. '19, K .03
Tintic Standard	Salt Lake	3 10	2 90	3 10	June '20, Q 0.10
Wilbert	N. Y. Curb	*5	*4	*4	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	17⅛	17	17⅛	Mar. '19, .50
Internat'l Nick.pf.	N. Y.			82	May '20, Q 1.50
QUICKSILVER					
New Idria	Boston			6	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb			*10	
VANADIUM					
Vanadium Corp.	N. Y.	92	82¼	92	Apr. '20, I 1.50
ASBESTOS					
Asbestos Corp.	Montreal	85	81	83	Apr. '20, Q 1.25
Asbestos Corp. pf.	Montreal	93½	92½	92¼	Apr. '20, Q 1.50
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	60	57	60	June '20, Q 1.00
Am. S. & R. pf.	N. Y.	90	90	90	June '20, Q 1.75
Am. Sm. pf. A	N. Y.	73½	73⅛	73⅛	Apr. '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	59⅛	57	59⅛	Apr. '20, Q 1.50
U.S.S.R.& M. pf.	Boston	45	43⅛	45	Apr. '20, Q .87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3 55-7 00	7 09	7 02	8 25	$6 62- 8 00	4 57
No. 12	3 60-7 05	7 09	7 07	8 30	6 67- 8 05	4 62
No 14	3 65-7 10	7 09	7 12	8 35	6 72- 8 10	4 67
Black:						
Nos. 18 and 20	4 15-7 30	8 10	7 80	9 35	7 80- 8 80	5 17
Nos. 22 and 24	4 20-7 35	8 10	7 85	9 46	7 85- 8 85	5 22
No. 26	4 25-7 40	8 10	7 90	9 45	7 90- 8 90	5 27
No. 28	4 35-7 50	8 10	8 00	9 55	8.00- 9 00	5 37
Galvanized:						
No. 10	5 80 7 50	9 60	8 50		8 25 10 00	5 50
No. 12	4 80 7 60	9 60	8 60	10 10	8 35 10 10	5 55
No. 14	4 80 7 60	9 60	8 60	10 10	8 35 10 10	5 60
Nos. 18 and 20	5 10 7 90	9 60	8 90	10 40	8 65 10 40	5 90
Nos. 22 and 24	5 25 8 05	9 60	9 05	10 55	8 80 10 55	6 05
No. 26	5 40 8 20	9 60	9 20	10 70	8 95 10 70	6 20
No. 28	5 70 8 50	9 60	9 50	11 00	9 25 11 00	6 50

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled. Automobile sheets are unavailable, except in fugitive instances, when prices range to 15c per lb.

STEEL RAILS—The following quotations are per ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$45 00@$60 00	$45 00	$45 00@$60 00	$45 00
Standard openhearth rails	47.00@ 60 00	47 00	47 00@ 60 00	47 00
Light rails, 8 to 10 lb.	50@ 55	2 585*	2 585*@ 3 75	2 835*
Light rails, 12 to 14 lb.	49@ 75	2 54*	2 54*@ 3 75	2 79*
Light rails, 25 to 45 lb.	49@ 75	2 45*	2 45*@ 3 75	2 70*

* Per 100 lb.
NOTE—The lower price is that of the U. S. Steel Corp.

TRACK SUPPLIES The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝ in. and larger	$4 00	$3 25	$3 62	$5 34	$5.65
Track bolts	6.00- 6.50	4 90	4 62	6 50	6 65
Standard section angle bars	3 50-4 00	3 00	3 02	3 00	4 90

STRUCTURAL MATERIAL The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the $2.55 places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in	$2 45@ $3 75	$4 47	$3 47	$4 04	$3 97
Channels, 3 to 15 in	2 45@ 3 75	4 47	3 47	4 04	3 97
Angles, 3 to 6 in., ¼ in. thick	2 45@ 3 75	4 47	3 47	4 04	3 97
Tees, 3 in. and larger	2 45@ 3 75	4 52	3 52	4 09	4 02
Plates	2 65@ 3 75	4 67	3 67	4 24	4 17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2 55@$3 65	$2.55@$3.65	$2 55

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL Mill Pittsburgh	New York Current	New York One Year Ago	Chicago	St. Louis	San Francisco	Dallas
½ in. and larger	$4 50	$6 00	$5 05	$5 37	$5.44	$6 65	$7.50
	CONE HEAD BOILER						
½ in. and larger	4.60	7 10	5 15	5 47	5 54	6.75	7.50
⅞ and 1	4.75	7.25	5.30	6.62	5.54	7.00	7.50
⅛ and ⅞	5.00	7 00	5 55	5.97	5 54	7.25	7.75

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	50%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, iron rigging and guy ropes, +17½%; bright plow, 25% off.
Chicago, + 12½ on galvanized, 30 off on bright.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Birmingham
Straight	$5 75	$7.50	$7 00	$7 00	$7.00
Assorted	5 85	7 50	7.15	7 15	7 25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars.....$2.35@$4.00 Steel bars.....$4 27@$4 50

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago
$0 10	$0.16½	$0.18	$0.11	$0.15

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham
Solid	12@14c.	13c.	15c.
Hollow	16c.	.....	.....

STEEL AND IRON—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

BUTT WELD

Inches	Black	Galv.	Inches	Black	Galv.
¼ to 3	57 @ 54	44@ 41½	⅛ to 1¼	34½ @ 24½	18½ @ 8
			2 and 2½	33½	17½

LAP WELD

2	50½ @ 47	38 @ 34½	2	28½ @ 20½	14½ @ 6½
2½ to 6	53½ @ 50	41 @ 37½	2½ to 6	30½ @ 22½	17½ @ 9½
7 to 12	50½ @ 47	37 @ 33½	7 to 12	27½ @ 19½	14½ @ 6½
13 and 14	41 @ 37½	.....			
15	38 @ 35	.....			

BUTT-WELD, EXTRA STRONG, PLAIN ENDS

⅜ to 1¼	55½ @ 52	39½	⅜ to 1¼	34½ @ 24½	19½ @ 9½
2 to 3	56½ @ 53	44 @ 40½	2 and 2½	34½ @ 24½	19½ @ 9½

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	48½ @ 45	37 @ 33½	2	29½ @ 21½	16½ @ 8½
2½ to 4	51½ @ 48	40 @ 36½	2½ to 4	31½ @ 23½	19½ @ 11½
4½ to 6	50½ @ 47	39 @ 35½	4½ to 6	30½ @ 22½	18½ @ 10½
7 to 8	46½ @ 43	33 @ 29½	7 to 8	22½ @ 14½	10½ @ 2½
9 to 12	41½ @ 38	28 @ 24½	9 to 12	17½ @ 9½	5½ @ 5½

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
⅜ to 3 in. butt welded	40%	40%	40@54%
2½ to 6 in. lap welded	35%	42%	40@50%
	Galvanized New York	Cleveland	Chicago
⅜ to 3 in. butt welded	24%	31%	30 @ 40½%
2½ to 6 in. lap welded	20%	27%	27½@ 37½%

Malleable fittings, Class B and C, from New York stock sell at list plus 22½%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$4 00	$1 28	$0.75	$1 90	$0 50	$2 00
Hot pressed hexagon	+ 4 00	85	.75	1.90	50	2 00
Cold punched square	+ 4 00	1 00	75	1.90	50	1 30
Cold punched hexagon	+ 4 00	1 00	75	1 90	50	1 30

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50 10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅜ by 4 in. and smaller	list	20%	20%
Larger and longer up to 1 in. by 30 in	+20%	20-10%	10%

WASHERS From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York.....1 list Cleveland..$3 00 Chicago.....$3.00
For cast-iron washers the base price per 100 lb. is as follows:
New York.....$7 00 Cleveland..$4 50 Chicago. $4 75

CONSTRUCTION MATERIALS

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	1-Ply c.l.	2-Ply l.c.l.	3-Ply c.l.
No. 1 grade	$2.40	$2 90	$3 45
No. 2 grade	2.15	2 00	3 10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $3.50 per roll in carload lots and $3 75 for smaller quantities.
Shingles, red and green slate finish, cost $7.75 per square in carloads; $8.00 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq.ft.) per roll	$3 50
Tar pitch (in 400-lb. bbl.) per 100 lb	1 85
Asphalt pitch (in barrels) per ton	46 50
Asphalt felt (light) per ton	118.00
Asphalt felt (heavy) per ton	119 50

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis	$0.087	$0.158	$0.248
Seattle	.09	.175	.30
Los Angeles	.10	.175	.....
New Orleans	.238	.304	.43
Cincinnati	.125	.2186	.3286

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under			12 x 12-in. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$100 00	$85.00	.....	$80.00	$110 00	$105 00
Kansas City	51 00	51 25	$51.25	51.25	60.00	51.25
Seattle	.....	34.00	.....	.....	.....	35.00
New Orleans	53 00	.....	.....	.....	59 00	.....
St. Paul	62 00	61 00	61.00	47.50	43 00	58.00
Atlanta	62 50	64 50	66.00	76.00	79 50	82.00
Baltimore	75 00	.....	.....	.....	87 50	.....
Cincinnati	45 00	50.00	50.00	.....	55.00	55.00
Montreal	80 00	80.00	65.00	75 00	73.00*	100 00
Los Angeles†	.....	57.00	.....	.....	.....	59.00
Denver	.....	65.00	65.00	65.00	.....	66.00

	1-In. Rough, 10-In. x 16-Ft. and under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$115.00	$85.00	$65.00	$100 00	$85 00
Kansas City	102 00	106.50	106.50	113.00	112 75
Seattle	.....	37 50	.....	.....	38.50
New Orleans	61 00	.....	.....	67 50	.....
St. Paul	54 00	54.00	53.00	64 50	58 50
Atlanta	85 00	90.00	.....	77.50	87.50
Baltimore (box)	65@ 67 50	.....	.....	60–65 00	.....
Cincinnati	50.00	55.00	50.00	45 00	50.00
Montreal	75.00	75 00	66.00	.....	.....
Los Angeles	.....	58.00	.....	.....	.....
Denver	.....	62.00	62.00	140.00	127.50

*Montreal—Up to 32 ft.; over which, $3.00 per M. increase up to 30 ft.
† Base price, 2 x 3's and 2 x 4's, 8 to 14 ft., is $54 00
Detroit—Dimension stuff ranges from $60 to $68.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.25@4	$4.50	$6.90	$4.15	$5.50
Cut	.....	5.40	7.40	6.45	6.90

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago Without Bags
New York (delivered)	$3.80	$3.30	$2.30
Jersey City (delivered)	2.97	2.47	2.27
Boston	2.60	2.60	2.42
Chicago	2.15	2.15	2.00
Pittsburgh	2.20	2.20	2.05
Cleveland	2.42	2.42	2.32

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$19 50	$18.50	$3.50 at plant	$3 30
Kansas City	27.20	26.20	2.50	2 40
Chicago	.....	.....	2.40	1 75
St. Louis	25.00	21.00	.....	2.25
Boston	26.25	24.25	3.40†	3.25†
San Francisco	23.50	19.50	.....	2.25
Minneapolis	24.00	19.00	1.80†	1.60
New Orleans	.....	2.25†	.....	2.45

NOTE—Refund of $0.10 per barrel.
* 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	$1.58	$1.90	$2 02	$2.10
5-gal. cans	1.60*	2.03	2.27	2.30

*To this price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		One Year Ago		Current Dry and In Oil		1 Yr. Ago Dry and In Oil	
	Dry	In Oil	Dry	In Oil				
100-lb. keg	15 50	17.00	13.00	14 50	15 50		13.00	
25- and 50-lb. kegs	15 75	17.25	13.25	14 75	15 75		13.25	
121-lb. keg	16.00	17 50	13 50	15 00	16 00		13 50	
5-lb. cans	18 50	21 00	15 00	16.50	18 50		15 00	
1-lb. can	20 50	22 00	16 00	17 50	20 50		16 00	

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	
Underwriters' 2½ in.	.....	$0.85 per ft.
Common, 2½-in.	.....	30%

	AIR		
	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.60	$0.40	$0.30

STEAM—DISCOUNTS FROM LIST

First grade..... 20% Second grade.... 30% Third grade..... 35%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	30%	20%

RAWHIDE LACING—For cut, best grade, 25%; 2nd grade, 30%. For laces in sides, 79c. per sq. ft.; 2nd, 75c. For semi-tanned: cut, 20%; sides, 83c. per sq. ft.

MANILA ROPE—For rope smaller than ¼-in. the price is ¼ to $0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜-in., 6; ½-in., 4½; ⅝-in., 3; ¾-in., 2 ft. 10 in.; ⅞-in., 2 ft. 4 in. Following is price per pound for ¼ in. and larger, in 1200-ft. coils:

Boston	$0 30½	Kansas City	0.305
New York	.29	New Orleans	.29
Cincinnati	.27	Seattle	.28
Chicago	.275	St. Louis	.265
St. Paul	.275	Atlanta	.295
San Francisco	.27		

PACKING—Prices per pound.

Rubber and duck for low-pressure steam	$1.00
Asbestos for high-pressure steam	1.70
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.30
Asbestos wick, ½- and 1-lb. balls	.85

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$1 75	$1 60
Chicago—Creosoted	1 95	1 80
San Francisco—Douglas fir, green	1 74	1.24
San Francisco—Douglas fir, creosoted	3 36	2 38

Prices per tie at Missouri mills—St. Louis prices about 25c. higher.

Untreated A Grade White Oak	6x8x8	Untreated A Grade Red Oak	6x8x8
No. 1	$0 70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98	No. 5	.87
7x9x8 white oak	1 05		
7x9x8 red oak, No. 4	80		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago	
		In Bbl.	Carloads
Pure steam-distilled pine oil, sp.gr. 0.93 0.94	$1.80	$2 00	$1 95
Pure destructively distilled pine oil	1.60	1.90	1.85
Pine tar oil, sp.gr. 1.025-1.035	.48	.45	.43
Crude turpentine, sp.gr. 0.900 0.970	1.75	2.25	2 18
Hardwood creosote, sp.gr. 0.96–0.99*	.35	.....	.....

*F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11 00 15 50	13 00	16.00	11.00-14 00
Colored mixed	7 00–10 50	9.00–12.00	12.00	9.50–12.60

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13½
Cleveland	$55 00	$65 00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder
New York		$0.3425	$0.3425	.....	$2 30
Boston	$0.225–24	.245–28	.25–31	.3525	2 40
Kansas City	.2475	.27	.30	.3425	2 45
New Orleans	.2425*	.2825	.2825	.38	2.45
Seattle	.18	.2175	.2475	.29	2.60
Chicago	.2175	.2525	.2975	.34	2.45
St. Paul	.185	.2275	.2525	.2950	2.25
St. Louis	.2175	.26	.285	.295	1.90
Denver	.205	.2475	.2725	.315	2 50
Dallas	.265	.275	.3025	.....	2 60
Los Angeles	.22	.27	.31	.....	2 95
Atlanta	.22	.245	.265	.....	2.55
Baltimore	.225	.2675	.3075	.325	2.40
Cincinnati	.2275	.2525	.2725	.....	2.30
Montreal	.28	.31	.34	.38	3.90

* For 50%.

CHEMICALS

SODIUM CYANIDE—New York price is 24@ 25c. per lb.; Chicago, 30c.; St. Louis, 31c.; Birmingham, 45c.

SODIUM SULPHIDE—New York price per pound is 9c.@ 10c. for concentrated, Chicago, 5c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 12½c. per lb.; Chicago, 12½c.; St. Louis, 12c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1.52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union Single 25-Lb. Drums	Union 25-Lb. Ton Lots
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52	$1 49
Southeastern portion U. S. A.	115 50	110.50	1.63	1.60
Texas (except E. Paso)	124 00	119.00	1.74	1.71
El Paso, Texas	126.00	121 00	1 77	1.73
Denver, Colo	124 00	119 00	1 74	1.71
West Coast	129.00	124 00	1.81	1 77

INDUSTRIAL NEWS

Oliver Continuous Filter Co., Hooker-Lent Building, San Francisco, Cal., is opening a London office to be in charge of J. F. Mitchell-Roberts.

Albert E. Jenkins, connected for many years with the technical staff of the Grasselli Chemical Co., Cleveland, Ohio, died of heart disease Tuesday, June 22.

Western Electric Co., Inc., has opened a supply sub-warehouse at 930 West Rayan Ave., Youngstown, Ohio. C. A. Strauss is in charge of sales, and H. B. Bergman in charge of stores.

Refinite Company, Omaha, Neb., has purchased ownership and control of **L. M. Booth Co.**, New York, N. Y., makers of Booth Lime-Soda water softener for large steam power and central heating plants.

General Briquetting Co., 25 Broad St., New York, N. Y., announces that Henry Schoch, of that company, has been elected vice-president of **Nukol Fuel Co.**, Toronto, Ont., and now has headquarters in Toronto.

National Industrial Traffic League, Chicago, Ill., announces that on June 1, Joseph H. Beck, of St. Paul, Minn., assumed the duties of executive secretary, vice Guy M. Freer, deceased. His address is 411 Tacoma Bldg., 5 North LaSalle St., Chicago.

Nordberg Manufacturing Company, Milwaukee, Wis., announces that B. V. E. Nordberg has been appointed sales manager. H. W. Dow, former sales manager, recently resigned to become vice-president and engineer of the Forest Products Chemical Co., Memphis, Tenn.

Worthington Pump & Machinery Corporation, 115 Broadway, New York, N. Y., has purchased from the Platt Iron Works, Dayton, Ohio, drawings, patterns, good will and name on the latter's lines of oil mill machinery, hydraulic turbine line, feed water heaters, and high pressure air compressors.

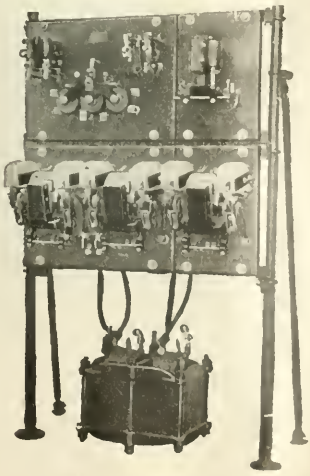
Metal & Thermit Corporation, New York, N. Y., announces the appointment of Charles F. Lederer to its rail-welding department. Mr. Lederer was recently superintendent of the way of the Milwaukee Electric Railway & Light Co., a company he had been with since 1908, and has had extensive experience in the application of Thermit in solving way department problems.

Dwight P. Robinson & Co., Inc., 125 East 46th St., New York, announce consolidation with Westinghouse, Church, Kerr & Co., Inc., under the former's name. Dwight P. Robinson is president and A. K. Wood, a vice-president and treasurer of the consolidation. H. H. Kerr is a vice-president in charge of the Chicago office, and W. L. Murray is secretary. Among the members of the directorate are Paul D. Cravath, John R. McGinley, and Harry T. Peters.

Edward Dauble, president of Union Tool Co., Torrance, Cal., died suddenly May 27 following an operation. Mr. Dauble was a native of Titusville, Pa., in his forty-sixth year. He early began to develop oil well drilling tools and machinery. In 1898 he went to Santa Paula, Cal., but soon moved his well-tools plant to Los Angeles, and in 1908 he consolidated his own great factory with the American Engineering & Foundry Co., forming the present Union Tool Co. This is one of the great plants of the southwest and now has works at West Chicago, Ill., Carnegie, Pa., and Torrance, Cal.

Starter for Mine-Fan Motors

The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has developed a control panel for the automatic starting of polyphase squirrel-cage induction motors driving loads of great inertia, such as mine fans, which require several minutes to come up to speed. This controller is essentially an automatic starter of the auto-transformer type, and consists of three double-pole magnetic contactors, two auto-transformers, a current-limit relay, and a time-limit relay, with the necessary auxiliary magnetic switches. The switch equipment is mounted on slate panels carried on a floor frame, with the transformers mounted separately. One contactor acts as a main-line switch, and the two other contactors connect the motor to the starting taps of the transformers and to the line respectively. The interval between the closing of the second and third contactors, which is the time given the motor to come up to speed, is governed by the series-current relay and the dash-pot relay, either of which is externally adjustable for current of time values. The starter may be controlled from remote points; and, the adjustable feature of its two relays adapt it to almost all operating conditions.



AUTOMATIC STARTER FOR MINE FAN MOTORS

The Balanced Skip-Hoist Transporter

An Improved Coal-Handling Equipment Hoists and Distributes Materials at Half Previous Cost

BY WARREN TRAVELL

So much attention has been given during the last few years to the design and construction of material-handling apparatus, that a radical improvement in this line is hardly to be expected, and, when made, is a matter of interest to many. Such an improvement has recently been patented by the writer and is now being manufactured by the Exeter Machine Works, Inc., 30 Church St., New York.

Of all the many forms of hoisting equipment which have been developed and used for the saving of labor, the skip-hoist probably holds the first position as regards priority. The earliest type consisted simply of a windlass with a tub or bucket; later, guide rails were added, and a cage structure was adopted, resulting finally in the modern passenger elevator and the deep mine hoist of great speed and capacity.

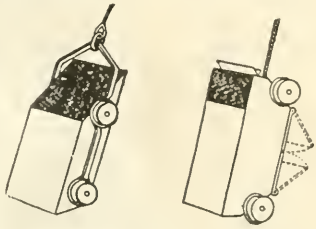


FIG. 1. EXETER MACHINE WORKS IMPROVED SKIP

One branch of this development dating back more than a hundred years produced the inclined skip-hoist having a skip with four wheels running on a pair of inclined rails. To automatically dump the skip, the tread of the upper pair of wheels was made narrower than that of the lower pair, and the track for these wheels was curved at the upper limit of hoist, and a wider gage track carrying the lower wheels was continued straight on for a short distance. This gave a simple and efficient hoisting machine and one which in thousands of installations has proved entirely satisfactory.

An important improvement has recently been made by which the same skip which elevates the material also transports the material horizontally, a single device doing the work which previously required two machines.

That the skip may be able to carry its load both vertically and horizontally without spilling, a radical change has been made in the form of its construction. The ordinary skip is simply a box with open top and equipped with four wheels and a hinged bale. The improved skip, as Fig. 1 shows, has an opening in the upper portion of the front side for receiving its load and

single- or double-hinged doors on the opposite side for discharging the load when the skip is running on a horizontal track.

The filling of the skip is accomplished preferably by a chute from a hopper.

The doors or valves of the skip are held in closed position by a latch. Discharging of the skip's load is accomplished by the tripping of this latch. The latch trip may be easily shifted along the track as required. A further improvement consists in having the trip carried on a traveling frame, which is moved back and forth by a hand winch conveniently placed.

The entire weight of the skip and half of its load is balanced by a counterweight which operates only during the vertical motion of the skip. In lowering the empty skip, the motor works to raise the counterweight, doing the same amount of work as in hoisting. As the weight of the skip is frequently as great as that of the load itself, this arrangement in such a case makes it possible to reduce the size of the motor and the unbalanced strains in the hoisting machine to one-quarter, in the ordinary unbalanced hoist, or to one-half of that for the less common type of double hoist.

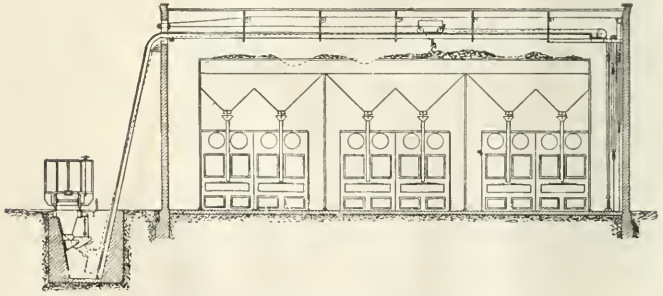


FIG. 2. BALANCED SKIP-HOIST TRANSPORTER

On reaching the top of the vertical rise, the skip engages and carries along with it a bar which is connected by cable to a third counterweight which operates to pull the skip backward after being discharged.

Automatic switches reverse the motor at both ends of the skip's run. By this means, in combination with the automatic filling device, the skip-hoist is made entirely automatic in operation and requires only the occasional services of an operator to keep the machinery oiled and to shift the traveling tripper when this is used.

The skip may be of any suitable capacity and the height of lift and length of run of any reasonable distance, and a skip of two tons capacity will handle 150 tons of coal per hour. The equipment is extremely simple, the cost of maintenance and repairs is reduced to a minimum, and the amount of power wasted by friction is very small. The size of the motor is reduced by one-half, its current demand evened up, and automatic operation reduces the expense required for its attendance to a minimum.

Non-Destructive Belt Joining Solves Unusual Problem

The problem of handling of hot cement clinkers at a temperature of 200 deg. and over was solved at the plant of the Standard Portland Cement Co., Leeds, Ala., in an interesting and cost-reducing manner, by using Goodyear Hy-temp rubber conveyor belt running at an incline of 12 deg., so that the lower pulley dipped into a trough of water, thus carrying a film of cold water upon the belt, on to which the hot clinker from the loading hopper was deposited.

In order to join the belt so that the belt's full strength would be retained, and in a way which would withstand the extremes of temperature, the wear on the pulleys, and the abrasion of the clinker, Crescent belt fasteners were adopted. These brought the belt ends tightly together in a snug joint, which made the belt practically endless on the pulley side, so there was no opportunity for clinker ash to get into the joint and abrade the belt ends. By this method of joining, no metal came in contact with the pulleys to cause wear, and a permanent joint was thus assured. Moreover, the exceptional strength of the heads of the Crescent rivets and the formation of "Crescent Plates" prevented destruction of belt joint through abrasion by the clinker. In six months of operation this conveyor has carried 61,000 tons of clinker, and the Standard Portland Cement Co. credits it with a saving of $300 in belt cost alone.

Not alone on heavy drives, such as tube mill drives, Griffin mills, crushers, and heavy conveyors, are Crescent belt fasteners successfully used, but also on lighter drives of all kinds where dependability is an economic factor, as they assure continuous production. The Crescent Belt Fastener Co., 381 Fourth Ave., New York, has published a new handbook illustrating Crescent belt fasteners in use on many different kinds of belting and under different conditions, and giving full data regarding their use. It will be gladly sent upon request.

TRADE CATALOGS

Hand Drills.—Ingersoll-Rand Co. are offering a fourth type of their "Jackhamer" drills, which is smaller and lighter than others of similar construction. Its weight is but 21½ lb., and it is recommended for bench work in soft stone quarries, trimming in metal mines and pop-hole work in open-pit workings. It is listed as BAR-33.

Brass—The Bridgeport Brass Co., Bridgeport, Conn., has issued an illustrated book of 78 pp., entitled "Seven Centuries of Brass Making." The book describes and illustrates in detail the art of brass making from early times up to the most modern practices, including the electric casting shops. The important steps in the making of tubes, sheets, rods, and wire are also shown. Following the description of the Bridgeport shops, the properties of brass as affected by composition, cold-working, and heat treatment are discussed. The arrangement of the material is excellent, and the issue constitutes a valued contribution to the history of the brass-making industry.

Centrifugal pumps of the single-stage and multi-stage types for various services are described in a handsomely illustrated catalog just issued by the De Laval Steam Turbine Co., Trenton, N. J. Manufacture is on an interchangeable basis, permitting of the supplying of finished repair parts made to accurate dimensions. The present publication describes these and other details, and also explains fully the use of pump characteristic curves in adapting pumps to various services, the adaptation of centrifugal pumps to different types of drives, and give the information required by the manufacturer in order to design a pump to meet given conditions. Formulas and tables for calculating horsepowers, efficiencies, the readings of Venturi meters, friction in pipe lines, and similar data ore also given.

Lighting Industrial Interiors

The Detroit Graphite Co., Detroit, Mich. has recently issued a bulletin, "Lighting Industrial Interiors," which calls attention to the adoption of many fixed principles by illuminating engineers and executives in relation to industrial lighting. As a means of reducing the costs of artificial lighting and accidents, and as an aid to sanitation and general conditions, the use of white paint for interiors is highly commendable, and the excellent qualities which are attributed to "Sta-White," a product manufactured by the Detroit Graphite Co., will be of considerable interest to operators of various industrial plants. In the mining field, the use of such a paint has proved very successful at laboratories, shops, mills, charge houses, and hoist and boiler rooms.

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Volume 110 New York, July 17, 1920 *Number* 3

The Bankers and the McFadden Bill

THE report of the special committee of the American Bankers' Association on the McFadden bill is about what we could reasonably expect. Bankers have always shown themselves strong in practicing their art, but weak on the insight into its workings. Now they are afraid of tampering with the "gold standard." They say, "Nearly all the European states are on a paper basis. Only a few of the smaller countries of Europe are even approximately maintaining the gold standard. The United States, par excellence, and Japan as well, stand out conspicuously as nations maintaining the gold standard."

Surely this shows surprising lack of comprehension or candor. All countries of Europe are on a gold basis, but the value of their paper diminishes as their gold basis shrinks. The United States is on a similar basis, and its paper money is relatively more valuable, because of the larger amount of gold security underlying it. But it is still inflated, and that is one of the reasons for high prices; the bankers themselves admit that in general talk, and the necessity for deflation is recognized.

Again, "All the world believes that our dollars are as good as gold. We enjoy a proud pre-eminence in this respect, and it should be zealously guarded and maintained. The belief which obtains in the world today that our dollars are as good as gold must be maintained." There is the mi'k in the cocoanut. We know quite well that our dollars are not as good as gold, but we must not admit it to the world. England also maintains that her five-pound notes are as good as gold, but exchange rates show that America does not admit this, and reflect the different grade of underlying gold security. Were there a country having a larger percentage of gold to paper than the United States, the dollar wou'd be at a discount in it. Actually, our dollar is now at a discount in Argentina and Japan. The Argentine peso, nominally worth $0.96 of our money, is quoted at $1.07; and the Japanese yen, nominally worth a little less than $0.50, is quoted around $0.51.

The report reiterates the same old economic principle, true of business on a gold basis, but which bankers do not seem to realize is not true of business on an inflated, semi-paper, or paper basis; and therefore absolutely inoperative in most countries at this time. It is that "diminished gold production in periods of high prices and high costs tends to reduce prices and costs again." Apart from the obvious lack of application of the theory, the facts at present sufficiently show this law inoperative. Otherwise, why the continual skyrocketing of prices, while the amount of gold relative to currency and credit diminishes? It is because we do not transact our business on a gold basis, and the elemental textbook laws which our bankers quote are not operative, except so feebly as to be powerless; nor will they operate according to specifications till we close up the gap between gold and credit. One way is to increase production of gold; another is to reduce credit and thus promote deflation. We should do both.

An increased production of gold in this country—in all countries—is most desirable and necessary, and the McFadden bill provides a method which might well be adopted. Let us be honest and say that it does recognize the existing difference between a paper dollar and a gold dollar, which is in a less degree like that between a paper franc and a gold franc, the latter being worth as much as ever. But any remedy must admit this: even the measures of the Federal Reserve Bank to reduce inflation admit it.

Keeping Step With Progress

ROUTINE, at best, secures a productiveness that is dependent on manipulative skill, either of labor, machines, or both, and the output, or result, is necessarily limited by capacity. To exceed this limit—in other words, to increase capacity, reduce costs, or bring about greater efficiency—it is necessary to break away from a former routine and to adopt other methods, which may include the installation and usage of new equipment, a different order in the performance of the work, and certain changes that necessarily follow deviation from former accepted practice. Often the change is a slight one, although the degree of variation is indeed no measure of what may be accomplished, for it is a truism that the smallest alteration of a detail may be productive of great results.

One of the fundamental purposes of the great technical societies is to encourage the interchange of ideas and opinions, and this is also true of the smaller local organizations of a similar nature, each performing a function that is most necessary if the industry represented is to flourish and keep in step with the ever-changing order.

The technical press plays no small part in spreading the gospel of development and improvement. Reaching out, as it does, in many directions, and obtaining new ideas from a number of sources, it is able to present from different angles the opinions and methods of the practical man as well as the theorist.

Mining and smelting companies make it a practice to encourage their men to visit other districts and plants, realizing that by so doing the employees come in contact with many new practices, many of which can be adopted to advantage in their own establishments.

All of these ideas are progressive—the society membership, the technical press, the inter-plant visit; each presents its opportunity for the expression of opinion and for profitable observations.

Without a certain order or routine, real accomplishment is impossible. It is essential that the most efficacious method be found, and that routine, when adopted,

should be the best that can be devised under the circumstances and conditions.

The best results in mining or in any other operation are seldom attained by "snap judgment." They flow from a careful selection of some practical method, or a modification of it, which has already proved to be satisfactory and efficient.

The Future of Mining

LIVING in a mining camp in its initial stages is to live in an atmosphere of hope; for, discounting the few pessimists that are always present, there is the buoyant spirit of youth, the elemental outdoors, and the absence of the cluttering fussiness of the city. Turning forward the hands of the clock to the time when half the stamps are hung up, and the dawn is broken by a few lonesome whistles where formerly a medley stirred one to action, it is not difficult to see why an air of pessimism should pervade the streets of the camp. Consciously or unconsciously, the dweller in such an atmosphere expresses the thought that mining is dead.

The state of mind induced by the closeness of the local condition is unhealthy for the individual thus inflicted. Mining has its ups and downs locally, nationally, and internationally. A single mine may discover a bonanza after a heart-breaking period of purse-emptying prospecting. A decade may disappear without a new Cripple Creek or a Goldfield. But bear in mind that all industry is subject to similar vicissitudes. Mining is a bedrock industry.

Our civilization is a metal- and mineral-consuming civilization which is growing at a pace that can scarcely be realized by the puny individual. The per-capita consumption of the different metals increases year by year.

The situation in the petroleum industry (which is the subject of continued discussion) is illuminating. The rapid increase in the use of automotive appliances and internal-combustion engines raises the important question not only of where future supplies of petroleum are to come from, but awakens concern respecting the use and conservation of even present needs and resources. Admitting the rapid development in every oil field, the prospective supply can hardly keep pace with the increasing demand.

In sharp contrast is the existing condition in the copper industry. Restricted production due to a torpid market, with consequent low prices, has caused the more timid in the mining industry to inquire anxiously as to the future of the copper-mining industry. The future is assured. The present condition is only a passing phase, a temporary ebb in the demand tide. A decade or more may produce a condition in the copper market similar to that now existent in the petroleum industry. We appear to have now a sufficient number of copper mines to supply the demand, but some will be worked out and disappear, and it is problematical whether new mines can be brought to production fast enough to cope with the per-capita increase in the consumption of copper. When we look at the ever-growing electrical power development, the ever-increasing market for electrical appliances, we can visualize a greater and greater per-capita consumption of copper. It is so with many other metals and with minerals. Mining is inevitable.

The kind of civilization now existent is not going to change materially, but rather will it extend itself in the direction now indicated. The miner will be hard put to meet this ever-increasing demand.

Mineral discovery is not as easy as it once was. Metal and mineral prices may be expected to increase materially as a consequence. Just as the "porphyry coppers," once thought to be too low-grade to work, have by improved and new methods become profitable, so will other metalliferous deposits, under the stimulus of high prices, become workable. Viewed broadly, the mining industry affords little opportunity for pessimism.

Lubrication of Air Drills

THE importance of lubrication in the economical operation of machines of various kinds has gradually won recognition. In steam engines, pumps, and particularly in high-speed machinery of all kinds, efficient lubrication by a system which will be continuous in its operation and almost entirely automatic is an accomplished fact. In hard-rock mines the air drill is preeminently important. With the former type of piston drill, lubricants were applied at two points. One was at the rotating mechanism. By removing a screw plug the lubricant could be applied at intervals, the movement of the mechanism carrying the oil to all parts. The other was by means of a small cup placed on the air pipe close to the valve chest. By filling this with lubricant and opening the valve, the lubricant was swept into the valve mechanism and carried into the cylinder. By applying the lubricant at sufficient intervals, the drill could be efficiently operated. Everything, however, depended upon the alertness of the drill runner.

With the advent of the hammer type of drill, a high-speed machine, the method of lubrication just described was inadequate. Some of the earlier and, in fact, fairly successful types of hammer drills failed to give all the service that was possible, on account of this all-important lubrication. Inadequate lubrication increased power requirements and repairs. A system that would be continuous with only occasional attention on the part of the drill runner was essential.

In the development of hammer drills the manufacturing companies did not overlook this important feature of lubrication. An exhaustive investigation of available lubricants has been made, and exact specifications for suitable lubricating media have been determined. The kinds of lubricant suitable for different machines and purchasable on the market are specified. Drilling machines as they are sold are provided with a tag, which gives definite information as to the kind of lubricant and the method of lubrication best suited to the machine. The waste in power, labor, and repair parts in a mine employing twenty-five to fifty machines or more, due to neglect or carelessness in the selection and use of lubricants, is undoubtedly large unless provision is made to prevent such losses.

The condensed epitome of information on the subject of lubricating drill machines which may be found on the tag accompanying the drill when it is shipped by the maker indicates that a great deal of thought has been put into the preparation of this card. Back of the card there was an immense amount of research and experimentation, to evolve the important conclusions which appear on its face. Just a tag tied to a machine—but how often are the conclusions placed on this card carried out? We are well aware that many mining companies have gone into the study of air-drill lubrication and its application with the same thoroughness that has

characterized their other operations. But do all drill runners, master mechanics, superintendents, and purchasing agents realize the endless experiments required to secure this important information and do they take advantage of the knowledge which drill manufacturing companies have so generously and freely given them?

Technical Journalism

THE *Engineering and Mining Journal* is not a one-man paper. There are eight editors who contribute editorials. That is why irregularities will creep in and editorials or paragraphs which may not please will inadvertently be admitted. Any editorial or other feature which appears to you particularly sound and brilliant you may credit the editor-in-chief: that is one of his perquisites. The editorial which you find so punk or offensive is the work of the jail editor. The jail editor may be defined as that editor who wrote the editorial which offends you: he is also that editor who is off on his vacation. The custom developed in ante-bellum days in Germany, where the newspapers were continually subject to imprisonment penalties for references to the Kaiser and the government; so that the custom grew up of having an editor to assume the sentences. Other editors were apt to be discreet until he got out of jail—and to become very daring immediately thereafter.

We are not sure whether our subject should be "technical journalism" or "technically journalism." In either case, it is perplexing to plain engineers. Shall we try to be all things to all men, or shall we be known as speaking "the truth, the whole truth, and nothing but the truth"? We have got far enough to know that though the latter sounds fine, we musn't do it. Truth will ruin anybody.

Years ago, as a cub reporter on a small-town daily, we were sent out to report an accident. Being then truthful we wrote it up as follows: "Our respected fellow-townsman Mr. Eliphalet Yokum, while drunk, fell off a sidewalk on Center St., and broke his leg." The editor remarked, "What in ———, etc., is this? Ain't you got any better sense than to say that?" "But it's true," we argued, "and everybody on the street knows it." The chief grabbed a pencil and wrote "Our esteemed fellow-townsman, Mr. Eliphalet Yokum, narrowly escaped a serious accident last Wednesday. While hurrying from his office, a protruding curbstone tripped him, and he fell heavily, resulting in a compound fracture of his right femur. As his benevolence is well known, he will not sue the city; but this calls attention once more to the disgraceful condition of the city streets under the present administration."

No; our ideal is to skate as near the truth as we can, without breaking through. We know when we are near enough when the ice cracks and subscribers write in and call us names; and we skim off on the other foot. We enjoy, however, hearing her crack. One of our contemporary technical journals remarked concerning us that as we were catering to a certain group we had better be careful how we expressed certain sentiments. The idea that we were caterers hadn't occurred to us, but we are thankful for the conception and the advice. Off-hand, though, we should think a caterer should have the privilege of grilling a politician or of roasting a subscriber now and then for the delectation of our other readers. It is all for the common good; and a little unselfish altruism on the part of the subject is what we think we have a right to expect.

The Practical Miner

THE successful miner, be he drill runner or shift boss, and the successful engineer, must have one characteristic in common—horse sense. No amount of study on the part of the latter will make him successful if he is not fundamentally well balanced, keeps his feet on the ground and has his eye always open for the significant details which are of vital importance at one stage or another of a mining operation. Nor, in the case of the miner, mill man, or smelter employee, will discontent with the social system, nor even—on the other hand—any amount of hard and faithful back-breaking work, make him successful and open up his way to large responsibility and prosperity unless he "uses his nut."

Did you ever see a job where brains wouldn't help—where brains were not the chief thing? There is none. Brains plus muscle reared the pyramids, up-ended the obelisks, flung the Brooklyn Bridge across the river; but without practical sense these things could not have been done—nor could the men who did them have found out how by consulting textbooks and encyclopedias.

Every day in mining operations some man who is working in the mine or the mill has an idea—he has seen a better way to do this or that than has been tried before. When we visit mines in certain remote countries or mines in this country run by greenhorns, we are astonished to see how many entirely evident things could be improved. We have in mind a mine which was operated on a basis of, say, $20 a ton cost. A new manager came on, with a bent for practical details, and by tinkering up this detail and that he brought the cost down to $12. Same mine, same mill, same power plant, same men and same wages; same staff. What was the difference? Nothing tangible; just that invisible and imponderable quality—horse sense. He didn't reduce wages or fire the force. The latter process is the elementary idea of economy, and is usually very expensive.

It would be fine practice if every man who has a job around a mine or a plant would sit down at the close of the day, look over the good bit of work he has done during the day, and spend half an hour or so in trying to figure out *how he could have done the job with less work*. We have known men who were regular hogs for work; but their energy needed expression in their muscles, and to use their thinkpieces bothered them and was painful. We heard of a lad in a plant the other day who complained because his work was too varied; he wanted to get on piecework, and turn out a certain part of the work on a certain piece of a certain machine all day and every day. Then he knew where he was at. That lad, of course, is worth the standard price for a man from the shoulders down; but a lad who studies how to do this or that quicker, easier, and better, and is interested in learning some new thing each day, needs no college, and the world has no reward that is not available to him. That is why we see so many men in big and responsible jobs who rose from the ranks and know all the practical details of their business from bottom to top, because they have plodded systematically up the whole road.

George the Third, according to Carlyle, never could figure how the plums got into the pudding. The same dullness lost him the American Colonies.

Hats off, then, to the man of plain common sense! We need him around the mine and the plant, and if all the world were like him it would run more smoothly.

WHAT OTHERS THINK

The Litigation Geologist Protests

I have read with much interest your editorial comment upon apex litigation in the *Engineering and Mining Journal* of June 19. I note with interest and some amusement that you characterize me as "a geologist pure and simple." I am glad to be considered pure, and I quite acknowledge my simplicity. I am a little regretful, however, that you join with others in slamming geologists who testify in apex suits. I detest apex law or apex litigation as cordially as anyone, but the law is an inescapable fact, and controversies do arise in the presentation of which to the court testimony is required, and in connection with this work geologists must be employed.

It is not a fact, as you imply, that there is always or generally contradiction as to facts between the geological witnesses of the two respective litigants. On the contrary, there is usually and almost invariably a remarkable agreement as to facts. It is seldom, indeed, that a statement of fact by a witness on either side is questioned, and when it is there is a prompt and unanimous exodus to the controverted place by witnesses for both sides at the earliest opportunity for the purpose of establishing the truth, and if some witness discovers that he has inadvertently testified wrongly, he is the first to take the stand and correct his testimony. The differences come in the interpretation of the facts.

Now, it seems to me that our critics are generally men of little experience in such matters. They do not know, for instance, that a geological witness of any standing whatever customarily reserves the right to investigate the premises in question and to decide on his own examination whether or not he can and will espouse the cause of those who offer him employment. Our critics are certainly not aware of the fact that engineers and geologists who have some reputation as expert witnesses in such matters are frequently offered employment by both sides, and that they visit the property and make their examination before deciding in their own minds the merits of the case, and that they frequently decline to accept employment by those whose cases they feel unable to advocate.

We are represented as a pack of wolves roving around, seeking whom we may devour, and eager to stir up trouble and avid for employment regardless of the facts and the merits of the case. Our critics do not know that we settle out of court more cases than we contest, and that our advice and influence constantly tend toward compromise and the avoidance of the expense associated with litigation. Those of us who have gone through the mill in such matters, experienced the uncertainties, the annoyances, and the expense of apex litigation, are constantly endeavoring to settle controversies and frequently are successful in so doing. For all this we receive no credit whatever. Neighbors will persist in squabbling; covetousness is inherent in the human animal; large orebodies within the range of different claimants are generally the inspiration for efforts to gain title through the courts; lawyers will advise clients that their chances for victory are bright, and litigation thus becomes unavoidable.

Nor would your suggestion of a selected body of engineers and geologists chosen by the court alleviate the situation. No such body will ever agree among themselves as to the interpretation of the facts in the light of apex law. The volume of legal decisions is so vast, and the complexities of geological structure in large mines are so numerous and so great, that even the keenest analysts and the most experienced geologists seldom agree on all points. Even when the facts are admitted, no two mining lawyers will agree as to many points which have not yet been decided by the highest court. Nor is there any limit to the number of such questions, for new cases constantly present new features, and the only method of final determination is through judicial decision.

It seems to me, therefore, poor taste constantly to impugn the good faith of those of us who are called in to advise in matters of this sort. We spend weeks and months in careful study. We learn the mines as no geologist ever learns them otherwise. We prepare plans, cross-sections, and models of unsurpassed accuracy and perfection of detail and presentation. We frequently succeed in developing valuable information which leads to the opening of unsuspected ore reserves. As a result of such careful study we reach conclusions which are so firmly fixed in our minds that we naturally become advocates and partisans with respect to our views; and I can say to you as a result of long experience that the correctness of the decisions reached by the courts is usually admitted by even the defeated litigant after the period of disappointment has passed. Thus, for example, in Butte the correctness of the Blue Vein theory, which was bitterly assailed at the time of trial, has now been universally admitted, and has led to the discovery of millions of tons of ore in that camp.

It is not perhaps surprising that there is a natural antipathy to the use of scientific testimony in connection with litigation. It is not surprising that the outside spectator who witnesses the spectacle of opposing scientists in such cases immediately jumps to the conclusion that they cannot both be right, and that therefore they are not both strictly honest. But it must be remembered that we are endeavoring to apply scientific facts to the statutes and that there is always room for a difference of opinion.

It never occurs to me to question the entire honesty of witnesses on the opposite side. I can see perfectly their point of view and understand thoroughly their mental processes in upholding their position. I should be sorry indeed to feel that my opponents in such litigation credit me with evasive or dishonest testimony or thought. Such being the case, I trust that you will no longer remain a member of that group of critics who are from time to time casting aspersions upon the integrity of men whom in other occupations they trust implicitly.

We all admit that the situation is unfortunate; that the system is wrong; that the law is inadequate; that it was never calculated to cover situations which have

arisen. But it is on our statute books, it regulates mining rights, and it must be interpreted in the light of the best information which can be obtained.

Minneapolis, Minn. HORACE V. WINCHELL.

Mining Reports of the Bureau of Foreign And Domestic Commerce

Your editorial on page 1,247, in the June 5 issue of *Engineering and Mining Journal*, and the letter of Olof Wenstrom, on page 1,250 of the same number, interested me greatly, for on or about May 19 I asked, by postcard, for the Confidential Circular FE-130, "Copper Mines in Western Manchuria," and received a letter of the same tenor as that sent to Mr. Wenstrom, asking me to call at the Custom House in San Francisco and explain why I wished a copy of the report. Instead of this, I wrote to the Far Eastern Division, Department of Commerce, on June 3, stating that I am a mining engineer who has been in Manchuria and that it appeared to me also that as secretary of the San Francisco Section, A. I. M. E., I was entitled to a copy. I also inquired, if not outside of the regulations of the department, for information as to the harm likely to be done to the Government by publication of the report.

In reply, a copy of the report was sent to me on June 11, and also a copy of the department's letter to you of same date. You will doubtless deal with this matter in your paper, and I wish to say that in the opinion of a number of engineers with whom I have talked, and in my own opinion, the department is making an error in treating these reports as "confidential." With regard to the particular report of Dr. Clement's it seems to have been improperly marked as "confidential." Be that as it may, it is clear that if any persons are entitled to priority on these mining reports it is mining engineers; and I hope that your influence and that of the A. I. M. E. will be powerful enough to see that these reports are given full publicity.

In writing with reference to the withholding of these reports, Frank Harding (page 1,348 in the issue of June 19) mentions his desire to prospect in "Chinese country." I have not been in China for a good many years, but from all that I hear it is about the poorest place possible for a prospector, chiefly because of the difficulty of obtaining title to mining property. I think it would be useful if some of your readers who are familiar with present conditions in China would tell us if there are any inducements for an American prospector to try his fortune in China.

Palo Alto, Cal. W. H. SHOCKLEY.

What Is a Living Wage?

When laborites, I. W. W.'s, bankers, and economists (amateur, professional and of the common or garden variety) have exhausted the subject as to what constitutes a Living Wage, some patient and simple soul with a high-school equipment in arithmetic, convinced that the truth has not yet been proclaimed, may perhaps retire to the woods for an hour or so and apply the same acumen to the problem that a successful farmer requires in computing the life of his red barn.

The human individual, mechanically, is a machine. In the creation, operation, maintenance, and replacement of machinery, these charges must be met: cost, interest on investment, insurance, maintenance, depreciation, and replacement. The principles of scientific business management can be applied to the solution of the wage question as to all industrial problems. Why not attack the Living Wage on that basis?

No one has the courage. The most just and philanthropic employer, under a competitive system, would speedily go broke if he were to pay his employees a wage to keep the machine—the man—housed, clothed, and fed, plus an amount to amortize the mortgage of old age, plus the sum needed for repair (sickness), plus a 6 per cent profit on labor turnover, and an equal share above that percentage for the workers' allotment of the profits of the industry over and above all financial and industrial charges. And about 90 per cent of the working class—and that includes almost all of us—if we were to receive the custody of such sinking funds, would blow ourselves to all manner of luxuries, work only part time, and attain sixty poor and dependent, in strict accordance with age-old tradition and present practice.

Th se being the facts, there can obviously be no other solution to current and prospective industrial and social questions and difficulties than a more intensive education in thrift, industry, and common sense, and as wide a dissemination of the truth of the situation as is possible and as the patients can be made to accept and the world afford. O'Ho.

New York City

A Message to Hoover

Mr. Herbert C. Hoover,
Washington, D. C.

My dear Herbert: I think the G. O. P. made an error in judgment in not placing you at the head of its ticket. However, I realize that my viewpoint on political questions is not very important, because, even if I had political sagacity, I have never had political training.

It is my conviction that the element of prominent political position is not a material factor in the "hoover" movement. You told me some years ago that you were in the position and had the inclination to do something for the public good. I feel sure that the vast majority of the men in the Hoover clubs of Colorado are inspired by the same spirit and will support you in your patriotic efforts whether you are in or out of office.

If I remember correctly, I believe that some of your greatest successes have occurred where the other fellow was the titular figurehead.

So here's to Harding and Hoover. Harding may adorn the prow of the ship of state, but I am sure that Hoover will have a lot to do with the operation of the rudder.

Sincerely,

Denver, Col. GEORGE R. BANCROFT.

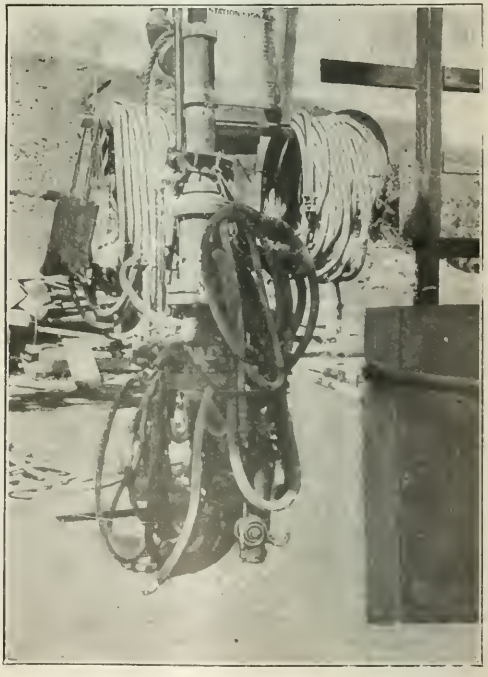
Truth and Fiction

In an interesting work of fiction entitled "The Wandering Blacksmith," one of the characters states that when men study other people's business they get lots of new ideas and are able to give good advice to the other people. Modern engineering practice often proves the truth of this philosophical assertion. A designer of ore-concentrating machinery has recently perfected a process for the separation of clams obtained by dredging. It is necessary to produce clean clams, free from broken shells and other rubbish. This is now being done at low cost. The details of the process have not been divulged.

The Arizona Commercial Mine, Globe, Ariz.

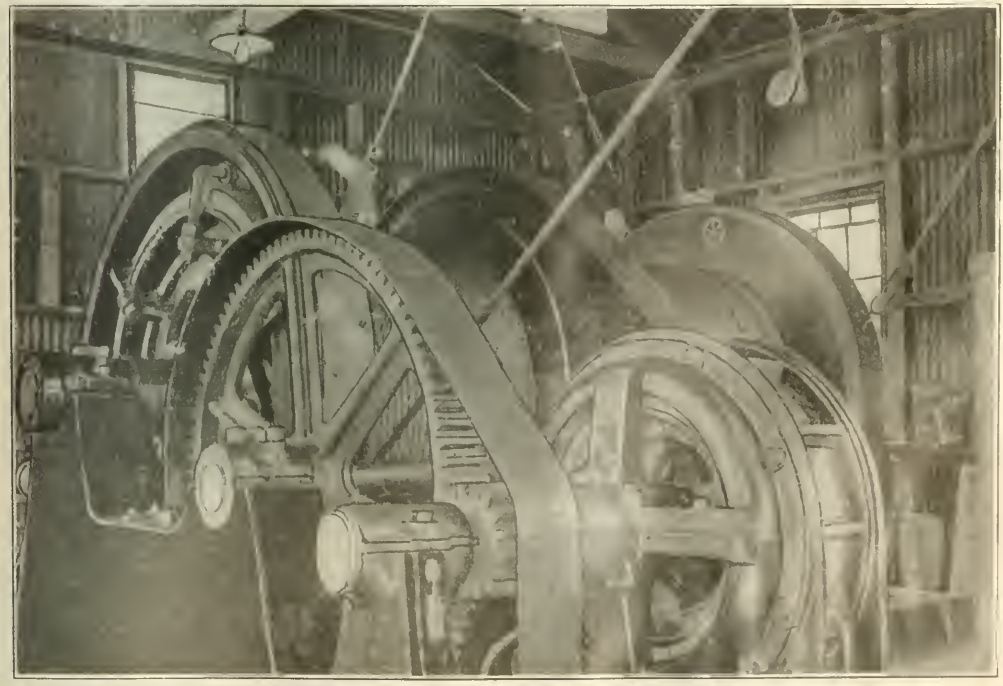
MOTOR TRUCKS DELIVER SUPPLIES, AND RAILROAD CARS TAKE AWAY THE ORE FROM THE NO. 1 SHAFT OF ARIZONA COMMERCIAL MINING CO.

HEADFRAME OF NO. 2 SHAFT, WHICH IS BEING CONCRETED AT COLLAR



HEADER AND EQUIPMENT USED IN SINKING NO. 2 SHAFT

NO. 1 SHAFT OF ARIZONA COMMERCIAL MINING CO. AT COPPER GULCH, NEAR GLOBE, ARIZ.



INTERIOR OF HOIST ROOM AT NO. 2 SHAFT, ARIZONA COMMERCIAL MINING CO., GLOBE, ARIZ.

An Economic Method of Thawing Dynamite

Utilization of Heat Supplied by Lunch Room or Change House Stove Provides Hot-Water Coil in Thawing House at Safe Distance—Arrangement Eliminates Danger From Fire Hazard and Provides Economical Construction

By Douglas Lay
Written for *Engineering and Mining Journal*

A SIMPLE, economic, and safe method of thawing dynamite, and incidentally one which greatly adds to the comfort of miners on shift, is herewith described.

A change house or lunch room of sufficient size to accommodate the miners and others on shift is erected close to the portal of working tunnel, or shaft collar, as the case may be. A large box stove in this building is supplied with a hot-water coil, by means of which a horizontal water coil is heated in a thawing box, situated in a small building about one hundred yards from the change house and placed at as great an elevation above the latter as the profile permits. The two water pipes between the two buildings are placed in a wooden box filled with hay or straw, the box being buried about eighteen inches below the surface of the ground.

The essential idea in the placement of the two buildings is that if the change house catches fire, the latter cannot possibly spread to the thawing house. At the same time, although the method of thawing

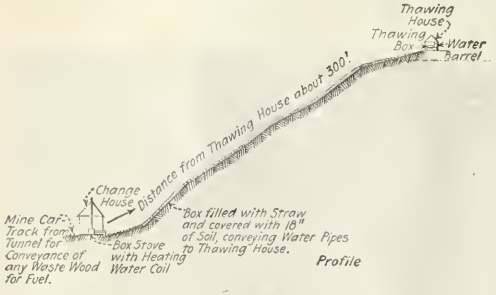


FIG. 1. GENERAL ARRANGEMENT OF CHANGE AND THAWING HOUSES

dynamite is comparatively safe, such a building as the thawing house should always be placed in an isolated spot, taking advantage of any natural protection afforded by ground contour, so that any untoward happening therein is not likely to cause loss of life. The above general arrangement is illustrated in the profile sketch, Fig. 1.

The size of the change house and lunch room depends, of course, upon the number of men it is desired to accommodate. Around the sides of the interior is a seat 15 in. wide, with a foot rest in front 21 in. in width. With this exception the building contains no floor, the soil being merely leveled off, with perhaps a layer of fine waste scattered over it. This ensures absence of danger from any hot ashes from the stove. A brick chimney for the latter is highly advisable, but if a stovepipe is used care should be taken to insulate it thoroughly. Most stovepipes are a constant menace unless run into brick chimneys. In the centre of the building is a large box stove, the larger the better, which contains a heating coil. The top of the stove serves to heat tea and coffee. The building contains no ceiling boards. It is preferable to place the building at the side of a mine track, so that any waste wood from the mine or timber shed, e. g., ends of timbers, old wedges, and similar materials, may be readily conveyed to the change house and utilized as fuel. The general arrangement is shown in Fig. 2.

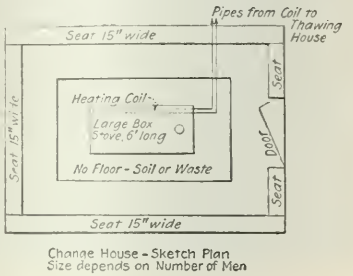
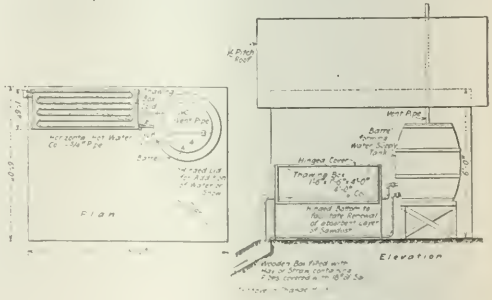


FIG. 2. PLAN OF CHANGE HOUSE

A convenient size for the thawing house is 8 x 6 ft., with 6-ft. walls and half pitch roof, sufficient to accommodate thawing box, water barrel, and a few unopened boxes of dynamite. (See Figs. 3 and 4.) The thawing box is made of 2-in. plank, and is 18 in. wide by 18 in. deep by 4 ft. long. Filling the bottom is a coil of $\frac{3}{4}$-in. pipe, over which a layer of sawdust, which acts as an absorbent of any exuded nitroglycerine, is sprinkled. The box has a hinged, tightly fitting cover. The sticks of dynamite are put in the box without any definite order, the idea being that they will criss-



FIGS. 3 AND 4. PLAN AND ELEVATION OF THAWING HOUSE

cross and so permit of efficient distribution of heat from the coil. The bottom of the box is hinged and opens downward, so that the sawdust may be renewed periodically. With this arrangement, the operation of removing old sawdust and putting in fresh occupies two or three minutes only. Obviously, attention should be paid to this matter of changing absorbent. The

bottom of the thawing box is set 18 in. above the floor of the building. The water-supply tank consists of an old oil barrel, which is provided with a vent pipe to outside, so that no steam is liberated in the building. A hinged cover permits of ready addition of water to compensate for evaporation. If the weather is sufficiently cold to require the thawing of dynamite, there is usually an abundance of snow adjacent, so that it is convenient to use this for the purpose instead of water.

Advantageous features of the method are as follows: (1) The high measure of safety; (2) inasmuch as it is frequently necessary in any event to provide some sort of change house or lunch room close to working tunnel or shaft, little extension is necessary to provide a thoroughly practical method of thawing dynamite in large quantities (the heat required for the change house is also used for thawing purposes); the fuel consumption is in any event not material, as odd bits of wood from the mine can be utilized, which would otherwise go over the dump; (3) if the man appointed for the purpose forgets to stoke up the stove before going on shift, it is morally certain that others on shift will see that there is a supply of fuel on hand for the purpose, otherwise they will have to eat their lunch in a cold building.

I have used this method for some years, and am impressed with its good points. There was always an abundant supply of thawed powder on hand, with the minimum of trouble.

Mining Industry of Abyssinia

THE mining industry in Abyssinia is undeveloped. There are evidences of commercial deposits of coal, iron, oil, sulphur, gold, silver, copper, and potash, but none of these deposits, excepting the potash, are now being worked on a commercial scale, according to Consul Addison E. Southard, of Aden, Arabia. However, the Abyssinian Development Syndicate, Ltd., a British concern, is planning to undertake the exploitation of Abyssinian mineral resources.

The potash deposits now being worked are in northeastern Abyssinia about six miles from the Eritrean frontier and about forty-six miles from the Red Sea coast. An Italian company, the Societa Mineraria Coloniale, of Asmara, Eritrea, is working the deposit and shipping the product overland to the small port of Mersa Fatimari, on the Red Sea, and thence to Massowah. The potash deposit has been worked since 1915, but the amount taken out in any one year has not equaled 4,000 metric tons. In 1917, the latest year for which statistics are available, 3,578 metric tons of potash salts from this deposit were exported. The potash produced is said to be 90 per cent pure, and 1,000,000 metric tons are estimated to be available.

Gold, Silver and Other Mineral Deposits

Alluvial gold is found in several river beds in western Abyssinia, principally at the edge of the Sudanese plain. Natives wash gold from the beds of the Blue Nile, the Dabus and its tributaries, the Beni Shongul, and the Tumat rivers. This gold reaches Adis Abbeba, usually in the form of small rings and ingots, and much of it is exported through the Bank of Abyssinia. Officials of this bank estimate the total exports as averaging a quarter of a million dollars in value per annum.

Quartz gold deposits are also found in western and central Abyssinia, but none are at present worked on a commercial scale. Under ordinary circumstances the government of Abyssinia demands and collects a royalty of 50 per cent on all Abyssinian gold brought into the market.

Silver is said to be found in the district south of the Baro River, southwestern Abyssinia. No deposits are known to be worked at this time.

Iron is widely distributed, and some rich ore deposits are known. In the Province of Tigre the Abyssinian peasants smelt the richer ores over wood fires. The comparatively small quantities of iron thus produced are used by native blacksmiths to make plowshares and various cutting tools of simple pattern. This industry may be regarded as one of the primitive native sort and cannot be said to be of commercial importance in the present stage of its development.

Copper, Asbestos, Oil, Salt

Prospectors have found evidences of copper and nickel deposits in the Walego Province. Aluminum clays are also said to have been found in this same province.

Oil and sulphur indications are reported from the vicinity of Ankober, Shoa Province, but no development work has been done.

Asbestos is reported from various sources, but this mineral has not yet been mined and marketed.

Salt deposits are found in the lowland desert plains between the Abyssinian Plateau and the Red Sea north of the Straits of Bab-el-Mandeb. Natives quarry this salt for use in plateau trading centers. The total quantity thus handled is probably not great, and there is no way of obtaining figures as to the actual amounts which enter into the inland trade of the country.

The Abyssinian government does not collect statistics and there are available no official publications or other forms of statistics.

New Paint Mine in New Jersey

By S. H. Hamilton

Written for *Engineering and Mining Journal*

The Pequest Co., of Butzville, N. J., is operating a new pigment plant under the direction of Herbert Cox. The raw material comes in part from the old Ahles iron mine, which formerly supplied the furnace at Pequest. The ore is soft, earthy, and composed of several minerals. Owing to its physical condition, and the presence of considerable manganese, it was not a desirable furnace ore. However, the deposit is large, with well-defined walls of Franklin limestone. It was found that by means of Dorr classifiers a 200-mesh product can be separated, making a desirable pigment, and the coarser material can still be used for iron ore.

Italy's Small Mineral Resources

As is well known, the mineral resources of Italy are relatively of small importance. The country produces no high-class steam coal, little more than half of its requirements of iron ore, and neither gold nor silver. The slender mineral output of the peninsula is supplemented, however, by the products from adjacent islands under the Italian flag. The bulk of Italy's iron ore is mined in the Island of Elba; rich lead deposits are worked in the Island of Sardinia; and for generations the Island of Sicily has held first place as the center of European sulphur production.

Charts for Computing Blast-Furnace Performances

Determination of Slag Production, Matte Fall, and Tonnage Smelted Per Square Foot At Copper Queen Smelter Is Aided Considerably by Graphical Methods — Much Arithmetical Work Eliminated

By HAROLD L. FICKETT
Written for *Engineering and Mining Journal*

CHARTS are investments that pay large dividends. The investment is spare time and odd moments, and the returns are valuable moments saved, when time is at a premium. When once made and put into use, charts are capable of yielding returns far in excess of the original investment. To be most useful they must be simple, legible, and accurate. A failure in any one of these prerequisites may be disastrous.

It is remarkable how great a field of variations can be covered easily and accurately by means of a few simple calculations and a piece of standard cross-section paper. Routine calculations of furnace performances

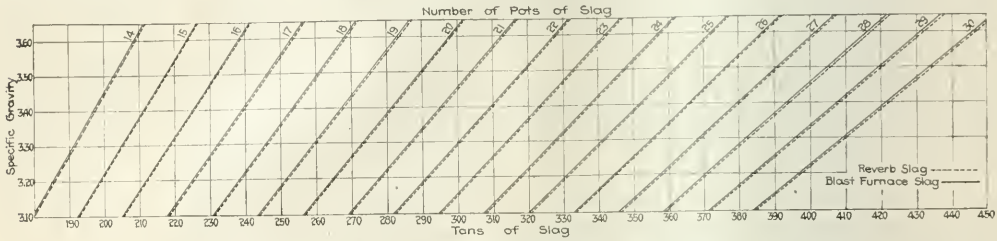


CHART FOR COMPUTING WEIGHT OF BLAST-FURNACE AND REVERBERATORY SLAG

offer great opportunities for using charts, and it is the purpose of this article to show how such aids are used in making up the daily blast-furnace reports at the Copper Queen smelter.

I. CHART TO DETERMINE THE WEIGHT OF SLAG PRODUCED

(a) Basic Data

A Copper Queen slag pot will hold 4.13 tons of slag the specific gravity of which is unity. A specific gravity determination is made on every composite daily slag sample, and used in calculating the slag production. As an example of the importance of considering the specific gravity in these determinations, a reference to the accompanying chart will show that, for 25 pots of slag, a difference of 0.10 in the specific gravity will make a difference of ten tons in the amount of slag produced.

On the daily blast-furnace log, the furnacemen record the number of pots of slag produced by each furnace. Experience has shown that, in blast-furnace computations, the specific gravity of the slag varies between 3.10 and 3.60, and that the number of pots of slag varies between 14 and 30. Hence, in making the chart, these become the limiting values.

The weight of slag produced may be expressed as

$$W = CSN$$

where,

W = weight of slag produced,
S = specific gravity of the slag,
N = number of pots of slag,
C = weight of slag whose specific gravity is unity.

As C is constant, the equation becomes the equation of a straight line for varying values of S. Therefore, it is necessary to solve the basic equation but twice for each value of N in order to obtain sufficient data to construct the chart.

(b) Construction of the Chart

If the horizontal co-ordinates represent the specific gravity, and the vertical co-ordinates represent the tons of slag produced, the pots of slag must be represented by a series of straight lines, in which series each line represents a certain number of pots. The basic equation must be solved for each value of N represented; once where $S = 3.10$ and once where $S = 3.60$. These values are taken because they lie at the extremities of each line in this particular chart.

When the specific gravity is 3.10, the equation for $N = 14$ becomes

$$W = 4.13 \times 3.10 \times 14 = 179.242$$

The equation for each succeeding value of N may be solved by adding the constant $4.13 \times 3.10 = 12.803$ to W for the preceding value of N; thus:

14 pots	=	179.242
plus		12.803
15 pots	=	192.045
plus		12.803
16 pots	=	204.848

and so on as far as it is desirable to go. In the same manner points on the 3.60 specific gravity line are located.

The points thus obtained are plotted on standard cross-section paper, and corresponding points on the extreme specific gravity co-ordinates are joined by straight lines. Each line will then become the locus of the equation for each value of N. With the indicating of the co-ordinates, the locating or plotting of the points obtained from the calculations, and the joining of corresponding points by straight lines, the chart is ready for use.

(c) The Use of the Chart

Follow the horizontal line corresponding to the specific gravity of the slag whose weight is desired, to its

intersection with the diagonal line representing the number of pots produced. Vertically under this intersection will be found the tonnage.

II. Chart to Determine the Per Cent of Matte Fall

(a) Basic Data

In the usual method of computing the per cent of matte fall, the tons of matte produced is divided by the sum of the matte and slag produced. With the aid of a chart it is possible to read the per cent of matte fall at a glance.

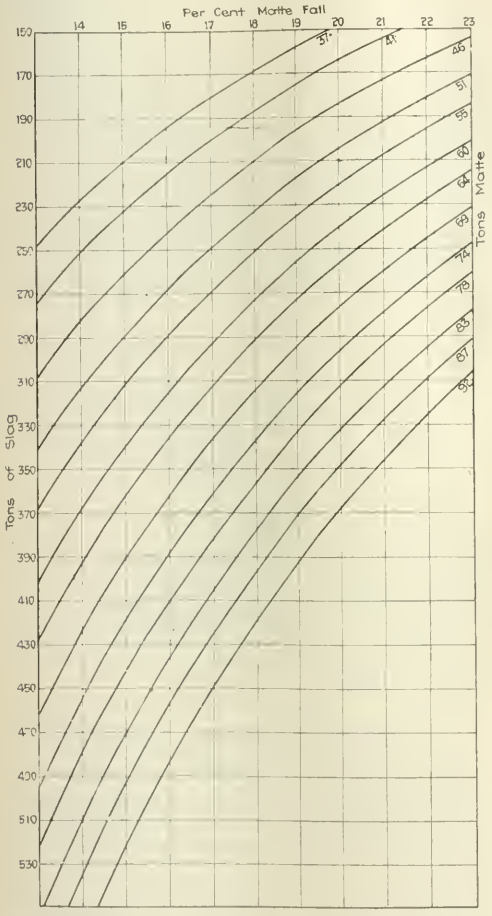


CHART FOR DETERMINING PERCENTAGE OF MATTE FALL

The tons of matte and of slag are figures which are obtained from calculations made in the office, from data reported by the furnacemen. It has been determined that a pot contains, on an average, 9.2 tons of blast-furnace matte. It is the custom of the furnacemen to report the matte produced to the nearest one-half potful. Therefore, in the construction of this chart, it is convenient to locate the curves at intervals equivalent to one-half pot of matte.

Unlike the other, this chart is composed of a series of irregular curves, which intersect the X-axis only at infinity. The basic equation may be stated thus:

$$M = \frac{X}{X + Y}$$

where M = per cent of matte fall,
X = tons of matte produced,
Y = tons of slag produced.

In the making of this chart the limiting values of X are 37 and 92; and the limiting values of M are 0.13 and 0.23. It must be borne in mind that M is less than unity in all these calculations.

(b) Construction of the Chart

At intervals of 2 per cent it is necessary to solve the basic equation, in order to locate sufficient points for each value of X. When these points have been determined from the computations, corresponding points for each value of X are joined by lines, drawn with the aid of a French curve. Many short-cuts may be used in compiling the necessary data for the chart.

The matte lines are spaced at intervals of four or five tons, and it is possible to determine a constant for each set of intervals and reduce the mathematical work largely to additions. The work of compiling the intersection of the 37, 41, 46, and 51 tons of matte curves with the 13 per cent matte fall co-ordinate may be outlined as follows:

$$\frac{X}{X + Y} = M; \quad Y = \frac{X - MX}{M} = \frac{X - 0.13X}{0.13} = 6.6923X$$

First solve:

4-ton interval = $6.6923 \times 4 = 26.7692$
plus constant 6.6923
5-ton interval = 33.4615

Then solve:

When $X = 37$, $Y = 6.6923 \times 37 = 247.5161$
plus 26.7692
$X = 41$, $Y =$ 274.2853
plus 33.4615
$X = 46$, $Y =$ 307.7468
plus 33.4615
$X = 51$, $Y =$ 341.2083

In order to use the chart, locate the tons of slag on the horizontal co-ordinates, then follow that co-ordinate to its intersection with the curve representing the tons of matte produced, and the vertical co-ordinate nearest the intersection will be read as the per cent matte fall.

Tons Smelted per Unit of Hearth Area

The most satisfactory method of comparing blast-furnace performances, in case of different size furnaces especially, is by comparing the tons of charge smelted per square foot of hearth area. At this plant are three sizes of blast furnaces, those with 66 sq.ft. of hearth area, 73.3 sq.ft. of hearth area, and 100 sq.ft. of hearth area, which are locally called small furnaces, medium furnaces, and large furnaces, respectively. The use of charts for determining the tonnage smelted per square foot of hearth area has been found a time-saving expedient. In the ordinary plant where all furnaces are of one size the preparation of such charts is comparatively simple. Subsidiary curves should be plotted for cases where the furnace is delayed for 10, 20, 30 or more minutes during the twenty-four hours.

Laying Flanged Pipe on a Steep Hillside

By Douglas Lay

Written for *Engineering and Mining Journal*

THE profile survey of a pipe line will determine the various points at which the surface of the ground departs from a straight line. Obviously, minor local sags are disregarded, as they can best be overcome by blocking the pipe up at these points. Care will distinguish between such points and those at which there is a change of grade for a material distance. In the latter case, in the actual construction of the pipe line, the alternative lies between insertion of metallic taper gaskets between pipe flanges and excavation. In rocky ground excavation will prove expensive, and in loose ground may be inadvisable.

Again, the exterior of the pipe will require re-painting periodically, and this cannot be done if pipe is buried. Most steel-riveted pipe leaks more or less, when the water is first turned in, and it is advisable, therefore, to have all portions of the pipe open to inspection.

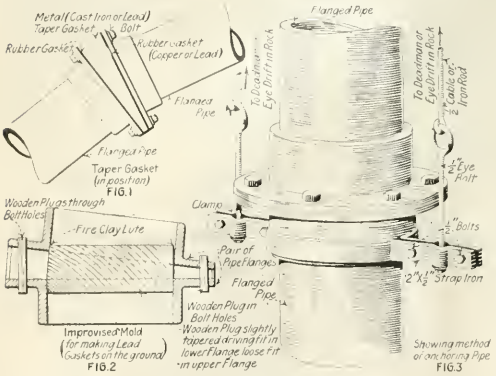


FIG. 1. TAPER GASKET IN POSITION
FIG. 2. IMPROVISED MOLD FOR MAKING LEAD GASKETS
FIG. 3. PIPE ANCHORAGE AND CLAMPS

The advantage undoubtedly lies with the use of taper gaskets, on the score of cheapness, if for no other reason. The dimensions of the majority of those required can be ascertained from an accurate profile survey, and the best plan is to have them made of cast iron by the company supplying the pipe, so that they will arrive on the ground simultaneously with the pipe. The thin end should be approximately one-quarter inch, and the thick end may be three inches. Assuming a flange diameter of eighteen inches, the stated dimensions will give a deflection of 4° 20′ at each flange face, or a total of 8° 40′ at the joint. The taper gaskets must match the pipe flanges, in respect to diameter and bolt holes. When the gasket is in position the bolts are not quite at right angles to the flange faces. This places a limit on the maximum thickness of the gasket. It is well, therefore, to specify bolt holes of liberal diameter, so that when the gasket is in position, the bolts can be readily passed through. A rubber gasket (copper or lead is preferable) is placed on each side of the taper gasket, as shown in Fig. 1. It will be obvious that by means of these taper gaskets, the pipe line can be deflected not only up or down, but also laterally.

To avoid any chance of error, the taper gaskets are sometimes made of lead on the ground, as the pipe is being laid. By laying two adjoining lengths of pipe in position at the required deflection point, the dimensions of the necessary taper gasket are accurately indicated. A satisfactory mold for casting lead gaskets can be readily improvised out of a pair of companion flanges. A slightly tapered wooden plug, about four inches long, of diameter equal to that of the pipe, is driven into one flange, so that it fits tightly, the smaller end of the plug pointing upward. The other flange is now pressed down over the projecting end of the wooden plug, at such an angle as to give the required taper to the gasket, as shown in Fig. 2. Any movement is prevented by inserting two pieces of wood, of the lengths respectively required, at two diametrically opposite points between the flange faces, and by inserting a small wedge between the wooden plug and the side of the flange.

The tapered end of the wooden plug is now luted with fireclay, after wooden plugs have been inserted in bolt holes in order to "core" bolt holes in the resulting gasket. Two or three plies of building paper are then wired tightly round the circumference of the flanges, a suitable opening being left for pouring at the thick end of the gasket. The mold is now ready for pouring, but it is a good precaution, and one which occupies little time, preventing chance of mishap, to bury the mold up to the pouring hole, before pouring the molten lead. Needless to say, when once pouring has started it must proceed continuously until the mold is full; otherwise the gasket will be made in two pieces and will be useless. Sufficient lead must be kept melted. It is also essential that the molten lead must not be too hot, or the wooden plugs will char.

A pipe line on a steep slope must be securely anchored at intervals, either to I-bolts in rock or to deadmen, depending upon the nature of the ground. A good method of attachment is by means of a clamp at the flanges, as shown in Fig. 3. For attaching the clamp to a deadman or I-bolt, either iron rods or cable may be used. The I-bolts connecting anchor lines to clamp should have a fairly long thread, so as to afford considerable "take-up."

Use of Glue in Electrolyzing Zinc-Sulphate Solutions

To retard the deleterious effect of certain impurities in zinc-sulphate solutions, such as cobalt, U. S. patent No. 1,322,071, granted to Royale H. Stevens, covers the use of glue in the solutions that are about to be electrolyzed. The inventor states:

"In adapting this invention to the current practice in the electro-deposition of zinc, I add a certain small proportion of glue in solution either to the electrolyte before passing into the cells or to the electrolyte in the cells. The amount of glue added is determined by the amount of impurities present in the solution, and such amount increases as the impurities increase, within limits, owing to continuous circulation of the solutions. Moreover, when manganese is present in the electrolyte in the form of manganese sulphate, a scale of manganese dioxide is formed on the anodes, which, in the presence of glue, is deposited in more coherent form, which inhibits corrosion of the anodes."

Time-Saving Devices in an Assay Office

Proper Distribution of Compressed Air Around a Disk Pulverizer—Sheet-Iron Holders for Flasks—Water Spray in Sink for Quick Cooling—Hoods Without Sides—Individual Cyanide Burettes

By F. L. Smith

Written for *Engineering and Mining Journal*

A CONCISE description of a few labor-saving arrangements used in the laboratory of the Nevada Consolidated Copper Co., Ruth, Nev., and found indispensable for combining speed with accuracy, is here presented:

Compressed air is used for blowing out the grinder in two different ways, as follows: First, a foot lever (see Fig. 1) is used to release a strong blast of air from beneath the machine. This completely cleans the grinder, except the drawer, the inside of the disks, top of disks, and lid. These places are then cleaned by a ½-in. air nozzle attached to a short rubber hose, which is hung at a convenient distance above the feed hole of the grinder by a fine wire spring. This holds the nozzle out of the way, but allows it readily to be grasped and pulled in any direction.

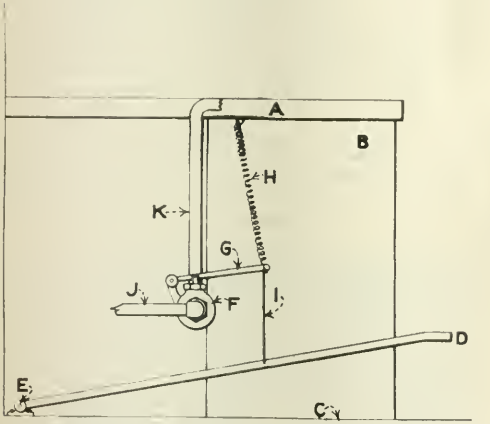


FIG. 1. SIDE VIEW OF FOOT LEVER AND CONNECTIONS

To direct the air beneath the grinder, a receptacle was made of heavy sheet iron (see Fig. 2) welded at the seams, round underneath, and slightly convex on top. This was let flush into the bench under the drawer of grinder, which is a Braun, type "U. A." The top was drilled with rows of holes so placed as to attain greatest cleaning effect. A 1½-in. lock-nut was welded on to a hole in each end, that in front being fitted with a plug to admit of cleaning out; that behind being connected by a pipe to a 1½-in. quick-opening throttle valve operated by the foot lever. (See Fig. 1.)

Some advantage might be gained by adding to this equipment a receiver made of, say, a 4-ft. length of 12-in. pipe, fitted with a small pet-cock underneath. This would serve the double purpose of increasing the volume of the sudden blast of air, and of obviating trouble caused occasionally by water in the air pipe during damp weather.

The dust thus stirred up is effectively restrained by a hood (see Fig. 3), which completely incloses the grinder except in front, leaving just enough room for the work to proceed without hindrance. This hood, made of sheet iron, is 18 in. wide, 20 in. deep, and 33 in. high, and is fastened to the bench with pieces of angle iron riveted on to its lower edge. It fits close to the body of the grinder on the right-hand side, whereas on the left a space of 1 ft. is provided. The front is inclosed for about 9 in. from the top.

FIG. 2. DEVICE FOR DISTRIBUTING COMPRESSED AIR UNDER GRINDER

An 8-in. pipe (see Fig. 3) connected with the top of this hood leads to the intake of a blower installed in the attic. The blower is of 1,500-cu.ft. capacity with 18-in. fans and ¼-oz. pressure, and is driven at about 2,000 r.p.m. The 8-in. pipe to the blower was fitted with a "T" in the attic, one branch connecting with the grinder, as described, the other leading from a hole in the center of the bucking-room ceiling. Each branch was fitted with a damper, so that full suction can readily be obtained for either. The hole in the ceiling is used for carrying away the dust when blowing out the room with a hose.

The net results of the foregoing are (1) that respirators are no longer required, and (2) that one man easily grinds 150 samples of porphyry ore per hour, the average weight of samples being 50 g., and average screen test, 99 per cent minus 80 mesh, and over 90 per cent minus 100 mesh; and this with the assurance that the grinder is thoroughly cleaned out after each sample. This rate of speed will probably just about occupy one average man at the balances.

Most of the copper determinations are made by the slop KCN method without filtering. By paying sufficient attention to details, the error is reduced to within

about $\frac{7}{100}$ of 1 per cent on a simple low-grade ore, when checked against the best custom-office umpire work. The samples are weighed into flasks set in trays with a capacity of forty flasks each (see Fig. 4). These trays, which save much time and eliminate confusion and accidents, were each made of two pieces of sheet iron, 19 x 30 in., 1¾ in. apart, held together by bolts. Each has five rows of eight holes, 3½ in. from center to center. For ordinary 250-c.c. flasks, 3¼-in. holes in the top sheet, and 3-in. holes in the bottom sheet are found suitable. Handles are provided on top at each end.

Acid having been added, the tray containing the flasks is placed on the 18 x 30-in. hot plate. It is

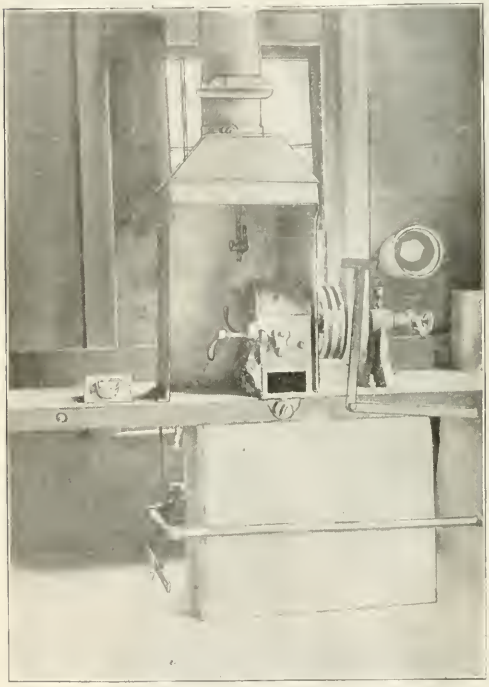


FIG. 3. GENERAL VIEW OF GRINDER, SHOWING HOOD

advisable to have another tray of the same pattern ready to receive the flasks as they are removed from the hot plate, as they may not all boil evenly. After removal from the hot plate, water and ammonia are added, and the tray, with its batch of forty flasks, is placed in a lead-lined cooling tank. The outlet hole of the latter was made of a 1-in. sleeve into which is screwed a nipple. This projects upward about ½ in., keeping the water at a suitable depth.

Water for cooling is supplied by the following contrivance (see Fig. 5). Four pieces of ½-in. pipe, 21 in. long, with a cap screwed on one end, were arranged parallel with each other, 7 in. apart from center to center, and connected with "T's" to one main pipe. This latter rests on the back wall of the tank, and is fitted with an elbow joint, which serves as a hinge and enables the apparatus either to be folded back out of the way or brought down level for use. The elbow joint was treated with white lead, and has never leaked. The four arms come exactly between alternate rows of flasks, and each of them was drilled with two rows of five pin-sized holes on the lower side, in such a manner that, when the water is turned on, each of the forty flasks receives a fine stream, thus cooling the whole batch to the desired temperature

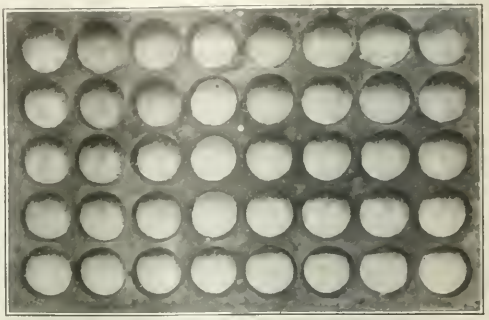


FIG. 4. SHEET-IRON TRAY FOR FORTY FLASKS

quickly and evenly. The pipe is fitted with a plug for rapid draining.

To expedite the work connected with the hot plate, the hood was made without sides or front, but with practically only a top. To insure that the fumes would go up instead of into the room, a ¼-in. compressed air pipe was inserted into the chimney about 3 ft. above the hood, and made to point upward. A valve in this pipe, placed conveniently near the hot plate, enables the operator to turn on the air whenever required, creating an upward draught, which effectually carries off the fumes.

The cyanide solution is kept in the attic in two lead-lined tanks, which were burned at the seams and not soldered. It comes down by gravity through a 1-in.

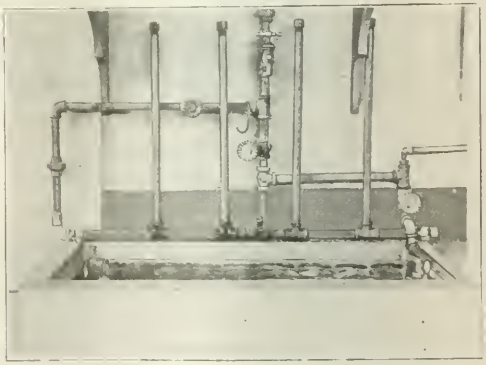


FIG. 5. PIPES FOR DISTRIBUTING COOLING WATER

iron pipe into the line of forty burettes, corresponding to the number of flasks in a tray. The 1-in. pipe was fitted with forty ½-in. nipples, 5 in. apart, to which the burettes were connected with rubber tubing and Mohr's clamps. Valves of iron, and not of brass, must be used for this pipe line. The slight yellow discoloration of the solution caused by the iron pipe is no detriment, though a valve for draining the pipe is found necessary at times.

A Picturesque Mining Experience

II. The Diamonds of Mitrovitza

By J. E. Spurr*

THE other day I was looking over a map of the new kingdom of Jugoslavia, and somewhere in the center I traced out in strange Slavonic letters the name Mitrovitza. I knew that town, although it has wandered far and wide geographically since my brief sojourn there. I had to get out of that town, before daylight, for my health. I own it without shame.

This happened some time ago—I hate to say how long; in fact, on reflection, I won't. I was sent out from Constantinople by special edict of the Sultan, Abdul Hamid, whose chief mining engineer, geologist, and adviser on mining matters I had become, on the recommendation of our Secretary of State, John Hay. I had various specific jobs cut out for me, all of which turned out picturesquely enough, and finally I drove many miles over country roads in an open carriage to Mitrovitza. I had with me two military aides and protectors—both Albanians, as we were to pass through Albania and it took an Albanian to protect an unintroduced stranger in Albania. It was no job for a Turk. Both were from the Palace Guard in Constantinople—one a terrible little major, an aide-de-camp of the Sultan, the son of a powerful vali or governor, and a little devil; the other a big stupid captain who had two wives, and much domestic trouble in consequence. Also, I had an interpreter.

It was a raw country through which we drove and tossed for two days. Not a man that we met but was hawk-eyed, free in action, and armed to the teeth. We stopped at night at a miserable little inn, where we lay on rude pallets on the sides of the low stone structure, floored with earth. The stove was a great affair of stone, in which open fires cooked food, when there was any to cook. There was none to cook that night—no bread—nothing but sour milk and raw cucumbers; and I regretted that I partook heartily of these. The house was crowded with great somber fellows in short embroidered jackets, embroidered silk shirts, thick knee trousers, and flat fezes. In the sashes at their belts were wonderful long inlaid pistols and great daggers; and each kept close to him a rifle of slender breech and prodigious length of barrel. Take any description by Scott of such a scene in the time of the Crusaders, and, save for the firearms, you will not have to alter a detail of local color.

The next evening, tired, we crossed a bridge over a river, and rolled down the principal street of a considerable town—Mitrovitza. The street was dense with people, who had to part to let us drive on, and they cheered and shouted wildly as we went through. This was "nuts" for my Albanian officers, proud of the Sultan's insignia on their uniforms, and they smiled and bowed paternally.

At this stage, I recall that it is necessary to explain the job on which I had been sent to Mitrovitza. It was such a secret that I almost told my story without betraying the confidence with which I was sent there. I had been advised by the Sultan's First Secretary, Tassin Bey, the most powerful man in the empire, that diamonds had been reported from Mitrovitza, and I would receive further information from the head man of the city. In the meantime, mum was the word. Therefore, none of my companions knew my mission.

Arriving at a rude hotel, where the mayor or head man and other members of the city government met us with great courtesy, curiosity, and inexplicable disappointment, I was eagerly preparing to eat something and rest my jolted bones, when it was translated to me, out of Albanian into French, by my interpreter, a Hebrew attorney from Constantinople, that they regretted an appearance of inhospitality, but I must turn right around and go right back again. I demanded to know the reason, and they hesitated to explain; whereupon I informed them that there was "nothing doing." They pleaded with me, and at last explained.

Mitrovitza at that time was on the borders of Albania, nominally under Turkish rule, and Bosnia, nominally under Austrian rule; and had a sort of dual government, with representatives of both the Turkish and the Austrian sovereigns. I was informed that the chief local ruler had been appointed from Constantinople, a "civil governor" and dear to the heart of the people. Probably he did not collect and send enough taxes to Constantinople. At any rate, the Sultan had dismissed him, and installed a "military governor," whose measures the fierce Albanians would have naught of. They had so informed the Sultan, and as no corresponding action had been taken, they had sent word that unless the military governor were removed and the civil governor were reinstated on a certain day, they would pull off a first-class revolution, and would not recognize Constantinople at all. It was on the evening of this certain day (I protest I am telling the plain truth) that we drove into Mitrovitza, and the people, seeing the Sultan's uniforms, and the benevolent countenances, concluded that the Sultan had been kind. All this the mayor explained; also, that the town was full of armed men who had flocked in from the province around—I now understood—and that if they found out that, instead of noticing their request, the Sultan had sent us to Mitrovitza for diamonds, our lives would not be worth that much. He did not apprehend that; he could promise it to us of a certainty.

Life suddenly turned stale and flat; but I valiantly swore that I had come to examine diamonds and I would not go back without having done so. They conferred, and then told me that the diamonds were in the river sands at the edge of the town. Why not go right down and expert them p.d.q.?—or Albanian to that effect. So into the carriage I went, and drove back across the bridge and down onto the sandy shore of the river, where the women were doing their laundry.

The officials washed some sand for me, and glittering crystals, brilliant gems, came out of it. Secretively a

*This "Picturesque Mining Experience," and the first one by Lieutenant Colonel Binckley, are designed as "decoy ducks" to induce the wild ducks of engineers and mining men to come across, each with an informal yarn. Will you please send in yours?—Editor.

bottle containing some that had been already washed out was stuck before my nose. They were certainly beautiful. With my hand-lens I looked at them, and saw that they were double hexagonal pyramids—all perfect dihexahedra of quartz, wth no prisms—as like a finely cut diamond as you might wish. I have never seen anything like it before or since.

Looking around, I soon found the matrix, a quartz porphyry, out of which these crystals were residual. My job was done. We drove back to the inn. To the eager queries of my military aids and the city council, I made no reply. I confiscated all the "diamonds" I could lay my hands on, as evidence, and insisted on dinner and bed, promising to clear out before daylight. Everybody took great care that we did so—a stealthy breakfast, and we drove back down the deserted main street of Mitrovitza hours before daylight, and were far away when the sun rose. As we fled, we met continually shadowy groups of the warlike country folk, armed to the teeth. Every group stopped us. "Who are you?" "Albanians — comrades — brothers!" proclaimed my guard. "Are you for the military governor?" "Surely not—may the devil take him!" "If that is so, yell for the civil governor." And we all yelled for the civil governor, by name—yelled cheerfully, even happily, and lustily; and so we fled merrily and yelled all the morning.

There are times that I hold the telephone and telegraph in slight esteem; and the blessing of having none was exhibited to me that day: for Mitrovitza closed behind me and I never heard of it again. What dramatic events took place that day in the city I do not know; for neither telephone, telegraph, nor newspapers chronicled such events in those days in Turkey; and it was impolitic as well as useless to inquire.

Formulae for Obtaining Haulage Efficiency

By Paul S. Couldrey
Written for *Engineering and Mining Journal*

In determining the gradient to be adopted in the main haulage drifts of a mine, allowance is, or should be, made for the kind of equipment to be used. This refers more particularly to the style of car wheels, because the gradient of equal traction for roller or ball bearings would be much too small for other types of wheel. Conversely, in old mines, with existing irregular or steep grades, the advantages of roller-bearing wheels might not be so great as would appear at first consideration. For example, a wheel with a brass bushing (also having a small frictional resistance) might be found equally serviceable. Up to the present time ball bearings have not met with much favor for rough mine work, especially where there are sharp curves or where much handling of cars on turn sheets is required.

Assuming that roller bearings (and the gradient that goes with them) can be adopted, the question of interest is, How flat should this gradient be made to take advantage of the bearings? Any gradient in excess of actual requirements will affect not only the haulage but also, eventually, the pumping and hoisting costs, noticeably so in long tunnels and scattered workings.

To answer this question it is necessary to know the coefficient of traction under average working conditions. With Hyatt roller-bearing wheels, under ideal conditions, this figure has been brought down as low as 3.9 lb. per ton, but a working figure usually quoted is 13 lb. per ton.

If w is the weight of an empty mine car; W, the weight contained in a well-loaded car; k the coefficient of traction going up hill empty; K, the coefficient of resistance going down hill full; a, the gradient of equal traction, and P, the drawbar pull per car necessary on this gradient—then after acceleration period is over, and car is going at uniform speed,

$P = kw \cos a + w \sin a$ going up hill empty and

$P = K(w + W) \cos a - (w + W) \sin a$ going down hill full, so that $kw \cos a + w \sin a = K(w + W) \cos a - (w + W) \sin a$

$$\text{or } \tan a = \frac{KW - (k - K)w}{2w + W}$$

$$\text{or, since } a \text{ is small, } a = \frac{K - (k - K)\frac{w}{W}}{2\frac{w}{W} + 1}$$

Assuming the coefficient of traction of the loaded car to be 75 per cent of that of the empty car, the above equation becomes

$$a = \frac{K\left(1 - \frac{1}{3}\frac{w}{W}\right)}{2\frac{w}{W} + 1}$$

It is obvious that the difference in value between k and K is of secondary value compared with K itself.

The ratio $\frac{w}{W}$ depends upon the design of the car and the nature of the ore, and will be made as small as practicable to obviate the hauling of dead weight. Assuming a value of $\frac{1}{4}$ for $\frac{w}{W}$ and 13 lb. per ton for K,

$a = 0.29$ per cent or approximately 3 in 1,000

Drainage grades have been made as flat as 1 in 7,200, and though it is not suggested that the gradient of equal traction could ever be brought to such a low figure, there is still a margin left for further improvement. On the other hand, mines equipped with roller-bearing wheels are probably not reaping the full benefit of their equipment if grades approximating 0.5 per cent are still being used, though sharp curves and high starting resistance may prevent a strict adherence to the calculated figure.

The loss of efficiency due to the adoption of the 0.5 per cent grade when one of 0.29 per cent only is called for is expressed by the fraction $\frac{(0.5 - 0.29)\ 1\ 100}{k + 5\ 100}$ i. e., about 15 per cent in the above instance.

The smaller the value of k, the greater the percentage loss due to heavy grades. This loss could be remedied in part if the factor $\frac{w}{W}$ could be still further reduced.

In Roasting Sulphide Ores in furnaces of the McDougal type it is sometimes advisable to reverse certain of the rabble blades. This gives longer roasting on any desired hearth and at the same time stirs up the ore bed more than could be accomplished by dropping some of the rabbles entirely.

Transporting Dredging Parts By Barge and Truck

Written for *Engineering and Mining Journal*

AT HAMMONTON, Cal., the Yuba Consolidated Gold Fields Co. operates eight gold dredges, scattered over a large area. Transportation of parts and supplies to and from the dredges has been worked out in an interesting way. A system of roads is maintained which gives access to points near by the dredges. As the dredges are continually advancing these roads have to be extended from time to time.

Some of the dredges are not readily accessible to the roads, and must be reached by canals which are connected to the dredge ponds. For transportation in the canals and in the dredge ponds, light steel barges of 20-ton capacity are provided. These are towed by a 60-hp. Holt caterpillar, which is used for heavy service.

Loading and unloading heavy parts is a necessary feature of transportation. At the shops a boom derrick is used for loading the parts on the trucks. At each road head a small derrick of the same type unloads from the truck and transfers to the barge. Transference from the barge to the dredge is accomplished by the two derricks which are a part of the dredge structure and are placed close to the bow of the dredge.

Power is used on all of the derricks, and loading and unloading are rapidly and conveniently effected. The steel barges are also used as working platforms where repairs are required upon the bucket line.

For transporting major parts of the dredge, such as the steel spuds, weighing up to forty-five tons apiece, the upper tumbler, twenty tons, and the lower tumbler, fourteen to fifteen tons, special trucks are employed. Tractors are used for haulage. The weights given are

TRANSPORTATION OF DREDGE PARTS

(1) Wagon trucks used to haul dredge buckets (each bucket weighs approximately 4,200 lb.). (2) Steel barge, launch and derrick at road head. (3) Auto truck carrying dredge supplies. (4) Dragging dredge buckets by caterpillar tractor.

power launch, or, where the distance between dredge and road head is small, the barge is pulled to and from the dredge by a wire rope operated from the dredge and also from the derrick which is placed at each road head.

Small parts are transported by boat and launch; larger parts are loaded on the barges. All small parts and supplies, such as lubricating oils and other necessary commodities, are loaded into a one-ton auto truck and carried to the road head. Large parts, such as dredge buckets, pins, tumblers and gears, are placed on wooden trucks, which are hauled singly or in trains to the road head. Two tractors are provided for this service, one a Yuba ball tread for light and the other for the parts of an 18-cu.ft. steel dredge. An 18-cu.ft. dredge bucket weighs 4,200 lb. complete, and is the heaviest piece that requires frequent handling. The capacity of the different derricks is: Weight capacity of dredge bow derricks, 2 tons; weight capacity of traveling crane, 15 tons; weight capacity of road head derrick, 25 tons; weight capacity of shop derrick, 25 tons.

Iron Ore has been discovered in the canton of Aargan, Switzerland, between the villages of Herzuash and Wolflinsivil, according to the *Iron Trade Review*. It is claimed to contain from 23 to 35 per cent iron, without appreciable amounts of phosphates or sulphur, and therefore should be of as good quality as the Lorraine product.

Oxygen in Cyanide Solutions

Its Determination, by White's Method, May Be Made With More Precision if Caramel Is Used As a Coloring Medium

By E. M. Hamilton
Written for *Engineering and Mining Journal*

READERS of *Engineering and Mining Journal* may be interested in an experience I had recently in working the new method for estimation of oxygen in cyanide solutions devised by H. A. White, of Johannesburg. (*Jour. Chem. Met. & Min. Soc. of S. A.*, June, 1918.) The method depends on the degree of coloration imparted to a cyanide solution by the addition of pyrogallic acid and caustic soda.

A set of color standards is prepared, taking as the tint for the first of the series the color produced by the addition of the reagents to a known volume of distilled water previously saturated with atmospheric oxygen. The quantity of dissolved oxygen present at saturation point is determined for any temperature and barometric pressure by reference to Roscoe and Lunt's table. (See Sutton's "Volumetric Analysis").

The first color in the series having been thus determined, five or six more bottles are prepared containing the proper proportions of the original color solution (diluted up to volume with water) to represent amounts of oxygen per liter of solution in quantities diminishing by 1 mg., the series finishing with ½ mg. of oxygen per liter.

Making Standard Color

For the standard colors White recommends "Diamond" brown dye shaded to a match by addition of methyl orange, acid, and potassium chromate, or, as an alternative, a solution of pyrogallic acid and caustic soda oxidized to saturation and then diluted to the shade required. By the first of these methods it is difficult to obtain a match, whereas, in the second, the color produced seems to fade in daylight, which, of course is detrimental to its use as a standard for more than a brief time.

I have found that a perfect color match without experimenting can be obtained by the use of a solution of caramel, and the tint appears to be permanent as far as could be observed in a period of three to four weeks. This solution, however, produced a slight fungoid growth after ten or twelve days, but this could probably be prevented by the addition of a preservative, such as formaldehyde.

At a mill in Mexico where I recently tried the method I found that the details as given by the inventor must be modified to make it workable. The difficulty was that immediately on addition of the reagents to the cyanide solution to be tested, a color was produced that was many degrees darker that that shown by the standard of distilled water saturated with oxygen. This first color, however, faded so rapidly that comparison of shades was impossible. At the end of five or six minutes the fading had retarded sufficiently to be able to make the comparison, though even at this point the density of color was equivalent to two or three times the oxygen content shown in saturated distilled water.

Why was the fading not allowed to continue to the point at which it matched the saturated distilled water, may be asked. The reason was that after standing for six or even minutes the solution began to cloud, and before the tint had time to approach that of the standard, the test was so murky that any comparison was impossible.

At the end of five or six hours a heavy ocher-colored precipitate settled out, leaving the supernatant solution almost colorless. I did not have an opportunity to analyze this precipitate, but as the solution contained silver to the amount of about 1 oz. or over per ton, and as White makes no mention of such a precipitate in gold solutions on the Rand, it is probable that the silver was responsible for the condition noted. That the dissolved oxygen is a factor in the phenomenon is shown by the fact that unprecipitated but de-aërated solution gave no sign of a precipitate on standing, whereas with the precipitated and aërated solution, a distinct cloudiness was apparent after about half an hour, though not to the same extent as in the pregnant solution.

Procedure

The procedure finally adopted was as follows: I took a sample of precipitated solution, and, after saturating it with atmospheric oxygen, placed it in one of the stoppered test bottles of 250-c.c. capacity, filling to a point such that the stopper could be inserted without leaving an air bubble. I then added 100 mg. of crystallized pyrogallic acid and 1 c.c. of twice-normal NaOH, as recommended by White, and after shaking down the crystals, inserted the stopper, and agitated until dissolved. I then allowed it to stand for exactly six minutes, and the color observed at that point was taken as the standard color corresponding to a saturated solution of oxygen in distilled water. This color was then matched with a solution of caramel which formed the first of a series of color standards.

The saturation point of oxygen in distilled water at a temperature of 18 deg. C. at the altitude of the mill was found by the table to be 6.25 mg. of oxygen per liter. A series of colors was then prepared by diluting the original caramel solution to represent respectively 5, 4, 3, 2, 1, and ½ mg. per liter. All that then remained to be done was to take any sample of plant solution to be tested, with proper precautions to prevent additional aëration during the manipulation; place in one of the stoppered test bottles so that no air bubble would be left on inserting the stopper; add the reagents, and after stoppering and shaking to dissolve the crystals, allow to stand for exactly six minutes and then compare the color with the set of standards, picking out the shade with which it most nearly matched and which was taken to indicate the oxygen content of the test.

Some of the determinations resulting from this method may be of interest:

OXYGEN CONTENT BY MODIFIED WHITE METHOD

	Oxygen, Mg. per Liter
Mill solution from storage tank	6.0
Mill solution overflow from pulp collecting tank	5.0
Pregnant solution, precipitation head before de-aërating	5.0
Pregnant solution after de-aërating by the Crowe process	0.5
Barren solution, effluent from precipitation presses	trace
Barren solution in barren storage tank	6.0

Variations of 1 mg. of oxygen per liter may be detected easily.

Carbon tetrachloride, used in fire extinguishers, has too high a freezing point, and so is usually mixed with chloroform. When the latter was scarce, during the war, the Bureau of Standards found gasoline or turpentine could be used instead, the resulting mixture being a fire-extinguishing liquid.

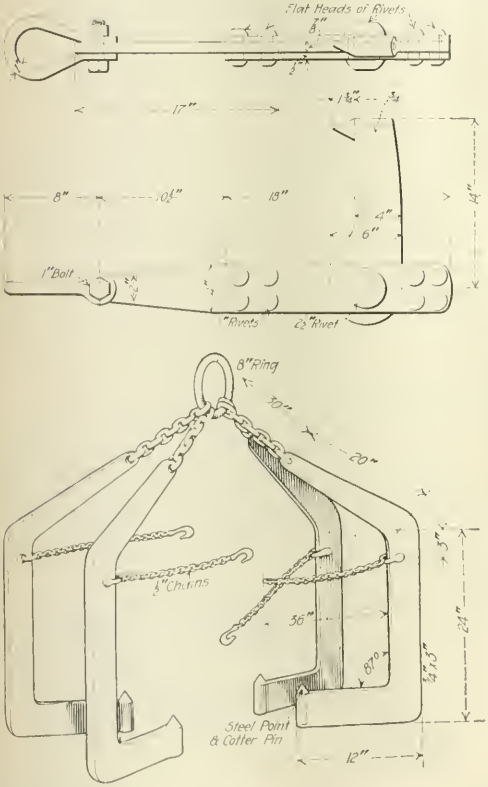
Handling Broken Rock and Ore Chunks

By H. H. Hunner

Written for *Engineering and Mining Journal*

IN THE operation of most rock crushers handling hard ore or rock there is considerable delay each shift due to extra large chunks of rock blocking the mouth of the crusher. Though blasting will usually remove or displace them at the first attempt, it should be avoided as much as possible on account of the increased maintenance cost on crusher and building caused by blasting.

At the Cornwall Ore Bank Co., Cornwall, Pa., where a hard magnetite ore is mined, a hook has been devised for use with a five-ton air lift over the crusher mouth and over dump cars. The hook seldom fails to take hold of a rock mass, and retains its grip long enough to at least shift the lump into a new position after



UPPER FIGURE IS DETAILED DRAWING OF A ROCK HOOK USED IN ROCK CRUSHING. LOWER FIGURE, A HOOK USED IN OPEN-PIT MINING FOR HANDLING LARGE ROCK MASSES AT THE OPEN PIT OF THE CORNWALL ORE BANK CO., AT CORNWALL, PA.

each try. On account of the sharp steel point, the hooks cannot slip off the most irregular chunks until the strain is sufficient to cause it to gouge itself out. Quite often, on an extra large slab that is either too heavy to lift or is keyed in with other lumps so solidly that it cannot be shifted by pulling it near the middle with the full five tons, the slab will fail in the center. The steel point is held in place by a cotter pin and the operator keeps a few sharp points on hand.

In blasting by drill holes on 70 or 80 ft. banks, the large area that is covered by the scattered rock at the toe of the bank is difficult to clean up by using a derrick and loading buckets by hand. An effective practice is to lay the loading track about 50 to 60 ft. in from the outside chunks and use a ten-ton derrick to clear the roadbed and sweep up the outside chunks. In handling the big chunks of rock with the derrick, heavy tongs were first tried out, but the workmen were reluctant to use them, on account of their weight and because they dropped the chunks about half the time, having only two points of support on the chunk. Lately a four-point grab that has lifted chunks weighing over eight tons has been tried out and has several good points to recommend it. It is easy to make, convenient for two men to handle, and is quickly attached to irregular chunks lying at random in a pile. Four times out of five it will release itself when the chunk is deposited on the stockpile. The material for the legs is ¾ x 3 in., but I would recommend using ⅞ x 3 in., or 1 x 3 in., when the apparatus is designed to handle chunks weighing more than seven tons, as hooks of the size shown in the figure have in practice required to be straightened out once or twice.

The chunks may be blockholed before or after moving with the derrick, as they are always set down on the stockpile in the same relative position. The jackhammer work can be done before the derrick is advanced far enough to reach the chunk. The foreman marks the chunks he thinks the derrick can handle, and they are not blasted unless the derrick fails to lift them. In this way, most of the large chunks are moved above the loading track without breaking them up and loading the small pieces into buckets by hand. The lower chains, three of which have hooks on the end, are pulled up snug and cross-tied after the legs are worked under the chunk at points convenient to get at. On round chunks, three legs are usually sufficient to make a lift, but in moving long slabs the four points of support are necessary.

Repairs to Rotary Pumps

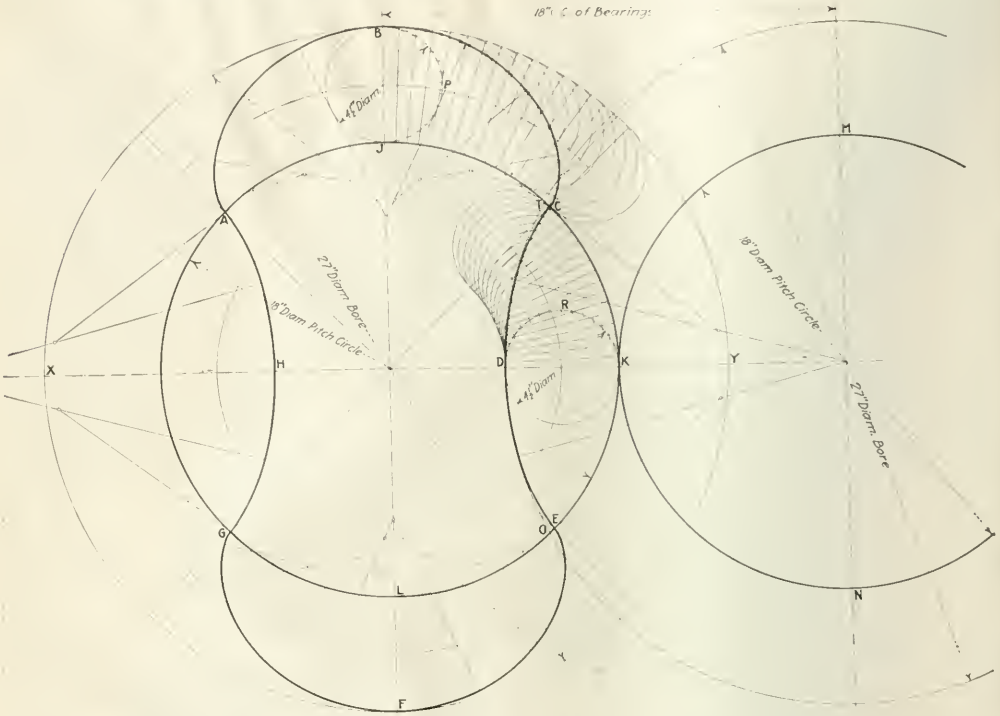
By Robert C. Baker

Written for *Engineering and Mining Journal*

THE repair of rotary pumps which have become so badly worn that their efficiency is impaired is a comparatively simple matter if one bears in mind that there are certain definite relations which must be maintained between the bore and the distance between centers.

When it was recently decided to repair one of the rotary pumps in service at a plant in Nacozari, Mexico, the first thought was to rebore the barrel of the pump, which had become badly worn, making it 27⅛ in. in diameter, instead of the original 27 in. The pump was a Connersville, with a capacity of 39 gal. per revolution. This would have entailed, of course, the casting of new impellers, which it was thought would be a simple matter, necessitating only the putting of additional stock on the ends of the impellers and making the throat sufficiently smaller to allow for the change. However,

this was found to be impossible, as a rolling fit could not be secured. Investigation developed the fact that, with the original distance between the centers in the pump 18 in., a bore of only 27 in. could be used.



LAYOUT OF PITCH CIRLES IN READJUSTING IMPELLERS OF ROTARY PUMPS

The repairs were therefore made in the following manner: The barrel of the pump was first relined, and then rebored to the original dimension of 27 in. The impellers were then developed as per the accompanying sketch, and cast. This gave a perfect rolling fit, with the pump in practically as good condition as new. The impeller, which is in outline wholly a series of developed curves, was laid out in the following manner:

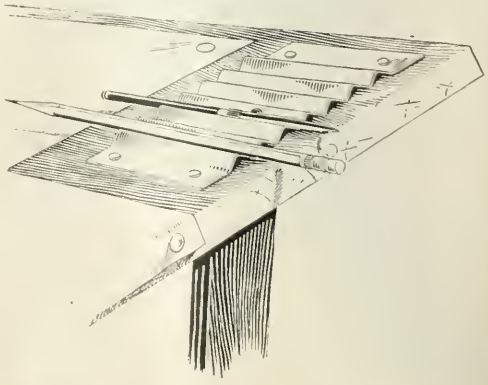
First, lay out the pitch circles, as shown. Next, lay out the bore circles, as shown, and intersect the pitch circle with diagonals at 45 degrees, as *AE* and *GC*. The curve *ABC* is then developed as an epicycloid by means of the generating circle *BPJ* on the arc of the pitch circle *AJC*, as director. The curve *EDC* is also developed as a hypocycloid by means of the generating circle *DRK* on the arc of the pitch circle *EKC*. The remainder of the impeller is laid out in a similar manner.

It is, of course, apparent, that to secure a perfect rolling fit it is necessary for the curves *ABC* and *CDE* to join on the pitch circle at the diagonal 45-degree line. Thus it is seen that the arc *BPJ* of the generating circle must equal the arc *JC* of the pitch circle; likewise the arc *DRK* must equal *KC* of the pitch circle. Therefore, it follows that *the circumference of the generating circle is one-fourth the circumference of the pitch circle*, and likewise that *the diameter of the generating circle is one-fourth of the diameter of the pitch circle.*

From the above it will be apparent that the bore will be 1½ times the distance between centers, or 1½ times the diameter of the pitch circle.

Drafting Table Rack

When the drafting board was on the incline and the draftsman found himself picking up things one after another, his patience slowly began to give out. His ruling pen became a rolling pen, and rolling tools gather a loss. This "uplift" work began to rack his nerves, and he began to rack his brain for a rack to hold his



RACK FOR DRAFTSMAN'S TOOLS

things in place above board. A simple rack which he devised did the trick and restored his equilibrium.

A sheet of heavy paper about five inches by eight inches was folded, as illustrated and tacked near the top of the drawing board. This simple rack afforded a berth for every tool, checked the gravity of the situation, and prevented further waste of time.

Feed and Product Size Diagram

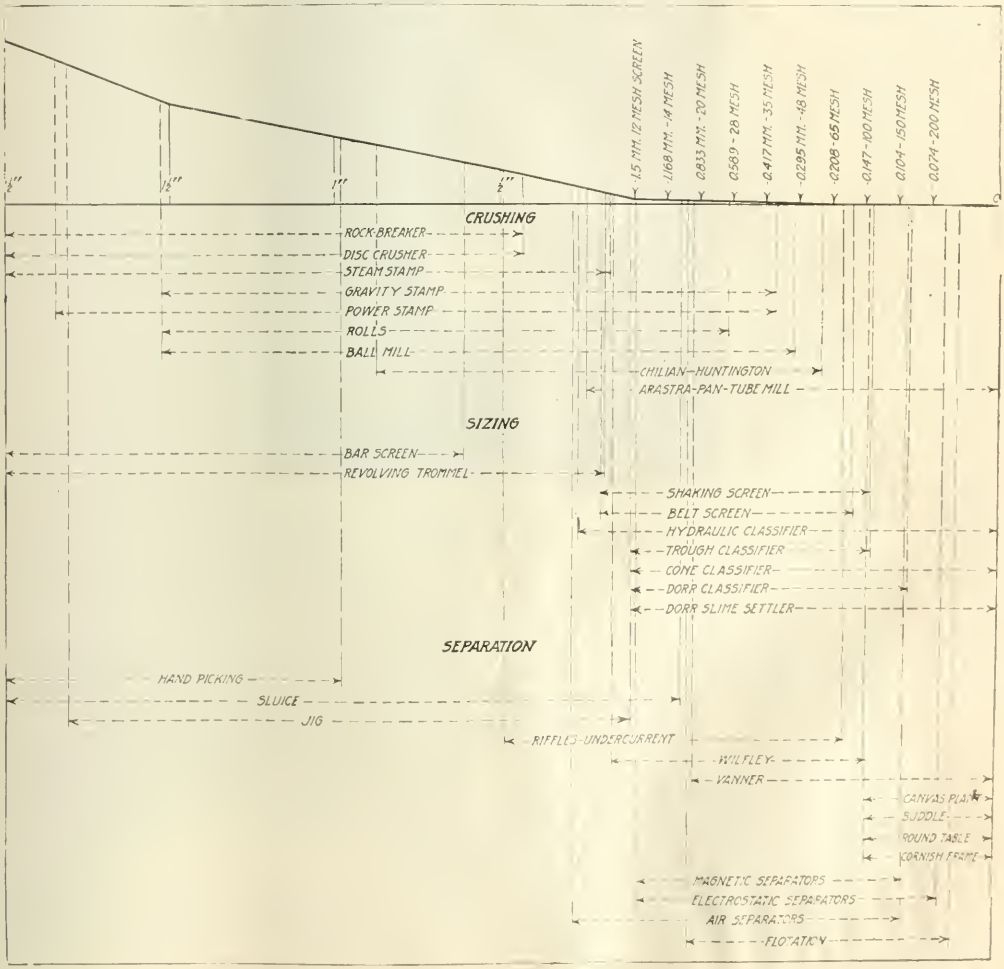
By George J. Young

Written for *Engineering and Mining Journal*

In the accompanying cut a diagram is shown which illustrates the approximate limitations of size of material fed to and delivered from crushing and grinding machines, classifiers, and separators. It is, of course, not to be considered as exactly accurate or comprehensive or to take into consideration the practices prevailing under abnormal or subnormal circumstances, but the chart will be found useful as a guide to average operations.

The Pace That Kills

When the late T. S. Austin was superintendent of the El Paso plant of the A. S. & R. Co. he became thoroughly accustomed to the policy of eternal vigilance. The type of intermittent-tap lead furnaces employed there also kept subordinate employees rather busy. Upon being transferred to the Aguascalientes plant, Mr. Austin endeavored to familiarize himself as rapidly as possible with all the technical details of the plant and also with the precise duties and normal activities of each and every man and boy on the payroll. Scurrying about under the guidance of his predecessor, he reached the tapping floor and inquired, "Who looks after things here?" A gesture indicated a Mexican who at the moment was languidly rolling a corn-husk cigarette as he strolled from one furnace to the other. "What is he doing now?" demanded Austin, nervously. "Nothing," was the reply. "Nothing, eh? Who is that fellow lying there half asleep?" "Oh, that is Pedro, Juan's helper."



APPROXIMATE LIMITATIONS OF SIZE OF MATERIALS FED TO AND DELIVERED FROM ORE-DRESSING MACHINES

Leaders in Metallurgical Practice

Arthur L. Walker

IT IS rather strange what little things influence young men in the selection of their careers. Were it not for the fact that Arthur L. Walker, after graduating from Morris Academy back in 1879, had been intimately acquainted with a member of the victorious Henley crew of Columbia University, his decision to attend the Columbia School of Mines would have been problematical. However, no one doubts that he would have exhibited in any other career the same amount of inventive capacity and general ability that he has displayed in mining and metallurgy. Upon being graduated from the School of Mines in 1883 he was tendered a position by Prof. Pierre De P. Ricketts as assayer for the Old Dominion Copper Co. at Globe, Ariz. In those days it took seven days to make the trip to the West, two days of which were spent in stage-coach travel, and despite hazy notions as to just where Arizona was, he jumped at the chance to work on the attractive Western borderland. After service for three years with the Old Dominion Copper Co. as assayer, chemist and underground engineer, Walker resigned to accept a position with the Silver King company, only to return to the Old Dominion Copper Co. a short while later as the new superintendent of the enterprise—inwardly admiring the company's courage in appointing so young an engineer to this responsible position. Yet (mining companies take note), during the six years of his stay there an entirely new smeltery was built, an aërial tramway—the first in the Southwest—erected to connect mine and smelter, and other extensive improvements were made.

ARTHUR L. WALKER

In 1893 this young engineer went to Baltimore to take charge as general manager at the Baltimore Electrolytic Refining Co., now the Baltimore Copper Works, and while there invented the first successful machine used to supplant the old laborious hand ladling of casting copper—the Walker casting machine. There were many difficulties to overcome in designing and introducing this machine, but the result was most satisfactory, and the machine is now used all over the world. Considerably more than one-half of the copper that is now produced in the world is cast on these Walker machines.

The next jump was to Perth Amboy, N. J., where Mr. Walker was placed in charge of the copper operations of the Guggenheims. Inventive talent again asserted itself—this time it was the idea of combining the advantages of the series system and the advantages of the multiple system for electrolytic copper refining that yielded what is now known as the Walker system of electrolytic tank and conductor arrangement, a plan that was first introduced in 1902 at the Perth Amboy Electrolytic Refinery and which has been adapted in all but one refinery subsequently built. In 1906 Walker was elected a director in the American Smelting & Refining Co. and a member of the executive committee. His duties were very general, but carried him to operations principally on the Pacific Coast. Two years later he severed connections with the American Smelting & Refining Co. to accept the chair of metallurgy at Columbia University, bringing to the School of Mines the benefit of the wealth of experience he had accumulated in twenty-five years of practical association with mining and metallurgical work. Professors as a class are often accused of being too theoretical and of subordinating the practical aspects of their teachings, but Prof. Walker's record is quite a contrast to such generalization. In the war he was first consulting metallurgist to the Chief of Ordnance, then attached to the Small Arms Division, and later to the Metallurgical Branch of the Inspection Division.

Prof. Walker claims that, to him, the two outstanding achievements of his professional work are his position as general superintendent of the Old Dominion Copper Co., when only twenty-four years old, with the eminently successful operating results under his régime, and the special inventions he was able to introduce in copper metallurgy.

Oh, yes! Prof. Walker has always been interested in athletics—his particular hobby being the great American pastime. He organized a ball team at Globe, and he plays golf. Incidentally, his son Arthur L. Walker, Jr., is able to meet almost anyone at the game.

By the Way

Cuba Prosperous

More than the high prices of sugar and the presence of great numbers of thirsty American tourists is responsible for the superlative degree of prosperity that is being enjoyed in Cuba, declares D. F. Hewett, who has just returned from the island, where he made examinations of manganese properties for the War Minerals Relief Commission. The additional reason for this prosperous state of affairs is the entry of new capital into mining. In Cuba, a tax is levied upon production only, and many Americans who object to the taxation policy pursued at home are making investments in Cuban mining properties.

Canitopsis

The supply of tin cans is below normal and probably the smallest, relative to demand, it is said, that the country has ever experienced. Our predicament is really becoming serious. The tin can has played an important part in our national life, and we have taught the world to use it. Called a wasteful people, we have nevertheless shown man how to preserve his surplus fruits and vegetables. To the engineer, prospector, and miner and to him who seeks the uttermost parts of the earth, the can has especial significance. To him, sordid and rusty though it be at times, it is the symbol of existence, and after he has passed along it remains a monument to his passing. Take the wings of morning, pierce the Barcan wilderness, wherever it may be, and the cans will be found mutely dotting the landscape, their metal once won from earth now cast aside to be resolved to earth again. The desert whirlwinds swirling through the abandoned camps make of them their plaything, and their clanking furnishes a rude music, which there is none to hear. The can, too, has played its part in the world of metallurgy and in the precipitation plant has aided in recovering copper from the waters of the mine. Thus the can through silent service has won for itself honorable mention. When we read, therefore, that the supply is diminishing, we wonder if it, too, like so many other things of recent years, is to become scarcer and scarcer until finally it disappears. Then, perhaps, we shall be taking our food in pellets, and the question of containers will be of less importance.

Inaugural Exercises; or, Arizona on Tiptoes

"An eager and expectant crowd stood about the well site of the United States Oil & Refining Co., in the Bowie oil basin last Sunday, to witness the inaugural exercises that set in motion the new Imperial Ideal Standard rig that all southeastern Arizona confidently expect to unlock nature's treasure vault and shift Arizona into the column of oil states," said a Bisbee daily recently.

"All day the stream of visitors came and went and all day the big machine worked with the even and smooth precision of a perfect mechanism, and every one who saw it knew at a glance that it was fit for the job and put away from his thoughts any brooding doubt that the public will get a run for its money.

"Five hundred feet of water was bailed from the well, —the accumulation of two months while the rig was being set up—and as the bottom of the 860-ft. hole was reached the slush water carried visible evidence of liquid oil that rode down the slush ditch into the sump. This phenomenon has marked the last 200 ft. drilled in the well, before suspension of work, to a greater degree than was exhibited Sunday, as the pressure of 500 ft. of water had tended to chill the oil and retard its flow into the well. Drilling was begun Monday morning, and, as the ponderous bit smashed its way downward, cutting new ground, larger quantities of oil appeared in the slush as work advanced—this is the hopeful factor.

"Representatives of the important towns of southeastern Arizona made up the list of visitors. They appeared more than satisfied with what they saw and went home to impart their confidence to their local communities. Manager Washburn was tireless in his efforts to entertain his guests and tell them everything they wanted to know. He indicated that it would be his fixed policy to encourage visitors to the well and keep no secret from the public. He says that only some cataclysm of nature can balk the progress of the work and he looks for a speedy proving of the Bowie oil basin."

The Divining Rod Again

Evidence continues to pile up that there is money in divining rods. We have had this hunch for a long time, but have hesitated to give voice to it lest some unprincipled person should see a copy of the issue in which the tip was given and should attempt to turn our surmise into cash. We exercise great care in these matters, having the welfare of others at heart. But the news seems to have got around anyway, so there is no longer any need for us to keep silence. Let the innocent beware! If they would lose their money, let them invest in such devices.

A Riddle

"Congress is now made up of 531 men, endowed by their Creator with such mental powers as He intended them to have, and with such breadth of view, sanity and judgment, and knowledge of world affairs as their earthly environment has vouchsafed," said George A. Post, chairman of the railroad committee of the Chamber of Commerce of the United States. "Ninety-six of them sit in the Senate, and 435 sit in the House of Representatives. While the numerical size of Congress has increased, from time to time, its quality is about the same as it has always been."

In the light of the recent Congressional adjournment and the political effort to defend or criticize the status of legislation, can this safely be regarded as a condemnation of our national legislators, or should it lead us to believe that, after all, even a dilatory Congress is not going to get us into trouble if history can safely be taken as a precedent?

The Basement Complex

Modern children are precocious, and it is only natural that they should pick up words and phrases used by their elders. The seven-year-old daughter of an erstwhile geologist, playing with a bedraggled but cherished kitten, was asked what her pet was called. "Well," she replied, with a pedantic air, "there is considerable divergence of opinion. Daddy calls her a segregation from an intrusive magma of doubtful genesis; mother refers to her as the basement complex; sister Bessie insists that she is a typical example of secondary impoverishment; but I just call her my dear little Kitty."

CONSULTATION

Native Quicksilver

"Has native quicksilver ever been mined in the United States? It is our impression that the source of the metal is rare."

Although native quicksilver is an ore, it furnishes a relatively insignificant supply of the metal. Over 95 per cent of the domestic quicksilver comes from the bright-red sulphide of mercury, cinnabar, a very rich quicksilver mineral. In the native form quicksilver usually occurs as tiny globules—small amounts have frequently been found in mining exploration and occasionally in cavities of considerable size.

Cadmium Prices

"Will you please tell me how the present price of cadmium compares with its value for the past five years? Has this metal any broad application, or is its use in the manufacture of fusible alloys the principal one?"

The present quotation of $1.40 to $1.50 per lb. for cadmium is merely nominal. There is little business being done in this minor metal. As it is obtained mainly as a byproduct from zinc and lead refining, the supply of the metal is mainly dependent upon the output of those two major metals. Present quotations are about 25c. higher than the average for 1919 and about equal to the price during 1916, 1917, and 1918. The value was around $1.20 in 1915 and 90c. in 1914.

Cadmium's chief use is in alloy manufacture—mainly in fusible alloys— and as a substitute for tin in solders. The compounds of cadmium are used in paints and pigments and as salts to give luster to glass and porcelain.

Mining Oil Shales

"We are interested in the development of the oil-shale industry and intend to undertake the mining of the shale. Can you give us any information regarding the features of this particular variety of mining?"

When the oil-shale industry is developed, mining will necessarily have to take place on a large scale and will have problems peculiar to itself to solve. Open-cut methods, or quarrying, will be found satisfactory in some conditions, along the general lines of practice in this country. Underground mining will no doubt find wide application, and the method used will possibly follow coal-mining practice, as the conditions are similar. Not much mining or experimentation has been done, and there is little to guide in planning an attack on the problem. Standard methods of coal and metal mining will probably find applications, with modifications necessitated by the characteristics of oil shale. In coal mining the matter of fines usually defines the method of mining used, but in oil-shale mining there is no restriction as to fine material, as the substance will necessarily have to be crushed for redistillation purposes. However, the problems of ventilation will resemble those of coal mining—gas and dust explosions must be guarded against. The best type of drill and the most appropriate explosive remain to be determined for this embryonic industry. The physical character of the shale is such that percussion drills do not seem to work advantageously. In general, oil-shale mining will resemble coal mining more than metal mining. Incidentally the problem illustrates the consanguinity existing between the oil industry and mining.

Lithopone

"Will you kindly inform me as to how barytes is used in lithopone and what other substances combine to make up the composition of that material? Is lithopone of much commercial importance?"

Lithopone is a useful pigment manufactured from barytes and zinc. It is essentially an interior dull-finish wall paint, and has both advantages and disadvantages when compared with its rival pigments, zinc oxide and white lead. It is not affected by sulphur or hydrogen sulphide as white lead is, and is non-poisonous —a decided advantage. Furthermore, it is whiter than white lead. However, as an exterior paint, lithopone is not as satisfactory as other materials, owing to its tendency to discolor under direct sunlight, producing checks and a chalky surface. Mixtures of lithopone with other pigments such as zinc oxide are said to have removed this difficulty.

Lithopone is usually made by mixing and heating a solution of barium sulphide with a solution of zinc sulphate obtained from the chemical treatment of barytes and zinciferous products, respectively. A reaction takes place with the formation of a precipitate containing about 70 per cent barium sulphate and 30 per cent zinc sulphide intimately mixed, which is heated to a high temperature and quenched in water, rendering the powder more opaque and white. The process is a delicate operation and its success is dependent greatly upon careful manipulation. Some of the zinc sulphide is converted to the oxide in the heating process, usually from 1 to 10 per cent. Naturally, with a manufactured compound such as lithopone, trade secrets concerning the manufacture of the product are often carefully guarded.

The composition varies widely, and frequently another material, such as flake white, is added to enable the manufacturer to claim exceptionally meritorious qualities for his lithopone. Although there are many trade names for the pigment, such as Ponolith, Zincolith, and others, a graduation such as is indicated in the following table is frequently used:

	Zinc Sulphide	Barium Sulphate
Green Seal	1 part	2 parts
Red Seal	1 part	3 parts
Blue Seal	1 part	4 parts
Yellow Seal	1 part	5 parts

Green Seal is the best grade of the product, and the others follow in the order named. The lithopone industry is still in an infant state and is an important barytes consumer. It has been estimated that about half of the domestic production of crude barytes enters into the manufacture of lithopone.

THE PETROLEUM INDUSTRY

The Petroleum Section of Engineering and Mining Journal

THERE has been some question as to how far the old subscribers of the *Engineering and Mining Journal* found the Petroleum Section interesting and approved of it. The Petroleum Section was initiated on account of the frequent close and common interest between metal mining and petroleum mining, as expressed in our editorial of April 24, 1920, and with the belief that most of the metal-mining men were interested in the petroleum industry.

To get statistical data upon the situation, questionnaires were sent out to a representative and varied list of subscribers. To those subscribers the following questions were put:

1. Have you any interest in the Petroleum Section of the *Engineering and Mining Journal?*

2. If you are interested, is your principal interest in the metal mining or petroleum mining?

3. Do you approve of the Petroleum Section in *Engineering and Mining Journal?*

4. Would you be interested in seeing the Petroleum Section of *Engineering and Mining Journal* expanded, provided the amount of space and attention and metal mining is not reduced?

The answers received were carefully studied. A tabulation shows that 75 per cent, in answer to question 1, were interested in the Petroleum Section; 20 per cent were not interested; and 5 per cent were indifferent.

Of the 75 per cent who are interested in the Petroleum Section, it is illuminative to note that three-quarters of these, or 75 per cent, are interested principally in metal mining, only 10 per cent are interested primarily in petroleum, and 13 per cent are equally interested in both. These figures support, even more strikingly than we had anticipated, the close connection of metal and oil mining, and prove that most of our old subscribers find in the Petroleum Section something which touches their business or their interests at one point or another.

In answer to question 3 as to whether the subscriber approved of the Petroleum Section in *Engineering and Mining Journal,* we find even a larger proportion, due to the fact that many who are not interested in petroleum approve of the Petroleum Section; so that only 10 per cent disapprove of the Petroleum Section and 90 per cent give it their emphatic approval or their tolerance.

In regard to question 4, dealing with the expansion of the Petroleum Section, we find that there is a general feeling of satisfaction with the present size of the section; nevertheless about two-fifths of all the replies favor the expansion, providing it were not at the expense of the other mining interests. The general trend of votes, therefore, was in favor of very cautious expansion, if any were undertaken.

Of those in question which expressed an interest in the Petroleum Section, about 37 per cent were mining engineers; 19½ per cent mine executives; 13 per cent lawyers, bankers, brokers, capitalists, investors, metal merchants, and persons in general business; 13 per cent metallurgical engineers, chemists, and assayers; 11 per cent mining men; 4½ geologists; and 1½ per cent college professors.

The Scramble for Oil

Under the above heading, the *Compendium,* published in London, discusses the British petroleum policy, as follows:

"That country which controls the petroleum supply will control the trade of the world." So said the chairman of the Standard Oil Co. to the Foreign Trade Convention at San Francisco a fortnight ago, not without a note of regret that the British were the first to recognize this fundamental fact. It is as true today that the future lies with oil as that in the past the industrial greatness of Britain has been built up on coal. But coal is king no longer. The war, government control, and the miners have effectively dethroned it. It has become too scarce and too dear to hold undisputed sway. Very soon the world will no longer turn its eyes to Britain for coal, but rather to the tropic lands for oil.

There are no illusions on the subject among the leaders of British trade and industry. They see clearly that coal has a rival. With equal clarity they see that Britain's commanding position in trade is lost if she cannot secure oil wells commensurate with her coal measures. The world scramble for oil has already commenced, only, however, to find that Britain has been there beforehand. Thanks to the initiative of private enterprise, this country has secured over a wide area the rights to supplies which will to some extent, if not altogether, adequately safeguard her maritime and trading interests for a generation to come.

There is no need to retell when and how these oil fields have been opened up—that in Mexico, Central America, Trinidad, Persia, India, Burma, Egypt, the Straits Settlements, Russia and Rumania, British companies have acquired and are operating oil fields on an ever-extending scale; that the Anglo-Persian Oil Co., only latterly assisted by the government, has secured and is developing immensely valuable resources in South Persia, and that now North Persia is to be exploited. All this is well known. What is new and what has, unfortunately, raised a political controversy at home and abroad is the action of the government at San Remo in establishing its claim on the oil fields of Mesopotamia, in association with the Royal Dutch and Shell group.

Briefly stated, the position is this: In the peace settlement, Great Britain was given mandatory rights over Mesopotamia, which was formerly Turkish territory and in parts of which great oil fields were supposed to exist. But, before the war, a company in which Dutch, British, and German interests were represented received oil concessions expected to be of considerable value from the then Turkish government. The question of dealing with these concessions after the war naturally arose, and, though it was admitted that the German interests must no longer be considered, those of the Dutch were in a different category and must be recognized.

Then France was admitted to have a special interest in the Mosul area, which brought another group of interests into the case. Hence the understanding which has just been arrived at between the government and the Shell and Royal Dutch companies for the exploitation of the Mesopotamian oil fields. The exact detail of the arrangement have not yet been announced, but the broad fact that they sufficiently safeguard British interests may be accepted without hesitation. In the East, therefore, with Mesopo-

tamia and Persia added to the far-reaching resources of these companies, large supplies of oil are insured for this country, and in the west, as is known, such supplies have been in existence for years.

The Colombian Petroleum Law of December 29, 1919

To the Editor:

I have read with considerable interest the authoritative and timely study by J. W. Thompson of the recent Colombian oil legis'ation and your editorial comment which appeared in *Engineering and Mining Journal* of May 22. I have had occasion myself to go into this matter extensively and to examine the new law in its original, Spanish version.

I find that in certain important respects Mr. Thompson's article does not cover the ground as fully as, to me, seems desirable for a clear understanding of the conditions as now fixed by this law and which deserve to be discussed freely in the best interests both of Colombia and of the American investors.

I am advised that some American oil operators who are new to this field have taken exception to sundry features of this law, and it should be remembered, in this connection, that a large portion of the prospective oil resources of the country already have been acquired by powerful. foreign corporations under more liberal concessions that are not affected by the present law.

From a private communication on the subject I quote an abstract of the more important, novel features of this law:

Oil deposits, in public and private lands *alike*, when not alienated through an earlier government oil concession, are subject to the regulations of this new law and to payments to the government, as *royalties* on the gross output of oil (from both public and private lands), and, also, as *rentals* for the surface of the ground occupied on public lands. Classifications and provisions are:

Land Classification:

A. Public lands, "terrenos baldios," and all lands, including grants of lands recovered to or repurchased by the government, but not lands under navigable waters.

B. Private lands held under grants from the government of later date than Oct. 28, 1873.

C. Private lands under grants of later date than Oct. 28, 1873, and antedating Oct. 28, 1903.

D. Private lands under grants antedating Oct. 28, 1873.

Exploration for Oil:

On Class A lands, on "terrenos baldios," permitted without license.

On all other Class A lands, permitted only under government license.

On Class B and C lands, permitted only under government license and after previous notice to actual land owner.

On Class D lands, permitted without license, but only after filing a sixty days' advance notice with the Minister of Public Works.

Exploitation of Oil:

On Classes A, B and C lands, permitted only under government concession or contract.

On Class D lands, permitted only after filing notice of exploration, as above, and map of location, report of operations, and other details, within one year after beginning operations, with the Minister of Public Works.

Licenses for Exploration:

Issued for tracts of not less than 1,000 hectaras and not more than 5,000 hectaras. (One hectare approximates 2.5 acres.) Licenses cannot be issued to one applicant for more than three tracts in each department, and in frontier districts not more than one to each applicant.

On lands of Class C actual owners of the land have preference in the issue of licenses during the years 1920 and 1921.

The government may retire or cancel licenses at any time, and licenses do not convey any legal title or claim whatever.

Concessions or Contracts:

Size of tracts and number for each concessionaire, the same as for licenses.

Duration of contract, twenty years, with a renewal period at the option of the government for another ten years.

Bond: A minimum bond of $20,000 required for each concession.

Transferable only with the approval of the government and not at all transferable to foreign governments or foreign corporations in which foreign governments are interested financially.

On lapse and forfeiture of contract, all machinery and all other installations within the area of the concession become the property of the Colombian government without payment.

Forfeiture of contracts will be declared for a number of the usual causes, such as non-payment of royalties, rentals, or other charges, and also for failure to prove commercial deposits of oil within five years after date of contract, and for suspension of operations, without legal cause, during one entire year.

Concessions cannot be taxed by departments and municipalities.

Contracts do not need approval by Congress.

Payments to the Government—Royalties on the gross output of Oil:

For Lands in Classes A, B and C

Zone.	Base Minimum Per Cent.
A. Atlantic Coast frontier	20
B. Ecuadorean frontier	20
I. Within 200 kilometers of the coasts	10
II. Within 400 kilometers of the coasts	8
III. Beyond 400 kilometers of the coasts	6

For Lands in Class D.

I. Within 200 kilometers of the coasts	8
II. Within 400 kilometers of the coasts	6
III. Beyond 400 kilometers of the coasts	4

The above minimum base royalty applies to the first period of ten years; after which, for each subsequent ten-year period, the minimum base royalty will be increased by one "unit." Whether this "unit" means the entire base royalty or only 1 per cent, is difficult to understand. Possibly the official English translation may make this point clear. If it should be the former, it must be considered as excessive and confiscatory.

Annual rental on Area Covered by Concession:

		Cents per Hectare.
On lands of Class A.	First year	10
	Second year	20
	Third year	50
	Fourth year	$1

After the fourth year until the expiration of the contract, $1 per hectare.

Indemnities to Land Owners:

On lands of Classes B and C, according to stipulations of the Colombian Mining Law, Chapters 12 and 13.

On lands of Class D, according to private agreement.

Rights of Foreigners:

Foreign governments and foreign corporations in which foreign governments are interested cannot acquire oil concessions.

Foreign individuals and foreign corporations can only acquire oil concessions by declaration of submission to Colombian jurisdiction.

Rights of Private Land Owners:

Oil-bearing lands in private ownership which have not been developed within twenty years of the date of this law, will be penalized by a special land tax of $5 per hectare, until explored and developed, if proved oil bearing.

General Working Conditions:

The government reserves the right of inspection of operations and of records of production, and accounts.

At least 50 per cent of the workmen employed must be of Colombian nationality.

The fundamental novel feature of the law is that the Colombian government now asserts its right of eminent domain over oil deposits in all lands, public and private alike, in accordance with the old European principle of regal ownership to all mineral deposits (from this our own term "royalty" has been derived). This principle has prevailed in all Spanish-American countries since the time of the Spanish dominion as to all deposits of metallic minerals, and the new Colombian oil law now also extends it to oil deposits, by taxing all production a certain royalty, whether from private or public lands, and also by penalizing certain private lands with excessive taxes after a stated period until developed.

There could be no objection on the part of the foreign operator to this principle, as the royalties in a majority of cases are reasonable, if the new law were only consistent, but this is not the case. Though collecting production royalties on oil from all classes of private lands, on certain lands the government alone issues permits for exploration and grants working concessions, and in these cases the actual land owner is not concerned whatever, except in his right to a nominal indemnity for the surface actually occupied. On certain other private lands, however, the government, while collecting production royalty, does not require official licenses and concessions, but leaves the question of permit for exploration and contract or lease for operation to be settled with the land owner. Thus, in this class of land there is established a dual ownership to the oil deposits, which in practice probably will result in the collection of a double royalty, one by the government and another, equally large or larger, by the land owner.

In my opinion, either the royalty principle should apply only to public lands, or, if to all classes of lands, to all private lands alike, with the entire elimination of the land owner in the ownership of oil deposits.

Another unfavorable feature is the uncertain guarantee provided by the licenses and the fact that a license need not necessarily be issued to the first applicant. The original prospector thus may be spending his time and money in locating a tract of favorable oil lands, merely to furnish gratuitous information to a favored third party.

The anti-foreign clauses, as to jurisdiction and nationality of workmen, may also be objected to by many American operators. For myself I believe that these clauses will prove of small practical importance. In the last instance all these matters will rest entirely upon the goodwill of the parties concerned and their disposition to co-operate, and ultimately, also, on the state of friendly relations existing between the respective governments.

However, Colombia is a country that needs the co-operation of foreign capital, and therefore it ought to facilitate, by most liberal legislation, instead of hinder, the early development of its natural resources, including oil deposits.

OLOF WENSTROM.

Boston, Mass.

NOTE: Our readers, especially those interested in the oil problem in Colombia, are requested to communicate to the *Engineering and Mining Journal* their opinion of the Colombian mining law, that there may be a full discussion.—EDITOR.

Cementation in Sandstone

Deposition of Chemical Compounds From Solution in the Pore Space an Important Factor in Limiting the Extent of Oil Pools

BY ROSWELL H. JOHNSON*

Specially contributed to *Engineering and Mining Journal*

THAT the lateral limitation of many oil pools is the result of a more thorough cementation of the sandstone, rather than the occurrence of water, or a thinning of the bed, or of an increased fineness of the grain, is now well established. It becomes important, therefore, to know as much as possible of the progress of cementation, and especially of its distribution. The literature on the subject is not particularly helpful to the oil and gas geologist, as it has been written principally from the standpoint of the metalliferous deposits.

Thus, in his classic treatise on metamorphism, Van Hise places the greatest stress upon the zone of weathering or solution, which is said to lie above the zone of cementation. It is evident that the cementation is considered as the result, to a large degree, of the deposition of material dissolved in meteoric waters which have descended to lower levels.

As a matter of fact, in most oil and gas reservoirs, the inclosing rock has never been exposed to meteoric water. The oil or sand, when deposited, was covered almost at once by increasing depths of shales and other deposits, so that the deposits in question were taken far below the reach of meteoric waters. As a consequence, the history of the cementation must be worked out from a consideration of the connate and other fossil waters. These waters have produced far more cementation on the whole than that caused in Van Hise's zone of deposition from descending meteoric waters.

RECORDS OF CEMENTATION

The history of cementation falls into five phases:

1. The water which is deposited with the sand (the connate water) may carry material in solution which under some conditions may be deposited as a cement. Geologists know that coquina of quite recent origin will nevertheless be somewhat cemented, and it is probable that the connate water enriched by solution was the active factor. However, on the whole this phase cannot be considered important, for the reason that as the deposit in question becomes covered by a heavier and heavier overburden, the pressure on the water is therefore also increased, which increases its solvent action, so that, instead of deposition taking place, it would appear that cement might be actually redissolved were connate water alone considered.

2. The invasion of fossil water is a second phase. The compacting of the strata, especially the shale, is

*Presented at the Dallas meeting of the American Association of Petroleum Geologists, and published in *Engineering and Mining Journal* by authority of Council of the Association.

bound to extrude great quantities of water. Such water, in its migration, will, of course, follow the lines of greatest porosity, so that sandstone beds will receive water connate to the shale beds, which would be richer in dissolved material, owing to the less siliceous and more finely divided state of its particles. Cementation in this phase would therefore seem to be greater than in the first phase. However, as the depth from the surface is for the main part increasing throughout this phase, there is the same difficulty met before in that the waters are capable of holding in solution more and more material as the pressure increases.

3. As the heat and pressure become greater with increasing overburden, and stresses make themselves manifest, hydrocarbons are produced and enter the sandstone reservoirs in increasing amounts, there to be held by differential capillarity. Gas is more abundant at first, because thus far Quarternary deposits are found giving gas only where oil has not been contributed from below. Eventually oil, too, invades. But if the beds undergo such a history as to have their contained coal rank higher than 65 per cent in fixed carbon, the end of the invasion is solely by gas. The earliest invasion, as the drift gas of Iowa shows, has relatively more nitrogen and carbon dioxide, thus approaching marsh gas. It is largely of bacterial origin. The gas which follows, termed second-stage gas, ordinarily has some higher hydrocarbons, and the gas entering last (third-stage gas), if the area enter this stage, is more nearly pure methane, as at Poteau and Red Oak, Okla. The importance of this invasion is that water is displaced from the reservoir and cementation thereby arrested. Therefore, to study the distribution of closer cementation, the history of the hydrocarbon-filled volume must be known. This necessitates adding to existing knowledge the paleogeographic record of the formation, the history of its folding and stresses.

Importance of Record of Primary Hydrocarbon Lodgment

The places of early lodgment of hydrocarbons in the reservoir are of especial importance as indicating greater porosity. In homoclinal reservoirs these are at the original upper end and along the upper portion. They are also in the earliest anticlines. Conversely, ancient basins will be unduly cemented. Domes and anticlines formed only in the later history of a region will find the reservoirs already somewhat cemented, and hence have both the accumulation and the quantity of the hydrocarbon reduced.

Note that, as the percentage of gas relative to oil increases with time, late folds will entrap an excessive proportion of gas relative to oil. Is there not here one of three explanations for "gas-only pools"? The others are individuality of the source bed and the fact that any small dome in a general homocline has its catchment so gas filled as to spill on up the dip much of its earlier trapped oil.

The increasing proportion of gas in late invasions helps to explain some accumulations of gas on basinward sides in some pools where complete gravitional separation has been effected. Mills has shown that the loss of water vapor to gas reservoirs concentrates fossil water density, but this factor is relatively slight in this connection.

4. Phase of Increasing Solution—As the weight of overburden and other stresses increases the temperature and pressure, the waters become increasingly enriched. This has been shown in the deep Geary well. Cementation, therefore, is not only not increased, but is actually decreased in this stage.

5. Eventually, as drilling is done on land areas, elevation of the reservoir begins. Now, decreased temperature and pressure reduce the solubility and so increase the deposition of the materials which are of very slight solubility. Where the temperature and pressure have been great enough, even quartz is taken into solution in pure water, to be later deposited when temperature and pressure diminish.

The word phase has been used, but these items are not strictly successive phases, as they overlap to some extent and also oscillate as elevation and stresses oscillate. These oscillations are especially important, because the expansion of the gas leads to movement back and forward, facilitating the segregation and the separation of the oil and gas.

Bunker Fuel Oil Required

Fuel-oil tenders have been invited by the U. S. Shipping Board for one-, three-, or five-year periods, beginning Sept. 1. Bids were opened on July 15. The Shipping Board's statement in this connection reads as follows:

The Division of Supply and Sales, U. S. Shipping Board Emergency Fleet Corporation, invites tenders for furnishing such quantities of "C" grade bunker fuel oil as may be required for periods of one, three, or five years beginning about Sept. 1, 1920, for use by all ships under its ownership or control at ports, and in approximate quantities as follows:

Name of Port	Quantities — Barrels of 42 U. S. Gallons — Month	Year
Boston	77,000	925,000
New York	775,000	9,300,000
Baltimore	125,000	1,500,000
Norfolk	290,000	3,475,000
Philadelphia	250,000	3,000,000
Charleston	33,000	400,000
Savannah	100,000	1,200,000
Jacksonville	31,000	375,000
Mobile	31,000	375,000
Pensacola	15,000	175,000
New Orleans	96,000	1,150,000
Port Arthur	19,000	225,000
Galveston	40,000	475,000
Panama Canal	125,000	1,500,000
St. Thomas, V. I.	40,000	480,000
Bermuda	10,000	120,000
Ponta del Gada, Azores	31,000	375,000
Brest, France	83,000	1,000,000
Bizerta, Tunis	18,000	216,000
Durban, S. A.	15,000	180,000
St. Vincent, C. V. I.	23,000	275,000
Rio de Janeiro, Brazil	42,000	500,000

In addition to the above-mentioned ports, tenders will be considered at all other United States domestic and adjacent ports from which bidder is prepared to make delivery.

The buyer agrees to place at the disposal of the successful bidder, tank-steamer tonnage, at the Government time-charter rate of $6.50 per D.W.T. per month, in the amount necessary.

1. To move crude petroleum from producing terminals to refining centers and,

2. To move fuel oil supplied at any port from successful bidder's nearest refining center to such port or ports.

World's Largest Oil Well

The largest oil well in the world is believed to be in Mexico. It is known as the Cerro Azul No. 7, and is reported to yield 370,000 bbl. of oil every twenty-four hours.

NEWS FROM THE OIL FIELDS

Mexican Oil Law Will Provide Protection

President de la Huerta Says New Decree Will Give More Liberal Interpretation of Article 27

A decree, soon to be issued, will, it is believed, settle the Mexican oil situation permanently and provide protection of the rights of American holders of oil property in Mexico. In a recent interview, President de la Huerta of Mexico stated that the Mexican government will insist upon the principle of national ownership of soil, and added that controversies now existing would be settled in a manner satisfactory to all. He declared this would be done by issuing a decree granting owners of oil properties a five-year period to file claims to land that is theirs either by direct sale or lease. If such claims were not filed within a required period, others would then have the right to file claims to the same property. When claims were finally awarded, the right to drill for oil would become exclusive and perpetual prerogative of claimant.

De la Huerta said the forthcoming decree would supersede those issued by Carranza regime, which oil operators had declared were confiscatory. He said Article 27 of the constitution would not be changed, but this would be given a much more liberal interpretation than in the past. He admitted the Carranza decrees contained many unjust provisions. He said the new decree would give oil-property owners preference in development, whether their property was acquired before or after the 1917 measures were enacted. He said rentals would be charged for the lands, but that the rentals to be fixed would be materially reduced.

De la Huerta will act as judge and final arbitrator. He said the solution above suggested was only his personal opinion, but added his belief that this principle would prevail. He said that there was little doubt General Obregon would agree to this solution. De la Huerta will formulate an oil law which he will present to the Mexican Congress when that body meets next September.

The oil-well supply industry of United States has not been able to keep up in last few years with demands of petroleum industry for drilling equipment, according to the *Wall Street Journal*. In 1919 it is estimated that approximately 30,000 wells were drilled in the United States, and in 1918 the number was 25,700. Based on the estimate of a prominent oil man, the average cost of drilling a well is $20,000.

Kentucky Oil Fields

From Our Special Correspondent

Latest reports from Bowling Green, Warren County, state that the well completed recently by Jorstatter and associates in the Davenport pool is believed to be the biggest producer in the field. It is estimated by reliable oil men to be larger than the famous Tarrant well in the same pool, and only about 500 ft. away. The Tarrant well is said to be yielding $25,000 worth of oil a month.

The Big Sandy district of Eastern Kentucky is showing a creditable production. In the Johnson-Magoffin field, several new wells have been developed, producing from 20 to 75 bbl. per day from the Weir sand at a depth of about 1,000 ft. The Cumberland pipe line has been taking oil from this field for several weeks. One of the best of the late discoveries was the Bed Rock Oil Co's Griffith No. 3 which started flowing when the sand was entered. Along the Magoffin-Morgan border, an advance test drilled by the Kenton-Morgan Oil Co. on the Howard farm is rated as a 100-bbl producer. In Floyd County, the Upper Big Sandy country, the first well to be drilled through the corniferous sand has just been completed on Bull Creek at a depth of 2,400 feet. This deep sand showed two pay streaks and is considered a profitable strike.

Nevada Corporation Closes Books

From Our Special Correspondent

The hopes of a number of business men and residents of Elko, Nev., who recently incorporated the Elko Oil Corp., were dashed when Prof. Frederick J. Pack, of Utah, informed them that there was an entire lack of indications pointing to the existence of oil on their holdings at Adobe Flat, six miles north of the city. It was believed that there were good possibilities for the finding of oil in the field and those interested deposited $100 each for the purpose of determining the merits of the holdings. The company will return to its members the amounts paid in, less expenditures to date, and with the disincorporation of the company, one of the cleanest oil promotions will come to an end.

Professor Pack stated that his report of the Elko field by no means indicated a lack of oil in other sections of Nevada. It is his belief that Nevada has better indications of oil than Utah, where oil was found some years ago along the San Juan river, and more recently at Moab, though the well at the latter place does not show oil in such quantity as to justify hope of commercial exploitation.

State of Texas Awarded Stevens County Lands

Gulf Production Co. Pays Royalty on Oil Produced — News from Other Counties

In the case "The State of Texas vs. The Gulf Refining Co. et al," the Fifty-third District Court recently awarded the state 160 acres of oil-bearing land in Stephens County, valued at $8,000,000, and royalty amounting to $80,000. P. K. Shuler, of Waco, a co-plaintiff, was awarded $200,000 as his share of the royalty on oil produced from this land by the Gulf Production Co., as he holds the mineral lease.

In Mitchell County, the well of the Underwriters Oil & Gas Co., two miles west of Westbrook, has oil standing 160 ft. in the well. It is believed that to the southwest, between this well and the McDowell well in Glasscock County, twenty miles southeast of Big Springs, an oil field will be opened. Oil standing in the McDowell well was not appreciably lowered by bailing. Later, it is claimed that several hundred barrels of oil daily are being produced by swabbing.

Seven wells are being drilled in Brewster County. The Presidio Oil & Gas Co. will test its well for oil, a showing having been obtained near 1,700 ft. In Pecos County, the Montezuma Oil Co., of California, will drill for oil, having leased a large acreage.

The total oil produced in the state of Texas during the month of June was approximately 8,000,000 bbl. Divided into sections, North Texas and Central West Texas produced about three million bbl. each, and the Gulf Coast about two million bbl. During the month 522 completions were made, and of these 340 were productive, making an initial daily production of 72,000 bbl. as compared with 139,000 bbl. initial production for wells completed during May.

The largest producing well in the Texas coastal fields completed during the week ended July 3 was the No. 3 Jones-Stateland of the Humble Oil & Refining Co. at Goose Creek, flowing 1,000 bbl. daily. This well is on submerged land, and is over 2,200 ft. deep. At West Columbia, three producing wells were completed during the week, No. 37 Hogg, Texas Co., making 550 bbl. daily from 3,000 ft.; No. 38 Hogg, same company, making 300 bbl. from 3,285 ft., and the No. 4 Marmion, Crown Oil & Refining Co., pumping 100 bbl. from 3,425 ft.

At least two wells at Goose Creek now drilling are reported to be below 3,700 ft. The deepest oil-bearing stratum found in the field so far is 3,400 ft., but rock salt has not yet been struck and there is a possibility that deeper oil may exist.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Geologists as Expert Witnesses Are in Scientifically False Position

Dr. Ransome Suggests the Court Call in Unattached Experts Paid From the Public Treasury

In an editorial in the current number of *Economic Geology*, Dr. F. L. Ransome discusses at length the question of geologists as expert witnesses. He mentions the tendency toward disapproval of the present practice and adds:

"Nor is disapproval confined to the lay public; many judges, sorely tried by the conflict in testimony that should be impartial, have been tempted to exclaim with Mercutio, 'A plague o' both your houses!' and some have even instructed the jury to disregard the expert testimony entirely. Unquestionably, the modern practice in mining lawsuits of employing numerous highly paid geological experts on each side, has enormously increased the costs of the litigation, not only by the fees paid but by greatly swelling the bulk of the testimony and by protracting the hearings."

Dr. Ransome points out that the frame of mind of a scientific investigator and that of an expert witness who is retained by one party in a controversy are fundamentally different and opposed. He qualifies this situation by stating:

"In view of the fact that many eminent and honorable men of science have accepted positions as expert witnesses, it is not justifiable to assert roundly and without qualification that such acceptance is morally wrong. Certainly, the intent of wrongdoing has usually been absent, and many such witnesses may have been thoroughly convinced of the inherent righteousness of the cause espoused. Nevertheless, I believe that it must be admitted that the geologist who becomes an expert witness for one side in mining litigation places himself in a scientifically false position."

Dr. Ransome sums up the case as opposed to the practice as follows:

"It is admitted that such work is not only profitable but is often intensely interesting, and may give opportunity for scientific observations of value. The temptation to engage in it may be very strong. Can a man who cherishes the highest ideals of scientific work afford to yield to it, under the existing practice of employing expert witnesses? Opinions on this question will differ, but my own belief is that in general he cannot. . . . It has been said that a witness before he undertakes a case may be sure of his ground. As a rule no geologist can tell in advance what all the developments in a suit will be, and it is doubtful whether a geological expert witness can escape being a partisan witness when he is employed by one of the litigants with the obvious intent that he shall help to win the case."

Dr. Ransome is inclined to favor the plan "that the judge himself, on any issue involving expert scientific knowledge or opinion, should call in one or more experts, such expert or experts being merely additional to those called by the litigants." Such unattached experts would presumably be paid from the public treasury, as part of the official expenses of the trial. He observes that "there is nothing in the proposal to prevent each party to the suit from having its own geological experts in court or from having its evidence prepared under the direction of geologists, who need not appear as witnesses. It is believed that the tendency would be to keep the litigants' geologists out of court proceedings, and in any event their number should be limited to three or less on a side."

Congress Grants a Pittance

The Sterling-Lehlbach bill which provides for the retirement of Government employees has just become effective, and those in the Federal service above 62, 65 or 70 years of age, according to the branch of the service, are to be retired on a pay which is pitifully small, especially for those who have occupied responsible positions. After thirty years of service retirement is on the basis of 60 per cent of the salary, but a maximum of $720 per year limits the retirement pay. Those who have been fifteen years in the service retire on a 30 per cent basis, but here again the maximum retirement pay is limited to $360 per year.

It is certainly gratifying to know that Congress has at last recognized the principle of retirement provision for superannuated civilian employees. However, it is not pleasant to consider the situation of a technical expert who has been in the service for thirty years and under the new law required to surrender two and one-half per cent of his basic salary, being provided with the munificent (?) reward of $60 per month when he retires for old age. The professional men of the country cannot look with any degree of satisfaction on such an arrangement.

It is incumbent on our technical men and organizations to get busy and see that a more nearly adequate arrangement is made for the retirement of specialists. Particularly for those in technical and other professional lines the retirement should be upon a basis comparable with the dignity of the position which they have occupied. This is essential to restore the Federal services to self-respect and reliability.

Liquid Oxygen as Explosive

Its Development Before and During the War Traced and Discussed

Advantages and disadvantages of liquid oxygen explosives are discussed by George S. Rice, the chief mining engineer of the U. S. Bureau of Mines, in Technical Paper 243, just issued. Mr. Rice's report goes minutely into the development of liquid oxygen explosives during the war. The paper describes the results of experiments conducted by the Bureau at its explosives testing station near Pittsburgh, Pa., and gives an account of the methods of use as developed in Germany, observation on its use by the Germans for destroying French iron and steel plants, and an abstract of a German military paper on instructions for using liquid air explosive.

During the war the growing scarcity of glycerine and ammonia greatly increased the cost of dynamite. This caused the Bureau of Mines to investigate the possibilities of liquid oxygen explosives, which do not require nitrates. Results of the preliminary testing begun in April, 1917, were decidedly favorable. Mr. Rice, while in Europe, in 1919, as a member of a committee to observe progress in post-war industries, paid special attention to liquid-oxygen explosive. The Germans were found to have used the explosive, known as "oxyliquit," extensively in non-gaseous coal mines, in excavating subways and tunnels, in quarrying, and in iron mines, as well as for destroying French steel plants.

The explosive was first tested at a coal mine in Germany, in 1897, following Linde's invention of his liquefying apparatus in 1895. Trials made in driving the Simplon Tunnel are said to have been favorable.

In 1900, Claude, of France, patented the rectification principle. Linde, in 1902, designed his rectification apparatus. Both types of apparatus are extensively employed in liquefying gases. In 1904, Dewar, of Great Britain, invented the Dewar flask—a container for liquefied gases. Further development of liquid oxygen for blasting purposes was inconsequential until the war began.

The Allied countries, being able to import nitrates from Chile, did not take up its use, but if the war had continued the United States would probably have been compelled to do so. The method will now have to depend on its merits and on commercial conditions.

The experiments of the Bureau of Mines have shown that a liquid oxygen explosive can be prepared which has a blasting strength greater than 40 per cent straight nitroglycerin dynamite. This was shown by tests in the stand-

ard testing apparatus of the Bureau, as well as in blasting.

The procedure adopted was to place a No. 6 detonator in the inner cartridge, a cheesecloth sack containing carbonaceous material. The cartridge is soaked in liquid oxygen ten to fifteen minutes in an improved container devised by the Bureau. The cartridge, frozen stiff, is slipped into a pasteboard container, placed in the hole, a wad of cotton placed on it, a brass tube inserted, and clay tamped around the tube. The hole left by the tube provides an outlet for evaporating oxygen, until the shot is fired.

The advantages, as compared with dynamite and black blasting powder, are lower cost per ton of material blasted, elimination of dangers in transportation, from premature ignition, misfires, or unexploded sticks in ore or coal, in handling and thawing, or in storage magazines.

The disadvantages are: the liquid oxygen, because of its rapid evaporation, must be used quickly after charging, thus limiting the number of shots. A liquefying plant must be maintained near the mine. The explosive cannot be used in gaseous coal mines.

Its introduction into mines is difficult, because miners are not accustomed to it. The method offers great possibilities for lessening blasting costs in non-gaseous coal mines, and in metal and mineral mines using a chamber method where only a few shots are fired at one time. The chief cost is that of the oxygen, but there is hope of a decided reduction in cost through promised improvement in liquefying machines.

Manitoba Branch of Canadian Mining Institute Elects Officers

At the annual meeting of the Manitoba branch, C. M. I., the following officers were elected: Prof. R. C. Wallace, chairman; W. J. Dick and B. Stewart McKenzie, vice-chairmen; J. S. DeLury, secretary-treasurer; and L. G. Thompson, assistant secretary. J. W. Harris, G. B. Hall, E. W. Jackson, R. C. W. Letts, A. M. Stewart, R. Kerr and J. A. Campbell were elected to the council.

Engineering Section of National Safety Council held its summer meeting in co-operation with the Western Society of Engineers recently in Chicago, Ill.

The morning session heard the reports of the committees on education, on safeguarding machinery at the source, and on codes. In the afternoon all the discussion centered about safety for power-press operators, and the fundamentals of a safety code for metal-working power presses.

An informal dinner was held at Hotel La Salle in the evening. Among the speakers were W. G. Nichols of American Manganese Steel Co., who spoke on "The Engineer and Production," and S. J. Williams, whose subject was "Safety and Engineering Efficiency."

Holmes Safety Association Awards Gold Medals

Presentation Next September at Denver —Three Lost Their Own Lives but Saved Others

The Joseph A. Holmes Safety Association announced on June 29, the award of gold medals and diplomas to four Western miners and to the nearest surviving relatives of three others who lost their lives in attempting to rescue other miners from death. The formal presentation of the medals will be made by Dr. F. G. Cottrell, director of the United States Bureau of Mines and president of the association during the First Aid and Mine Rescue contest at Denver, Col., next September. The men who will be awarded gold medals and diplomas and the deeds they performed are as follows:

John L. Boardman, of Butte, Mont., safety engineer for the Anaconda Copper Co., who lone-handed saved three miners from death by gas in the West Colusa mine during a fire in the Leonard copper mine adjoining. He entered the gas-filled mine four separate times to save life.

Daniel Bionvich, of Biwabik, Minn., employee of the Balkan Mining Company, who drove his electric locomotive through smoke and gases in the burning Belgrade mine three times, bringing out helpless men. A fourth time he descended the shaft ladder and brought out a fellow-worker.

James Collins and **James Dilimirk**, both of Mullen, Idaho, employees of the Gold Hunter Mining & Smelting Co. While endeavoring to reach two entombed men in the mine, they themselves were caught by a cave-in, buried to the shoulders, and imprisoned for fifteen hours. The other two entombed men were finally brought out alive after fourteen days.

The following three miners sacrificed their lives in trying to save others:

Michael Conroy and **Peter Sheridan**, of Butte, Mont., both employees of the North Butte Mining Co., started down into the mine to save their fellow-men from the burning Speculator shaft, but before they reached the men at the 2,200-level the fresh air which had been coming down the shaft reversed, allowing hot and poisonous gases to come up the shaft. When the cage was hoisted to the surface, the bodies of the two brave men were found on the cage burned to a crisp.

James D. Moore, another miner at the same North Butte Mining Co. fire, collected seven men to bring to the surface, then he was driven back by smoke. He led them into a blind drift, built a bulkhead against the gases and kept up the spirits of the eight men until rescued. Sixty hours after the completion of the bulkhead, rescuers wearing apparatus found the barricade and broke through and found six men alive, though Moore and one other were dead. The six men were brought safely to the surface; they all gave credit to Moore for saving their lives.

The awards were decided upon by a committee of the Association, composed of James W. Paul, representing the Mine Inspectors' Institute of America; William Green, of the United Mine Workers of America; and John Turner, of the Mine, Mill and Smelter Workers. Others who participated in the making of the awards were James Lord, United Mine Workers of America; George S. Rice, American Institute of Mining Engineers; David White, National Academy of Sciences; O. P. Hood, Society for the Promotion of Engineering Education; Arthur E. Holder, representing Samuel Gompers, President of the American Federation of Labor; Charles D. Walcott, vice-president, and David T. Day, secretary of the Association.

Company Stores Barred on Rand —Only Act of Parliament Can Legalize Them

The institution of the company store is meeting difficulties in South Africa. The London *Financial Times* recently printed the following:

"From the onlooker's point of view it seems a pity that the appeal in the test case as to the legality of the Rand mining companies supplying goods to their native employees on favorable terms should have been dismissed. Only action by the Union Parliament could now legalize the innovation. The following is a report of the original hearing:

"'In the South African Supreme Court (Transvaal Provincial Division) case—Isaac Feinstein vs. the Modderfontein Deep Levels and the Native Recruiting Corporation—in which application has been made for an interdict against respondents on the ground that they were interfering with him by trading on mining ground, Sir John Wessels, in the course of his judgment, said: "The essential idea underlying trade is buying and selling. We may say with certainty that if a person buys and sells with the intention of making a gain out of his transaction he is carrying on a trade. He may, however, be carrying on a trade even though he does not contemplate a profit. If a charitably disposed person sets up an establishment for baking and selling bread to the poor at cost price he is certainly carrying on the trade of a baker." The Judge came to the conclusion that respondents were carrying on a trade or business, saying, "The company sells the goods at cost price because it is to its advantage to do so. It keeps its natives contented by enabling them to get the goods cheaper. This advantage is a gain to the company."

"'His Lordship further held that the goods sold by the company to their employees were not incidental to mining. An interdict was granted restraining the respondents from trading in such goods as shirts, trousers, socks, tunics, blankets and similar articles, with their native employees. Costs were granted to the applicant.'"

Book Reviews

Mining and Preparing Domestic Graphite for Crucible Use. By George D. Dub and Frederick G. Moses. Paper; 6 x 9; pp. 80. Published as Bull. 112 by the U. S. Bureau of Mines. For sale by the Superintendent of Documents, Washington, D. C., for 20c.

The graphite industry in this country normally cannot compete with that in Madagascar and Ceylon. There the deposits are large and of very high grade; also labor is cheaper than here. During the war, domestic graphite production boomed, on account of a shortage of imports, but since that time many companies have suspended operations, though many are still making money, recent reports from Alabama being particularly encouraging. Alabama and New York have the principal deposits, production from the former ranking first. Alabama is under the disadvantage, however, of being at some distance from the principal market, and from the low grade of the deposits, as the average extraction is only 19 lb. of No. 1 flake per ton. Pennsylvania has produced some graphite, and Texas contains large high-grade deposits which could be worked at a profit if marketing conditions were better.

Mining, concentrating, and refining methods are described in this book. Open-pit mining is general in Alabama, but underground working also is carried on in New York. After crushing, the ore is concentrated by one of several methods: skin flotation, the pneumatic process, the log-washer process, tabling, the Huff electrostatic process, and froth flotation. The log-washer plant is the cheapest to install and to operate. The concentrates are dried, ground in a buhr mill and screened, the graphite remaining on the screen. To treat 10 tons per hour, a complete plant would cost fom $40,000 to $70,000.

Tests conducted by the Bureau showed that two other finishing processes might be used: (1) Treating the crude concentrates in an electrostatic separator, followed by grinding in a buhr mill and screening. (2) Grinding the wet concentrates in a pebble mill, followed by froth flotation, drying the flotation concentrates, regrinding in a buhr mill, and screening. Each type of concentrates was found to be a problem in itself.

E. H. R.

A Vocabulary of Russian-English and English-Russian Mining Terms. By C. W. Purington. Cloth; 4 x 3½ in.; pp. 128. J. B. Lippincott Co., Philadelphia, Pa.

This little book contains about 1,600 words, compiled as a result of the author's engineering experience in Siberia. It should be helpful to those who have occasion to carry on work in Russia without a good knowledge of the language, and to those who are called upon to translate English-Russian engineering matter. Russian characters are of course used in spelling the words in that language. We do not know the price of the book, but, being very small, it is probably inexpensive.

Technical Papers

Natural Hydrocarbons — In its *Reports of Investigations* for May, 1920, the Bureau of Mines discusses the occurrence, mining, treatment and utilization of the natural hydrocarbons, such as gilsonite, elaterite, wurtzilite, grahamite, and ozokerite. A bibliography is appended.

Western Australia Statistics—The Pocket Year Book of Western Australia, for 1920, has been issued by S. Bennett, government statistician, Perth, presumably free of charge. It contains 117 pages of miscellaneous statistics, and is of vest-pocket size.

Sulphur Smoke—"Sulphur Dioxide as a Factor in the Smoke Problem of Salt Lake City" is the title of one of the mimeographed Bureau of Mines *Reports of Investigations* for May. (6 pages.) A considerable number of SO_2 determinations are given. Some of the samples were collected with an airplane.

Zinc—"Zinc in 1917" has reached us. A list of smelters is given and general data pertaining to the industry. The pamphlet is published by the U. S. Geological Survey and will later be incorporated in "Mineral Resources."

Lead Smelting—The June issue of the *Bulletin of the Institution of Mining and Metallurgy* (No. 1 Finsbury Circus, London, E.C. 2) contains twenty pages of discussion of Rigg's paper on Broken Hill practice which we reviewed on June 19.

Belgian Metallurgy—The May 15 number of *Revue Universelle des Mines* (16 Quai des États-Unis, Liège, price 5 frs.) contains a 50-page illustrated article on the metallurgical industry of Belgium before, during and after the war.

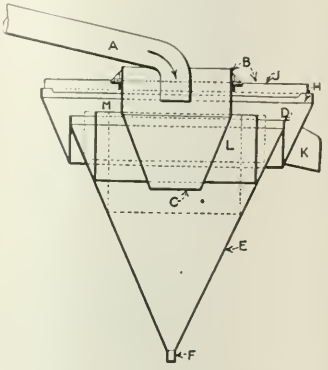
British Mineral Production—A brief history of the mineral production of the British Empire, by Frank Merricks, occupies twenty-seven pages in the May *Bulletin of the Institution of Mining and Metallurgy* (No. 1, Finsbury Circus, London, E. C. 2). Complete statistical tables of the value of the principal minerals produced by each of the various dependencies from 1893 to 1917 are appended.

Carnotite—Some hints to the prospector and a description of conditions in the Utah-Colorado carnotite fields are given in an illustrated article in the *Salt Lake Mining Review* for June 30. (Salt Lake, Utah. Price, 15c.).

Recent Patents

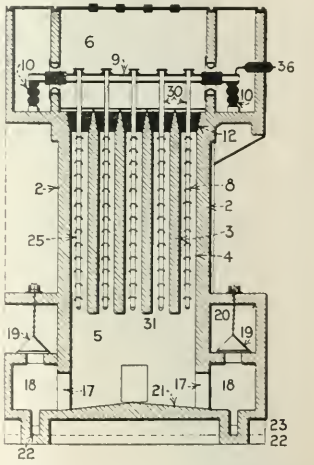
1,339,683. Upward-Current Separating Process and Device. Charles Allen, El Paso, Tex. Filed July 3, 1917.

A method of varying the upward movement of a liquid carrying solid particles overflowing the top of the tank in a settling device by varying the length of the overflow periphery, whereby the velocity of the overflow of the liquid over the overflow lip is controlled.



1,339,480. Art of Separating Suspended Particles from Gases. Walter August Schmidt, Los Angeles, Cal., assignor to International Precipitation Co., Los Angeles, Cal. Filed Aug. 27, 1917.

In the art of precipitating suspended particles from gases by electrical action, the method of maintaining a clean



electrode surface for receiving the precipitated material, which consists in distributing a liquid in a film, over a porous surface constituting a receiving electrode.

MEN YOU SHOULD KNOW ABOUT

H. G. Ferguson is examining potash deposits in the vicinity of Silver Peak, Nevada.

Elmer A. Holbrook, assistant director of the United States Bureau of Mines, took the oath of office on July 10.

C. F. Kelley, president of Anaconda Copper Mining Co., is in Butte on an inspection of the corporation's properties.

A. K. Knickerbocker, of Cuyuna, Minn., has been examining properties in the Batesville, Ark., manganese district.

G. C. Martin will make geologic surveys and investigations of mineral resources in the lower Yukon and Kuskokwim regions of Alaska.

A. G. Burritt, geologist, of Salt Lake City, Utah, has recently completed examinations of oil lands in Fremont, Sweetwater and Lincoln counties, Wyo.

J. B. Tyrrell, mining engineer and geologist, of Toronto, has gone to the Rice Lake gold district of Manitoba, to examine the Gold Pan and other properties.

Harold A. Linke, mining engineer, 226 Dooly Building, Salt Lake City, Utah, has just returned from an examination of oil lands in western Utah near Great Salt Lake.

Robert Linton, president of North Butte Mining Co., 120 Broadway, New York City, is in Butte, Mont., making his periodical inspection of the company's property there.

Bart L. Thane recently passed through Seattle on his way to Juneau, Alaska, where he will visit the property of the Alaska Gold Mines Co., of which he is managing director.

Frank A. Hughes, consulting engineer, of Philadelphia, Pa., has gone to Arizona to make examinations in the interests of the Arizona United Mining Co., Johnson, Cochise County, Ariz.

John E. Bergh, of Sturtevant & Bergh, mining engineers, Salt Lake City, Utah, has gone to Chesaw, Washington to commence development on a mining property in that district.

Frank L. Hess, of Washington, D. C., has returned from his trip to South America for private interests; but will not resume his work with the Geological Survey until later in the summer.

W. C. Hudson, mining engineer, returned to New York City recently from Ecuador, where he had been during the last two years as exploration engineer in the interests of the South American Development Co.

Charles William Wright, mining engineer, of 28 Via Parlamento, Rome, Italy, and his brother, **C. A. Wright**, who was formerly with the U. S. Bureau of Mines, sailed from New York for Italy on July 8.

E. P. Mathewson, consulting metallurgist, who has been studying the Granby smelter at Anyox, B. C., left there about July 1. After a brief vacation in Montana, Mr. Mathewson will return to New York City about July 17.

John L. Malm, of the Malm-Wolf Co., sailed on July 6 from New York for England and the Continent. Mr. Malm will visit metallurgical establishments in England, Belgium and France before returning to New York early in September.

Thomas Turnbull, of Crosby, Minn., superintendent of the Croft mine, has been appointed Cuyuna Range superintendent of the John A. Savage properties, the Croft and Sagamore, to fill the vacancy caused by the death of John F. Murphy.

JAMES M. HILL

J. M. Hill, who has been placed in charge of the San Francisco office of U. S. Geological Survey, was born in Chicago, Ill., Feb. 14, 1884. His education was obtained in that city. He was graduated from the University of Chicago in 1906, and there attained the senior scholarship in geology. In addition to post-graduate work in the University of Chicago, he studied at Armour Institute and at the Michigan School of Mines. Practically all of Mr. Hill's experience has been with the U. S. Geological Survey, which he joined thirteen years ago. He has done geological reconnaissance work in practically all the Western states and has been engaged in several detailed geological studies in the West. Since 1912 he has been attached to the Mineral Resources Division of the Survey, and most of that time he has spent in specializing in platinum, gold, silver, and other precious metals.

J. B. McIntosh, superintendent of construction at the Murray plant of the American Smelting & Refining Co., has resigned to accept the position of chief mechanical and construction engineer for Cia. de Real del Monte y Pachuca. Pachuca and Hidalgo, Mexico, and left for Mexico on July 15. Mr. McIntosh acted as civil engineer for the Anaconda Copper Mining Co. for many years, having a prominent part in the construction of the Washoe smelter. In 1907 and 1908 he was engineer in charge of construction for the company's Tooele smelter, but resigned to go to Bisbee, Ariz., where he directed the preliminary work on the Clarkedale smelter. For the last eight or ten years Mr. McIntosh has been attached to the engineering division of the Utah department, A. S. & R. Co., and has executed several notable improvements in that company's plants.

OBITUARY

Enos A. Wall, mining man of Salt Lake City, Utah, died there on June 29 at the age of 81 after a long illness. Mr. Wall was one of the prominent mining men of Utah for many years, being particularly identified with the Utah Copper Co. holdings which brought him great wealth. He was born at Richmond, Ind., on June 23, 1839, went to Colorado in 1860, and in 1863 was prospecting for gold in Montana where he engineered the short-cut from Fort Bridger, Wyo. In 1889 Wall, whose inventive mind had already produced a number of new designs in mining machinery, recognized the possibility of concentrating and recovering value from the low-grade copper ores at Bingham Canyon and he at once started to secure the property which later formed the foundation of Utah Copper Co. prosperity. The law suit over the finances of that company, which he started in 1906, was later withdrawn and it passed under the Guggenheim interests. In recent years he had undertaken the rejuvenation of an old Park City property.

SOCIETY MEETINGS ANNOUNCED

Nevada Section, American Institute of Mining and Metallurgical Engineers, has postponed indefinitely the meeting previously scheduled for June 25-26 at Tonopah, Nev. Probably the session will be held in November.

It has just been definitely announced that **Third International Mining Convention** at Nelson, B. C., will be held on July 20 to 24. The officials in charge of arrangements plan that, in addition to a very interesting program and mineral exhibits, there shall be an enjoyable and instructive excursion to the leading mines of the Slocan district. Those interested should address Fred A. Starkey, Associated Boards of Trade, Office of the Commissioner, Nelson.

THE MINING NEWS

LEADING EVENTS

Flotation Inquiry Resumed in San Francisco

Latest Testimony Before Federal Trade Commission Reveals Little Not Already Known

The Federal Trade Commission hearing in the Minerals Separation case, transferred from New York to San Francisco, was resumed on July 6 and continued until July 10, Commissioner Huston Thompson presiding. G. R. Hawkins and C. R. Porter appeared as counsel for the commission and Alfred A. Cook for Minerals Separation, with C. B. Allen as secretary.

E. H. Nutter, the chief engineer for the flotation company, was the first witness. He testified as to his duties and to the work of his technical staff. Some of the sources of information were given, whereby lists of probable infringers were compiled. Some of the company's instructions to field employees were made clear, and the practice of maintaining a complete file of clippings was explained. Licensees were given the benefit of any new ideas secured by Minerals Separation as part of the service for which they paid. No entrance to licensee's plants was demanded without permission. Mr. Nutter mentioned the matter of charging infringers a double royalty for the period of infringement and defended the company's policy by saying that it would be unjust to licensees if those who had not taken out licenses were treated no better than those who had evaded payment for the privilege of using the process. The relation of the favored licensee was also explained.

J. A. Pearce, a metallurgist of Berkeley, then testified as to the restrictions which he encountered from the Minerals Separation company, when he attempted to introduce a flotation machine of his own invention. W. B. Shores of the Stimpson Equipment Co. told of his attempts to introduce Janney flotation machines into the mill of the Engels Copper Co. and of the opposition encountered from M. S. James L. Freeman of Chicago testified as to the royalties paid to Minerals Separation for the use of their process on Alaskan gold ore.

Cordial relations had always existed between his company and the flotation concern, according to D. E. Paxton of the Engels Copper Co., who said that the success of his company depended upon the use of the flotation process. However, he considered that under the present circumstances the royalties to Minerals Separation were burdensome.

Theodore J. Hoover testified concerning his employment with the defendant company and introduced the Sulman and Picard manuscript on the theory of flotation by surface tension. After argument by counsel this was allowed to go into the record. The witness believed the Minerals Separation royalties to be excessive and their restrictions on the publication of information in connection with the development of flotation, onerous. Being criticised for his ethical position in publishing information obtained while in the employ of M. S, he stated that he considered it a public service for him to make known such information. On cross examination, Attorney Cook introduced the terms of Mr. Hoover's employment contract and showed that Hoover was in the employ of the Miami Copper Co. from July, 1919, to April, 1920.

The general phases of the situation were discussed by T. A. Rickard, who gave the opinion that Minerals Separation had only contributed to the development of flotation, and that much of the work had been done by others. W. B. Shores was then recalled and testified as to the comparative tests of Janney and M. S. machines and related what he considered unfair statements of Minerals Separation relative thereto. J. B. Quigley and A. Roberts of Minerals Separation told of their field duties and instructions.

The whole hearing really developed little which was not known before.

WEEKLY RÉSUMÉ

The Federal Trade Commission holds hearings in San Francisco reviewing flotation litigation. The testimony presented reveals little that has not been disclosed by court procedure elsewhere, although much information is forthcoming from both sides. The Northern Minnesota Ore Co. transfers its manganese operations from Cuyuna, Minn., to Batesville, Ark., due to prohibitive Minnesota mining costs and a small manganese market. The Minnesota mines are permitted to be flooded. The mines of the Dolores Company, at Dolores, Chihuahua, Mexico, are to be opened after an inactive period of five years. Extensive repairs and remodeling will be necessary.

The Colorado Experiment Station of the U. S. Bureau of Mines, which was recently removed from Colorado, will find its new home in Reno, Nevada, where extensive experimentation is planned. Bare-metal work is to be continued, and a comprehensive scheme is advanced covering work upon Nevada's most pressing mining and metallurgical problems. More War-Minerals' Relief awards are made. U. S. Bureau of Mines plans a non-metallic experiment station in the South.

The five Dominion Steel Corporation interests headed by J. H. Plummer, who issued a call for proxies to oppose consolidation with other companies in British Empire Steel Corporation pending fuller information, were recently dropped from the directorate.

Minnesota Company Transfers Activities to Arkansas Field

The Northern Minnesota Ore Co. closed down its Northland mine, an underground manganiferous property north of Cuyuna, Minn., on July 10, and allowed the shaft to fill with water. No mining had been done since October 28, 1919, but the shaft and drifts had been kept unwatered. No ore has been shipped, and property has a stockpile of about 5,000 tons. Inability to sell the ore at satisfactory prices is given as reason for the shutdown. The company has purchased 600 acres of manganese land in the Batesville district, Arkansas, and will transfer its immediate activities to this field. The property lies about 1½ miles east of Cushman, in Sec. 10-11-14, and Sec. 15-14-7. A power scraper will be used in the shallow clay areas, where chert is absent, and mining will be done by hand. At the same time the company will carry on intensive prospecting with the idea of blocking out a steam shovel area and later erecting a washing plant.

Dolores Company to Open Chihuahua Mines

The mines of the Dolores-Esperanza Co. at Dolores, Chi., on the Mexico Southwestern railroad, will be opened within a short time after an inactive period of five years, according to a recent announcement by the officials of the company in El Paso. Extensive repair work will be undertaken before the opening of the mines, including timbering and repairs to equipment. A modern power plant will be constructed at Madera and power will be transmitted to the plant by means of a power line.

A special session of the South Dakota State Legislature was recently called by Governor Norbeck. Matters of importance are to be taken up, among which is that of state-owned and operated industries. The state-owned power plant utilizing the waters of the Missouri near Mobridge has been investigated by engineers and their report will be acted upon at this session. The project will call for an expenditure of about $3,000,000. The state-owned cement plant is another industry which has been thoroughly investigated but the site for the plant has as yet not been decided.

The electrical engineering department of the University of Arizona lately received a number of electric motors as gifts from the United Verde Copper Co. and the Ray Consolidated.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Colorado Station To Be Moved To New Home at Reno

Many Varied Problems To Be Solved in Connection With Mining Activities in Nevada

The experiment station of the Bureau of Mines, which has been located for a number of years at Golden, Col., has been moved to a definite location at Reno, Nev. In the future, the station will be known as the Rare and Precious Metals station. The station is to be conducted in co-operaton with the University of Nevada, which has obligated itself to construct a new building for the housing of the station. This building is to be erected at a cost of not less than $30,000 and is to follow plans drawn up by the Bureau of Mines. The construction of this station will embody the experience of the Bureau in the conduct of its various experiment stations.

The location of the station at Reno was not made until the ground had been gone over very carefully by Dorsey A. Lyon, the supervisor of stations. Mr. Lyon spent several weeks in the West engaged exclusively on the problem brought out by the necessity of moving the station from Golden.

It is admitted that Nevada has a long list of problems which are in urgent need of the attention which can be given them at this station. The results of this work will have an application over a much wider field than the state of Nevada. The problems, which are regarded as being in need of immediate study, are as follows:

1. A study of mining methods in narrow veins and the determination of the limiting factors of the various methods with regard to inclination of vein, pitch of ore shoot, strength of walls, width of vein, etc. Especially good opportunities are presented for the study of this type of mining in Nevada. In some cases, as many as three different mining methods are in use simultaneously in the same mine.

2. An investigation of diamond drilling in Nevada porphyry and the invention of a suitable drill for this purpose. At the present time it is practically impossible to use the diamond drill in western Nevada because the porphyry has alternate hard and soft streaks that render its operation uncertain and expensive. Other states have the same problem in individual instances but it is more serious in Nevada than anywhere else.

3. An investigation of the cyanidation of silver ores with a view to reducing the losses. This would be a fine problem for Nevada since Nevada is the greatest producer of straight silver ores in the United States. Low extractions mean great annual losses. They are due in some cases to unknown factors, as at Rochester where but 88 per cent can be obtained in place of 93 per cent, at Tonopah, and to known factors such as the presence of manganese which reduces the extraction at Candelaria and elsewhere. There is no other station doing work of this character.

4. Discovery of a cheap method of extracting lead and silver from low grade oxidized ores. There are great quantities of such ores throughout Nevada, as for example in the neighborhood of Eureka.

5. Investigation of processes for the extraction of oil from shale.

6. Discovery of a cheap method of extracting copper and silver from low grade oxidized ores. There are immense quantities of such ores throughout Nevada and in Mono and Inyo Counties, California, which would be tributary to the Reno station.

7. Commercial methods of treating low grade lead-zinc sulphide ores like those at the Simon Lead mine. These ores are fairly widely distributed in Nevada and in adjacent parts of California.

8. Investigation of methods for the extraction and recovery of all metals of value in base ores, i.e., ores containing gold, silver, copper, lead, zinc, and iron.

9. Slime settlement, use and conservation of lime, regeneration of cyanide, problems of fouling solutions, improved methods of precipitating silver, and of treating material swept up on tailing ponds.

10. Treatment of antimonial and arsenical ores carrying gold and silver. A large amount of this type of ore is reported to exist at Manhattan and at Northumberland, Nevada.

11. The treatment of low grade silver-lead ores. These are said to occur in large amounts at Eureka, Nevada, also in the Yellow Pine district in Clark County.

12. Treatment of the concentrate produced in such mills as those at Tonopah. A similar problem would be the treatment of flotation concentrate.

13. Treatment of complex sulphide ore which is found at Buckhorn, Nevada. A large tonnage of about $8 or $10 ore is reported in this camp which has resisted all attempts to work it.

14. Leaching of oxidized copper ores. These occur in large amounts in the following districts: Ely, Yerington and Luning, and in smaller amounts in many other districts of the State. The best figures from the Ely district indicate that over 30% of the copper entering the concentration passes out in the tailing. As this plant in normal operation treats per day as high as 15,000 tons of ore running nearly 2% copper, a loss of 30% of this copper would amount to a loss of between $30,000 and $40,000 in a single day. If this ore problem could be successfully solved, it would save in one day and in a single copper mining plant in Nevada approximately the whole cost of operating the Mining Experiment Station for a whole year.

15. Concentration of mercury ores. Applicable to several small districts for example, Battle Mountain, Winnemucca, near Rochester, and Mina.

16. Increased recovery from sulphur ores. Applicable to Sulphur, Nevada, and near Cuprite.

17. Production of rare metals. Applicable to platinum from Goodsprings and Bunkerville.

18. Conservation in the concentration of tungsten ores. Applicable to mills in the following districts: Lovelock and Mill City (three mills), Mina (one mill), Ely District.

19. Study of the utilization of the non-metallic resources of the State.

20. General investigations of waste in metallurgical industries in the State.

21. General study of co-operation between the small mine operators in the State.

22. Study of the methods used in crushing ores and a comparison of results secured by different machines.

It is pointed out that a few thousand dollars annually applied successfully to the solution of such problems as the above would result in the addition of many millions of dollars for the mining industry.

Recent War-Minerals' Relief Awards

Awards recommended by the War Minerals Relief Commisson for the week ended July 3 are as follows: (The claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown) T. F. Adams, manganese, $393.10, 11 per cent; Paga Mining Company, manganese, $5,002.70, 43 per cent; Dubakella Mining Company, chrome, $2,981.80, 68 per cent; Cypress Chrome Company, chrome, $2,738.73, 73 per cent; J. A. Nichols, chrome, $592.81, 29 per cent; Shiell and Prattie, $662, 100 per cent; Haynes and Mullen, $867.78, 37 per cent.

On July 1, the War Minerals Relief Commission had acted on 880 claims in which the total amount asked of the government was $9,621,363.90. The administrative expenses of the Commission to that date aggregated $261,786.68, or 2.72 per cent of the amount of the claims handled.

To meet the demands of its work, the Bureau of Mines is strengthening the chemical side of its investigations. This work will be conducted principally by O. C. Ralston, the superintendent of the experiment station at Seattle; L. H. Duschak, at Berkeley, Cal.; C. M. Bouton, at the Salt Lake station; Dr. Thomas B. Hine, at Tucson, and Dr. S. C. Lind, at Reno.

Non-Metallic Experiment Station for the South

Chapel Hill, N. C.; Atlanta, Ga.; Birmingham, Ala.; Tuscaloosa, Ala., and Knoxville, Tenn., are contenders for the non-metallic experiment station which is to be established in the near future by the Bureau of Mines. Each of the places mentioned claims to be situated advantageously in regard to non-metallic raw materials which are becoming of increasing importance with the rise of the chemical industry.

Mid-Year Production Reports

The mid-year reports on metal mining in the western states will be issued by the Geological Survey during the week beginning July 19. These reports will give estimates of production for the first six months of the current year. In the past, these estimates have come within one or two per cent of the exact output as shown by the final figures. It is expected that the estimates will show a very considerable falling off in both gold and silver production.

Vocational Plans Under Way

Plans are maturing rapidly for the vocational rehabilitation of persons disabled in industry. This activity is made possible by a law enacted at the recent session of Congress. It provides that the Federal Government shall pay half and any state that elects to co-operate must pay the other half. During the first year, the Federal appropriation is limited to $500,000. This is increased to $750,000 the second year, with $1,000,000 as the maximum amount in the third year.

NEWS BY MINING DISTRICTS

ARIZONA

Tucson—Complaints are made that the State land-lease law in a number of instances has been operating to the detriment of the miner, though every lease is given subject to any rights there may be upon the land in the way of mineral, including oil. It is said that a lease for grazing may be uncomfortable for the miner who happens to be working a claim within the tract that may be inclosed and stocked. The miner must make proof that he has mineral, and that his claims may be excluded from a lease—this proof often is expensive.

In Oro Blanco district, near the Mexican line, there has been a return to pioneer processes in the working of gold ore from decomposed croppings. J. C. Holden has a claim he calls the Grubstake, from which he is making about $10 a day by the primitive method of crushing in a mortar and washing in a gold pan. There is available only a seep of water and washing can be prosecuted only a few hours each day. In the same section other miners, similarly operating, pack their ore to a creek at a distance and there wash it.

Patagonia—A late rainstorm exposed very attractive croppings on open ground immediately south of the famous World's Fair mine. The ground has been located by Frank Huntington, Edward T. Sheehy, and Frank Powers and the claim has been named the Hiram Johnson, possibly because the vein trends into the nearby Roosevelt mine. The new vein is about 25 feet wide and carries high copper values in bornite.

Clifton—The American Silver Corp., which for two months has been operating the Socorro property at Mogollon, N. M., has ordered discontinuance of all activity, throwing out of employment a large force of men, headed by D. B. Scott.

Willcox—The 50-ton mill of the Dives Co. at Dos Cabezas is operating steadily with two shifts and a third shift is to be added. A force of 25 is employed, under Frank F. Friant.

Bisbee—The Phelps-Dodge and Calumet & Arizona Cos. are making especial inducements to employees for homebuilding. Money for homes is loaned for gradual repayment within 100 months, at 6 per cent interest.

Miami—The wonderful vegetable garden system of the Inspiration Co.'s employees has been damaged to possibly $20,000 by a late hailstorm, according to expert W. A. Sandige, in charge. Melons were about ripe and were ruined by hailstones that drove through their sides. There also was large damage to tomatoes, corn and peppers.

Yuma—Very rich silver ore is being exhibited here by D. M. DeLong, taken from the Black Rock and Silver Glance mines, north of Yuma, on the western side of the Colorado River, across from Picacho. At 200 ft. dept in the Black Rock the ledge is 12 ft. wide and at 350 ft. depth 30 ft. wide.

Nogales—The Animas mines at San Javier on the Mexican West Coast are reported bought by the United States Smelting, Refining and Mining Co. of Boston. The same corporation operates the Real del Monte mines in the Mexican State of Hidalgo and mines in Arizona, Utah and California.

Jerome—A mill of at least 50-ton capacity is to be built on the property of the Verde Mines Co., seven miles south of Jerome. Mill runs made on the company's ores gave returns of from $25 to $40 a ton in gold and silver. A double-compartment shaft is to be sunk, to cut the ore on the dip at 600 feet, probably in sulphides. President W. F. Burns has been in charge at the camp.

Kingman—The 400-level of the Catherine mine has been flooded and operations will be concentrated on the 300-level until proper pumping facilities have been provided.

Crosscutting in the Thumb Butte has cut the main vein and also has found a heavy flow of water.

United American has drifted nearly 200 ft. on a vein of milling ore believed to be a continuation of the Tom Reed orebody.

Arizona Mossback stockholders have authorized issuance of $500,000 in bonds to cover the cost of installing a mill on the property at Oatman.

The Arabia property in Union Pass is reported taken over by the El Tigre corporation, operating in Sonora, south of Douglas.

Activity is promised this fall on the well-known White Hills mines, northwest of Chloride.

Safford—The Grand Reef mine in the Aravaipa mining district of Graham County, owned by Richard V. Dey of New York has been purchased by the Aravaipa Leasing Co., which is controlled through stock ownership by the American Lead and Zinc Co.

Morristown—The Plomo King mine is hauling in lead-silver ore for shipment to the El Paso smelter. Recently the property was equipped with a hoist and compressor. A shaft is being sunk to a depth of 300 ft. The shipping ore comes from ground opened up last winter.

Kelvin—The Ray Verde Copper Co. developing the Tillman copper group in the Ripsy mining district, nine miles south of here is installing a hoist and compressor. The old shaft has been abandoned and a new one is to be sunk. Albert Hoch is in charge. The No. 1 diamond drill hole on the old Kelvin Sultana property now being prospected by the Ray Boston Copper Co. has reached a depth of slightly over 1,200 ft. It is expected that the ore shoot will be cut in the next 200 ft.

Ray—The Ray Lead Development Co. has resumed operations. About forty men are employed at present.

CALIFORNIA

Engelmine—John Reinmiller, former superintendent of the Engels Copper Mining Co., has recently taken over the Milcaller group, located about two miles northwest of the upper mine of the Engels company in Plumas County, and is developing a vein in which the average values are high. A winze being sunk on the vein is now down 65 feet and it is all in ore that averages

eight per cent copper, four ounces silver, and $2 gold per ton. The full width of the vein at this point is not known as all four sides are in ore of the same grade.

Sutter Creek—The 3,500-ft. shaft of the Old Eureka group has been completed and a station is now being completed on the 3,000 level. Extensive developments are planned, promising veins have been exposed, and rich orebodies are indicated.

Tuolumne—The sinking contract let by the Central Eureka Co. is nearly finished, and the company reports that several promising veins have been uncovered. The ore production continues to amount to about $40,000 monthly.

The Grizzly mine has been dewatered and preparations are being made to sink the shaft an additional 100 ft. It is now down 1,650 ft. A 4-ft. orebody has been exposed at the bottom of the incline shaft.

Grass Valley—In the Grass Valley district the new wage scale went into effect on the first of July, and the labor situation is already showing signs of improvement. The new scale ranges from $4.75 for muckers to $5.25 for timbermen, with an extra 50c. daily when the work is unusually hard or hazardous.

Redding—The Shasta Zinc & Copper Co. is to erect a zinc-oxide and zinc concentrator plant at Delamar. Recent reports from the Bully Hill mine state that a large deposit of high-grade zinc ore has been exposed in the lower workings of the Rising Star shaft. The ores also carry much copper and some gold and silver.

The Mammoth Copper Co. is doing considerable development work on the orebodies recently uncovered, and is replacing the tonnage depleted by heavy drains during the war.

IDAHO

Kellogg.—Raising is in progress from the main tunnel level of the Nabob Consolidated mine, near Kellogg. The raise has attained a height of 20 ft. and will be continued to the next level above, which is 220 ft. higher than the main tunnel. The work will be completed in six weeks.

The Orogrande Gold Mining Co. near Stites has increased the capacity of its mill to 500 tons daily. The designed capacity was 360 tons. Changes and improvements will be made in the method of ore dressing.

Workings of the Baltimore vein of the Silver Triumph Mining Co. in the Coeur d'Alenes have been entered for the first time in 30 years, ore containing 39 ounces in silver to the ton, 20 per cent lead and 18 per cent zinc. The discovery is 60 ft. from the surface. The old workings honeycomb the ground on two tunnel levels. The orebody between the main tunnel level and a point 150 ft. deeper is 6 ft. wide and gives promise of a greater width. Development in several parts of the mine disclosed mineralization that exceeds expectations.

MICHIGAN

Copper District

Calumet—The coal situation continues to be the most important problem for every copper mine in Michigan. The mines now are running from week to week. The solution of the problem is in no wise helped by the knowledge that there is no hope for any reduction in coal prices and that there is doubt that coal in sufficient amount may be secured even at the present prices. To add to the general pessimism there is the continued shortage of labor and the fact that there is little evidence in copper shipments of any great demand for the product of the mines.

Wolverine is showing a slight improvement in contents this month, and the rock, which is being sent to the Wolverine mill, averages 20 lb. to the ton. Wolverine No. 4 shaft is shut down temporarily although the tonnage is increasing from No. 3. The Wolverine stamp mill is out of commission for a few weeks so that repairs can be made to the rock bins. Meanwhile ore is being stamped at the Mohawk mill. The bulk of the ore is being obtained from the 38th level and the four levels above, including footwall arches and pillars. It is no longer necessary to handle the extra water which has been coming through from the South Kearsarge as Wolverine now is holed through to North Kearsarge.

The Seneca shaft is approaching the fifth level. The third and fourth level drifts are being pushed to the proper limits in order to secure greater lateral distance before further stoping is done. Under existing metal conditions this is a consummation not entirely objectionable. The Gratiot shaft development is showing much barrel and small mass copper.

MINNESOTA

Cuyuna Range

Cuyuna—The Merritt mine has been fully unwatered, and two shifts have been placed at work. A third shift will be added soon. The company has sold its season's output of high manganese ore to the Carnegie Steel Co., averaging from 18 to 20 per cent.

The Hanna Ore Mining Co. will construct a new concrete block engine house and change house at the Feigh mine. New equipment will include an electrically driven drum hoist, an air compressor and a generator and two 125-hp. boilers for auxiliary power.

Mesabi Range

Nashwauk—Operations have been resumed at the Pearson and will be conducted on the day shift only for the present although it is expected to put on the double shift later. The Pearson was one of the first operations in this district but has been idle for a number of years. Two years ago it was taken over by Clement K. Quinn and associates who are now operating it. The mine equipment includes a washing plant.

Gilbert—The old Mariska mine has been leased by the Mariska Iron Co. from Robinson & Flinn and dewatering will be commenced soon. New equipment will include electrical machinery and additional buildings as well as a new washing plant designed to handle 1,000 tons per 24 hours. The headframe will be remodeled to adapt itself to washing practice so that the ore may be conveyed through the plant or shipped direct or stockpiled. The Mariska was opened by the Republic Iron & Steel Co., in 1907, and abandoned by them in 1911 after making a total shipment of 133,685 tons.

MISSOURI

Southeast Lead District

Labor shortage is quite a serious factor in St. Francois County and all the large mines are more or less crippled for lack of full crews. The Leadwood property of the St. Joe Co. and the Elvins property of the Federal Lead Co. are running at about 50 per cent capacity.

The St. Joe Lead Co. is drilling in Crawford County, near Westover, some forty miles west of Bonne Terre, where they have optioned a tract on which the "Bonne Terre" limestone outcrops. They have also optioned the Schulte tract, near Fredericktown, in Madison County, where considerable lead and mixed copper-cobalt-nickel sulphides have been found. The property is near the North American mine.

The Milford tract on Big River which adjoins the Desloge mine has been purchased by Jack Elledge, who will drill soon.

The Annapolis Lead Co., at Annapolis, on the main line of the Iron Mt. R.R., recently lost its new shaft at a depth of 60 ft. through caving and this is now being recovered and concreted. Work on the surface plant is proceeding slowly as it has been decided to delay completion until the orbody has been developed by the new shaft.

The Picher Lead Co. have purchased the Fisher lead mine, near Anaconda, Franklin County, where a small but rich shallow run of sheet lead ore has been found on each side of a draw, the pay streak showing 6 to 16 in. of solid galena.

A new shaft is being sunk at the Beulah pyrite mine, in Franklin County.

MONTANA

Conferences Between Company Officials and Labor Elements at Butte—Wisconsin Mining Students in Montana

Butte—The Metal Trades Council at a conference of the different mining companies presented their demands for what amounts to an all-round increase in wages of $1 a day and five and a half days as a week's work. The representatives of the companies operating in this district listened to the demands of the men and at the conclusion C. F. Kelley, president of the

Anaconda Copper Co., speaking for all companies, said that the increase asked could not be granted as conditions in the metal market were such as not to warrant any change from the wage scale and working conditions existing under the contract at the present time. The representatives stated that they would report the decision of the companies to their respective unions. Before the contract can be terminated by either side 30 days' notice must be given. The organizations asking for increases include the machinists, engineers, pipe-fitters, blacksmiths, electricians and other metal trade crafts. One of the leaders in the metal trades council has stated that there would not be any strike. The men would stay on the job, he said, but would govern themselves in the amount of work performed by the wages received.

The 500-ton mill being erected at the property of the Boston & Montana Development Co. is expected to be in operation by early this fall, according to the announcement of Manager John D. Pope. The machinery is practically all in position and the work of enclosing the building is now going ahead.

In view of the close relations existing between the Davis Daly Co. and the Butte-Ramsdell Co. it seems to be generally accepted that the option given a short time ago on the latter property is in favor of the Davis Daly.

Benjamin B. Thayer, vice-president of the Anaconda Copper Mining Co., and Mrs. Thayer are at Swan Lake, the guests of Mr. and Mrs. C. F. Kelley, at their summer home.

A party of Wisconsin mine students from the University spent a week in this city going through the leading mines of the district in both copper, silver, zinc and manganese and later went to Anaconda where they spent a couple of days looking through the big Washoe smelter and other plants of the Anaconda Co. From here the party went into the Coeur d'Alene district to inspect the lead and silver properties.

The mines in the Phillipsburg district are turning out 500 tons of manganese a day which is being shipped east. In addition to the manganese the district is producing about 400 tons of silver ore a day, and altogether in the various mines employment is given to about 1,000 men, which makes this old-time mining district assume a lively aspect.

Between the treatment of ore of the company's own mines and the custom ore received the Washoe smelter is working about 60 per cent capacity. The zinc and manganese ore is treated at the plants at Great Falls.

The Davis Daly miners in the Colorado have cut through into the Butte-Ramsdell ground to follow a rich body of ore uncovered within 30 feet of the Colorado-Butte-Ramsdell dividing line. There is an arrangement with the management of the Butte-Ramsdell whereby the Davis Daly people can follow the orebody, which is said to be rich in both copper and silver. The Colorado is hoisting 150 tons of ore a day and having it treated at the East Butte smelter.

NEVADA

Talapoosa—Major W. H. Ferguson has let two contracts for some preliminary development work which he has started on the Talapoosa mine, located about sixteen miles east of the Comstock. There is a large mineralized area at the Talapoosa of much promise, which has never been prospected at depth and it is the intention of the company which Major Ferguson represents to do this. In about two months it is expected to have a considerable force employed and extensive operations under way.

Nevada Douglas—Henry I. Moore, manager of the Nevada-Douglas Consolidated Copper Co.'s mine in the Yerington district, states that the refinancing of the company has been completed, the bonds all sold, and active operations will begin within the next few weeks. The erection of a flotation plant has been considered, but negotiations for treating Nevada Douglas ores in the Bluestone plant are under way and if successful it is probable that the Nevada Douglas company will install a reverberatory furnace to treat the concentrates from both mines.

Spruce Monarch—The Spruce Monarch mine at Spruce mountain in Elko County is shipping an average of 50 tons a day of ore that nets the company $30 per ton, according to Sam C. Soupcoff who has recently visited the property. This is coming from a new orebody on the 450-ft. level which has been drifted on for a distance of 175 feet. The ore is hauled to Tobar on the Western Pacific R.R. and goes to the smelter at Murray, Utah.

Gold Circle—The Gold Circle Queen Mining Co. is crosscutting to the vein on the 315-ft. level, which will be reached within a few feet if there has been no change in its dip below the 230 level. If the improvement noted at the latter level is found on the 315-ft. level the company expects to build its own mill for treating the ore.

Virginia City—D. Hayden Collins, of Pittsburgh, Pa., who is interested in the Standard Metals Co.'s mine near Reno, Nev., has bought the Virginia Silver mine near Virginia City, Nev.

Dun Glen—The Buena Vista Del Oro company has commenced operations on the property which it acquired last fall. They have completed a wagon road and are said to be arranging for the building of a 100-ton mill.

Mina—Crosscut 701 on the seventh level of the Simon Silver-Lead Mining Co. property, Simon district, Mineral County, has penetrated an orebody 30 ft., according to the last report received from the mine. Indications point to this orebody being the downward extension of the ore opened at the surface north of the Copper shaft and not the principal orebody developed on the fourth, fifth and sixth levels.

Drillers sinking the well to develop water for milling purposes report the hole which will take a 12-in. casing, down a distance of 455 ft. when work was stopped to allow the men to celebrate the holidays. Water struck at 151 ft. rapidly rose to the 130-ft. level where it continues to stand.

NEW MEXICO

Lordsburg.—A. J. Stockridge, who has a lease and bond on the Ben Hinds gold property known as the Rocky Trail, has purchased a complete 50-ton concentrating mill from F. Fornfelter of Lordsburg, N. M. The mill will be moved to the mine and set up at once.

Brock, Weston & Kern are down 170 ft., showing a four-foot vein with a 12-in. streak of very high grade carrying gold, silver, lead and copper. They will move the old Brock mill to a point in the valley just below the mine and distant three miles. Concentrating tables to complete the mill will be purchased at once.

Central—Juan Padilla, who is operating a property owned by Clark Rodgers and Col. H. H. Betts at Lone Mountain shipped 10 cars of silver ore to the El Paso smelter during June.

Tyrone—The old Telegraph mine on the Gila River, 30 miles southwest of here, is being worked by Dorsey and Spencer. They are working on an old shaft that showed valuable ore in the early operations. The inaccessibility of the property prohibited the handling of anything but the highest grade in those days, consequently great quantities of low-grade ore are looked for in the present operations.

Silver City—Some good silver indications have been struck at the bottom of the Silver Spot shaft. It was necessary to stop work on account of an inrush of water. This is being satisfactorily handled by a 200-gal. sinker.

UTAH

Increased shipments from most Utah camps, as well as the somewhat larger dividend returns made during the first six months of 1920, as compared with the same period of 1919, are reflecting the better prices being received for silver, lead, and zinc, and this in spite of the handicaps of high costs and labor shortage. Dividends from Utah mines for the first half of 1920 were $5,706,171, as compared with $5,586,083, a gain of $120,083. A larger amount of low-grade ore with silver content than usual was shipped, and it is hardly likely that since the drop of the metal to a somewhat lower level, so much ore of this character can be utilized. Park City shipped 53,443 tons of ore and concentrates as com-

pared with 35,368 tons the first six months last year, but a part of this increase must be laid to more favorable operating conditions, as the camp did not suffer any inconvenience comparable to the I.W.W. strike of 1919 year. Tintic, which last year did not suffer from I.W.W. activities to any appreciable extent was this year handicapped somewhat by the switchmen's strike of two weeks and a smelter embargo of about two weeks on some of the mines, so that shipments are a very little lower than last year, the difference in favor of the first six months of 1919 amounting only to 95 cars, when 3,632 cars of ore were shipped as compared with 3,537 thus far in 1920. Returns from Bingham are not yet in, but shipments are expected to show a small increase.

royalty is naturally higher than when the miners must seek out their own ore, in some cases up to 75 or 85 per cent, and the groups working in each stope are privileged to oust any of their number who does unsatisfactory work and take in another miner. The plan is practically, as it works out, in the nature of extra compensation for efficient work, and is said to be proving profitable to both the company and the men. This mine during the first six months of 1920 shipped 981 cars of ore, being by 407 cars the heaviest shipper in the district.

Summit County

Park City—The Naildriver Mining Co. reports that the ore of shipping grade they recently opened has widened to 3 ft. There are good showings silver-lead ore on three levels and in three veins," says W. E. Seelye, vice-president of the property. "On the No. 2 level ore has been followed for 127 ft. The maximum value of the high grade is 106 ounces of silver and $60 in lead to the ton. About 85 per cent of the values of the mine are silver. The width of milling and shipping ore is from 5 to 9 feet on one level. Four carloads of ore have been shipped to the smelter and several hundred tons of milling and shipping ore are on the dump, ready to be sorted for shipment."

CANADA

Ontario

Kirkland Lake—Work has been started on the excavation for the

INTERNATIONAL SMELTING CO.'S PLANT, TOOELE, UTAH

Juab County

Tintic—Tintic Standard Mining Co. during the first six months of 1920 shipped 574 cars of ore. In June 100 cars were shipped, and the tonnage could be considerably increased if more miners were available. A part of this ore is coming from the lowest or 1,450-ft. level of the mine, and a winze will be sunk below this level, preparatory to further shaft sinking later. At the south end of the property, in which a shaft was recently sent down, drifting is being done on the 1,000- and 1,200-ft. levels. One of the drifts on the latter level, which has 1,200 ft. still to go, will connect with the large stopes now productive and is driven chiefly for ventilation, although it is expected that ore will be developed before reaching the stopes in question. Good progress is being made in building the experimental mill for low-grade ores. Shipments from the camp for the week amounted to 148 cars, as compared with 149 cars the week preceding. There were twenty shippers.

The Chief Consolidated Mining Co. is granting some of its old employees the privilege of working in stopes under a co-operative plan whereby the miners are allowed to work the ore under a group leasing system. The on the 900-, 700-, 600- and 500-ft. levels. The company has entered into a hauling contract, and it now expects to ship up to 200 tons of ore weekly. Work intermitted for a few days at the Ontario Mining Co. property, due to the breakdown of the large compressor and to make other repairs, was resumed after the holiday over the Fourth of July, and conditions at this property are as usual. The Judge Mining & Smelting Co. is opening a store which will sell goods to its employees at cost. The Silver King Coalition Mines Co. is working 190 men and could take on more if they were available.

WASHINGTON

Spokane—The shipment of ore has been resumed from the Roosevelt mine, in Stevens County.

A concentrating mill has been installed on the Lead Trust mine and placed in commission. The plant is of 75 tons daily capacity and designed to dress lead ore. Operations have disclosed ore 6 to 14 ft. wide on two levels. One of these levels is 200 ft. above the mill and the other 350 ft. Values are mainly in ore of milling grade.

"The Silver Mountain Mining Co., four miles east of Daisy, has opened foundation of the Ontario Kirkland mill. It is hoped to have the foundations completed before the winter sets in. Drifting on the 450-ft. level is being pushed as the ore shows greater enrichment than at the upper levels.

At the Wright-Hargreaves mill construction work has reached an advanced stage and some of the heavier machinery is now being installed. Owing to shortage of electric power, steam equipment is being used for underground work.

The shaft on the Ridgewood property is down 200 ft., at which level a crosscut is being driven to cut the 12-ft. vein opened up on the 100-ft. level.

Gowganda—This camp has come increasingly into prominence owing to recent rich discoveries on the Trethewey locations. There are now 16 properties being operated. The mill of Reeves-Dobie Mines, Ltd., with a capacity of from 25 to 30 tons daily, will be altered to increase its capacity to 50 tons.

South Lorrain—At the Keeley mine No. 3 shaft is being put down to 400 ft. Drifting on Wood's vein at 230 and 300 ft. has opened up a considerable tonnage of milling ore. The new mill of about 80-ton capacity is nearing completion.

West Shining Tree—The Wasapika Consolidated has decided to offer 2,000,000 shares of treasury stock, par value $1, for subscription at 10c. per share "in view of the speculative nature of the enterprise." Some 200,000 shares have been taken up during the last few months at this rate, mostly by President George B. Rogers, to provide funds for current expenses. The new offering is being made to raise about $50,000 for the installation of a mill capable of treating 50 tons of ore per day.

Beaver House Lake—Samples of remarkably rich ore from the find recently made at the Argonaut gold mine have been received at the head office of the company in Montreal. President J. H. Rainville states that the vein in which the find was made has been opened for a length of nearly 900 ft. and is still carrying heavy gold content. The new 12-drill compressor and electric hoist are in operation to sink to 500 ft.

Butt Township—The Mining Corporation of Canada has taken an option on eight mining claims supposed to carry pitch blende, staked last fall by Hamilton, Flynn and Rankin. They surround the McConnell property, where pitch blende occurs in encouraging quantities. The claims are now being explored.

Cobalt—The Kerr Lake Mining Co., Ltd., has let a contract to Dominion Reduction Co. for the treatment of between 75,000 and 100,000 tons of low-grade milling ore.

The mill of the Peterson Lake Silver Cobalt Mining Co. has been closed down temporarily owing to shortage of power.

British Columbia

Placer Law Amendments Effective—Alice Arm Growing—Copper Ore Discovered Near Usk

By ROBERT DUNN

Victoria—The amendments to the Placer Mining Act of British Columbia, passed at the last session of the Provincial Legislature, came into effect on the 1st of July. Holders of placer leases, however, have until the 1st of January, 1921, to make such arrangements as are necessary to hold their property. They may do one of two things, viz., pay up arrears on their leases and continue annual payments as laid down by the old Act or consolidate the arrears and pay a proportion of the whole amount together with the current annual fees. Those failing to do either one or the other will be dispossessed of their holdings, the act as amended providing for automatic forfeiture of their leases under such circumstances.

Stewart—Arrivals from Stewart, B. C., declare that there is no mining boom in the Portland Canal District, but that there is much solid development. Nine diamond drills now are in operation, two on the Premier, two on the Northern Light Group, one each on the 49 Group, the Big Missouri, the Mother Lode, one on Goose Creek and one on the B. C. Exploration Company's property, Marmot River. It is stated that the snow is rapidly disappearing from the higher reaches and that there still is employment for good miners.

Activity is apparent through the country contiguous to the Bear River Valley. Men are engaged in putting the line of the Canadian Northwestern Ry., owned by Sir Donald Mann, in shape for operation, and a gas locomotive has been bought, together with some rolling stock, in order that the transport of supplies to the various camps may be undertaken as soon as the repairs to the road render it feasible.

Some of the mining operations in this section that may be instanced are the development of the Q. & L. Group held under bond by J. Tretheway, of Cobalt, consisting of surface stripping which has resulted in the exposure of a vein carrying good values and the driving of a tunnel on the vein the ore of which on assay gives returns in galena, zinc-blende, and silver; the opening of the Red Top Group by G. Seivert; further work on the Tower Mountain Group by K. P. Matheson, who found promising leads of silver-lead galena last year; the exploration of the Goose Creek Group by the Algunican Development Co., who have it bonded; the development of the L. L. & H. on Bitter Creek; and the vigorous development of the Lakeview Group, Glacier Creek, by P. Welch, of Spokane, and H. J. Fletcher, of Seattle, Wash.

Alice Arm—The Taylor Mining Co. Ltd., successors to the Dolly Varden Mining Co., are now hauling two hundred tons of ore per day from the mine to tide water and this amount is expected to be increased steadily as fast as new rolling stock and development will permit. The company have let a contract for the installation of a complete hydro-electric plant at Trout Creek adjoining their large Wolf property three miles up river from the Dolly Varden mine.

A concentrator and cyanide plant will also be constructed, if present tests prove satisfactory.

An important strike of high-grade silver ore has been encountered in the North Star mine adjoining the Dolly on the north and a large ore body has also been recently discovered on the Royal Group adjoining the Dolly on the south. This property is under option to Capt. McLennan of Vancouver.

Several properties have been optioned or purchased from the original owners during the past month. The season has been late and snow still covers many of the properties at about three thousand feet elevation. There is no boom but a very healthy and normal growth is noticeable.

PROSPECTING IN NORTHERN ONTARIO (BLACK FLIES AND MOSQUITOS TOO SMALL TO BE VISIBLE)

Usk—High-grade copper ore is reported to have been discovered on Nicholson Creek, near Usk, northern British Columbia, by Albert Baxendale, a prospector. As a result the Crescent Group of mineral claims has been staked. Stripping is said to disclose a fissure vein, one foot to six feet wide, for a distance of 700 feet carrying bornite and chalcopyrite, much of which is of sufficient high grade to ship.

Slocan—That the Utica mine will be re-opened at once and put on a shipping basis as soon as possible is announced by C. F. Caldwell, vice-president and managing director of the Utica Mines, Ltd. The old Sunset property, situated near the Utica, also is to be developed. The latter has not been worked for fifteen years. During its operation over $500,000 worth of ore was shipped, some 2,000 tons averaging $250 a ton at the former price of silver. It is proposed to continue the existing crosscut to strike the vein at new depth. The mine, it is hoped, will be shipping by fall.

Work on the Evening Star mine, Dayton Creek, is proceeding with satisfactory results. The crosscut being driven at depth has reached an advanced stage, its face now being somewhere near the line of the shaft and below it. The workings will be unwatered before an attempt is made to connect the two. As the workings radiating from the shaft are quite extensive the latter work will take some time. Hugh Sutherland, of Winnipeg, Man., formerly executive agent for the Canadian Northern Railway, is the owner of the Evening Star and also of the Silver Nugget, in the same vicinity, which is to be developed.

Ainsworth—Construction of another unit of the power plant of the Florence-Silver Mining Co. at Ainsworth has commenced. About 60 men are employed, the mine operating two shifts and the mill one. There is reported abundance of ore in sight.

Trail Smelter—Receipts at the Trail smelter for the seven days ended June 30 were 8,755 tons, as follows:

Mine	Gross Tons
Anna mine, Slocan City	26
Emerald, Salmo	34
Electric Point, Boundary, Wash.	205
Florence, Princess Creek	117
Josie, Rossland	370
Mandy, Le Pas	313
Maestro, Ainsworth	11
North Star, Kimberley	125
Providence, Greenwood	49
Stemwinder, Fairview	2
Loon Lake, Loon Lake	22
Lookout, Skagway	27
Company Mines	7,354

Nelson—The Florence Silver mine, near Nelson, B. C., is in operation and the installation of another unit for the power plant is under way. The mine is working on a two-shift and the concentrator on a one-shift basis. There is said to be an abundance of ore in sight, both the Fisher and Replacement veins looking splendid.

About 150 tons of mill feed is coming down daily, and it is expected that the mill will be able to ship 300 tons of concentrates a month.

Another deal is reported in connection with the Granite-Poorman mine, Eagle Creek, it being stated that a syndicate has been formed to take over the property from the Vincent Development Co. As a result the Granite-Poorman property will resume operation immediately, a crew of men already having been put to work.

A preliminary map of the International Boundary Region between Portland Canal and Stikine River, Alaska-British Columbia, has been issued by the International Boundary Commission of the United States and Canada. During the present summer there is to be a slight change in the line near Gracey Creek, south of the Unuk River, and on the other portions additional monuments will be erected.

Manitoba

Flin Flon—J. W. Callinan of Pittsburgh, who has been associated for some time with the development of the Flin Flon copper mine, states that the work of exploration has proceeded rapidly this spring with about 140 men employed. William Koerner is engineer in charge and associated with him is Thomas Tighe, both of whom were formerly with the Inspiration Copper Co. The work is being done under contract by E. J. Longyear & Co. Two shafts are being sunk to a depth of 400 ft. Flin Flon Lake will be drained to Ross Lake by a tunnel 4,700 ft. long and having a drop of 50 ft. Much depends on arrangements for a smelter and railroad connections. The Manitoba government has agreed to build the railroad on receiving assurances that a smelter of at least 2,000 tons daily capacity will be erected. A conference will be held in August by the engineers acting for the W. B. Thompson interests when it is expected that a definite policy as regards the building of a smelter will be adopted. In the meantime search for a suitable water power is being made and several are in view, one having 34,000 and another 60,000 hp.

In the Herb Lake section three gold properties are under development. Two of them have machinery installed, and the third is under active development by hand.

MEXICO

Coahuila

Sierra Mojada—Sierra Mojada district is the terminus of the Mexican Northern Railroad, 125 km. from Escalón, Chihuahua. This camp has been a constant producer of lead silver and limy silver ores, for the past thirty years. A geological examination by a prominent American firm of mining geologists, several years ago, revealed the presence of zinc ores and since that time, the camp has produced zinc carbonate ores in increasing quantities. In common with all mining camps located off of the main line of the railroad, Sierra Mojada has suffered lately for lack of transportation facilities.

American Smelting & Refining Co.,

VIEWS OF THE VILLAGE OF ALICE ARM, BRITISH COLUMBIA

operating the Trinidad claim of Cia. Minera La Trinidad, S. A., are shipping limy copper ores to their Asarco smelter at Velardeña, and to their Number 3 smelter, at Monterrey.

Cia. Minera La Parreña, S. A., operating the San Salvador, Parreña, Nuevo Almaden and Encantada claims, are shipping several thousand tons per month to the Mapimi and Torreón smelters. It is stated that this company has discovered the continuation of the Trinidad ore shoot in the Nuevo Almadén claim.

Cia. Minera La Constancia, S. A., of Saltillo, continue to operate on a reduced scale, in spite of their large and important holdings in the camp. This company is shipping to the Torreón and Monterrey smelters of the Cia. de Minerales y Metales, S. A.

Hilario Martinez and associates, of Monterrey, have leased the Exploradora claim of Cia. Minera La Exploradora, S. A., and are shipping several hundred tons of 4 per cent copper ore containing good silver values, to the Torreón smelter.

Cia. Metalurgica Mexicana continues to make a good production of silver ores from its Veta Rica claim. This company has entered the ranks of the zinc producers and shipments will start shortly.

The operators of the Sierra Mojada district await with interest the decision of the railroad authorities, concerning the completion of the railroad which

was to connect Sierra Mojada and Cuatro Ciénegas. This road, begun under Carranza, would make the Sierra Mojada mines as close to the Monterrey smelters as to the Torreón and Chihuahua smelters. It should also decrease the cost of fuel, due to shorter distance to the Coahuila coal fields.

Zacatecas

Zacatecas—At present only two concerns are actively engaged in milling operations, the Fresnillo Mining Co. and the Bote Mining Co.

Fresnillo lies some 20 miles north of the State Capital and, in the epoch of the Patio process, was the largest of its kind in the world. Toward the end of 1919, the Mexican Corporation, Ltd., Hugh Rose was then general manager, acquired interests in the old Fresnillo company and this now ranks as one of the units of the Mexican Corporation. In 1917 with S. N. Cook in charge, reconstruction of the plant was commenced, and operations resumed toward the end of 1918, with an approximate capacity of 300 tons daily.

This camp ranks first in size and capacity in the state, and since the conclusion of arrangements with the Mexican Corporation, it promises to rank as one of the large plants of the world. Construction of an entirely new modern 1000-ton mill is being rapidly pushed and further units will probably be added. A standard gage track has been laid between the station of Fresnillo on the Mexican Central Ry. and the property, a distance of approximately 7 miles. The new equipment will consist of stage gyratory crushers, Sturtevant ring roll mills and rod mills, with Dorr agitators and a combined counter current agitation and Butters filters, Merrill presses and zinc dust precipitation. Power will be electrical throughout obtained from steam turbine plant and generators. The nature of the ore deposit is peculiar for Mexican silver-gold deposits, being simply a hill of mineral several hundred feet high. It is well developed, several million tons are in sight, extraction is by open cut system with gravity tramming to mill. The ore is low-grade silver carrying a small proportion of gold and is economical and amenable to cyaniding.

S. N. Cook is manager and T. S. Butler superintendent.

The Bote Mining Co. is one of the oldest concerns in the district; operations were suspended in 1914 due to conditions in the country and were resumed in 1919. Dump ores exclusively are being milled, little or no mining being carried on at present. The mill equipment consists of gyratory and jaw crushers, roughing rolls and slow-speed Chilean mills, Wilfley concentrators, agitators and Kelley filters. Electrical power throughout is generated by producer gas engines of the Koerting type. Enlargements to this mill are contemplated.

La Fé Mining Co., Ltd.'s large new plant completed and barely tried out prior to the general disorganization in 1914, is still inactive with no indications of a resumption of operations. E. A. Strout is manager.

The customs mill belonging to the San Cristobal company is still idle and in an abandoned condition; the same applies to the City Customs mill of Cia. Metalúrgica y Beneficiadora de Zacatecas, although indications are that the latter may shortly resume operations.

Veta Grande—This famous old camp a few miles north of Zacatecas, has been optioned to a group of Spanish capitalists, but work is limited to the extraction and shipping of small lots of argentiferous lead ores. These properties have been examined in turn during the past few months by several of the prominent Anglo-American and Anglo-Mexican corporations in Mexico without, however, anything being done.

An Anglo-Mexican corporation prominent in Mexico has taken an option on the famous old Los Campos mine.

The attractive price of silver has induced several of the smaller property owners to resume development and considerable new ground has been taken up. More active development in the copper belt is also evident; the largest of the copper mines, the Magistral, is still closed down through litigation; the Parroquia, belonging to W. C. Palmer and the San Roberto belonging to C. Bently, are showing greater activity. A new local company, the Piedras Negras Mining Co., are acquiring and developing properties in a limited way.

The inability of operators to obtain a sure and steady supply of fuel is hindering development in the district. Metallurgically, the silver-gold ores are not refractory to treatment, and by concentration and cyaniding render up between 80 to 90 per cent of their values. High power costs and unavoidably high consumption of cyanide are the great drawbacks. Zinc, lead and copper ores carrying varying silver values are also exported.

AUSTRALIA

New South Wales

Broken Hill—In deploring what he termed "the record strike of the world" at the half-yearly meeting of the Broken Hill Block 10 Co., held in Melbourne on May 31, chairman Alex. Campbell, expressed the hope that the commission appointed by the New South Wales Government to seek a way out of the existing labor troubles, would find some reasonable solution and that the wheels of industry would revolve again before long. In his opinion, if the Barrier mines were nationalized, or handed over to the labor section to operate for themselves, the properties would never be made to yield sufficient money per week to equal one half of that which the companies now offered to the workers. So far some £2,000,000 wages had been lost to the employees through the strike, apart altogether from non-production losses to investors and to the states directly concerned, New South Wales and South Australia. A round table conference is now being held in Sydney.

Kingsgate—Kingsgate Molybdenite, a Victoria company, acquired an area of land at Kingsgate, N. S. W., containing 54 molybdenite pipes. One or two have been worked to depths approaching 500 feet without showing any signs of cutting out. After long delays the mill is now capable of treating over thirty tons of ore per day, but drought is still restricting operations For every 1,000 tons of matrix mined 400 to 500 tons of milling ore is produced, containing approximately 0.5 per cent bismuth and 1 per cent molybdenite. The first run with the new mill was not a financial success, but the material was low-grade, and included a large proportion of hopperings. The percentage extraction of molybdenite was 53.8 per cent.

Astrolabe Copper Field—The New Guinea Copper Mines, Ltd. has been registered to take over the property of the Laloki (Papua) Copper Mines, No Liability, on what is known as the Astrolabe copper field, eighteen miles from Port Moresby, Papua. The company has entered into a contract with the Electrolytic Refining & Smelting Co., Port Kembla, for the purchase of 6,000 tons of pyritic ore per annum from the Laloki and Dubuna mines. The railway from the Laloki mine to Bootless Inlet, a distance of fifteen miles, is in course of construction. This will be the first railway in the Commonwealth's island territory of Papau. Up to December 31 the Laloki Co. and spent £60,681 on development, viz., £50,168 at Laloki, £9,973 at Dubuna, and £540 at Mt. Chalmers (the old Great Fitzroy mine in Queensland). Percy R. Osborne is general manager.

TASMANIA

Risdon—It is officially stated by the board of directors of Electrolytic Zinc Co. that within a few weeks the output of electrolytic zinc will be increased from 100 tons to 140 tons per week by the use in portion of the new plant of an extra 1,750 hp. of electric energy to be supplied under arrangement with the Tasmanian government hydro-electric department. The construction of the first half of the new 100-ton-per-day zinc plant is being steadily advanced, and work on the buildings and plant for the treatment of by-products and the development of subsidiary industries is also proceeding. Further consideration has been given by the directors to the production of caustic soda, chlorine, and chlorine products. It is the intention of the board to proceed as soon as practicable with the production of 6,000 to 8,000 tons annually of caustic soda, with a corresponding quantity of chlorine and chlorine products. For this purpose the company will use the plant of the present 10-ton zinc plant which has been found to fit in with the requirements of the new industry.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

July	Sterling Exchange	Silver: New York, Domestic Origin	Silver: New York, Foreign Origin	Silver: London	July	Sterling Exchange	Silver: New York, Domestic Origin	Silver: New York, Foreign Origin	Silver: London
8	394	99½	94½	54	12	393	99½	92⅞	53⅛
9	394	99½	91¾	52¼	13	392	99½	93⅛	53⅝
10	394	99½	92⅛	52⅝	14	390½	99½	93	53¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Daily Prices of Metals in New York

July	Copper: Electrolytic	Tin: 99 Per Cent	Tin: Straits	Lead: N. Y.	Lead: St. L.	Zinc: St. L.
8	18.60	45.00	48.75	8.10	8.10	7.70
9	18.60	46.50	50.00	8.10	8.10	7.70
10	18.60	46.50	50.00	8.10	8.10	7.70
12	18.65	47.25	50.50	8.10	8.10	7.75
13	18.65	46.25	49.75	8.10	8.10	7.80
14	18.65	45.75	49.25	8.10	8.10	7.85

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 55c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

July	Copper: Standard Spot	Copper: Standard 3 M	Copper: Electrolytic	Tin: Spot	Tin: 3 M	Lead: Spot	Lead: 3 M	Zinc: Spot	Zinc: 3 M
8	89⅛	91⅜	105	249	256⅛	33¼	34¾	41¾	43¼
9	89¾	92¼	105	258½	263¾	33¾	35½	42	43¼
10	..	....	...	....	....	....	....	....	....
12	91⅛	93¾	105	264½	271	34½	36	43¾	44
13	90⅜	93	105	266	271½	34¾	36½	42½	43¾
14	90	92½	105	265¾	271½	34½	36	41¾	43

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, July 14, 1920

A better feeling is in evidence throughout the market, although sales are in anything but large volume. Transportation is improving slowly, and some shipments can be made today that were impossible a week ago. No new strikes of any moment have been reported, and the labor situation gives evidence of improvement in the fall. Immigrants are coming in larger numbers. Many large industries are laying off men, the woolen companies in New England, for example, and the automobile industry in Detroit. Agents of the larger mining companies are having better success in securing men in the large industrial centers. It is true, many wish to take vacations and others to work in the harvest fields, but by the first of September labor conditions in the mining districts should be better.

Copper

Buying has been on a larger scale than for two or three months, but has not reached the volume of the last buying movement, nor is it likely to. Producers are obtaining their asked price of 19c. delivered, but are willing to sell at this price regardless of the point of delivery. However, this price cannot be considered as firmly established, for business has been lost at this figure. Wire mills have been the chief buyers. Most of the metal sold has been for third-quarter delivery; for fourth-quarter delivery, ¼c. premium is being asked.

One big producer reports foreign inquiry and sales excellent, England, France, Germany, and Italy being in the market. It has been a long time since sales have been made to Italy, and the general opinion was that her stocks were ample.

Lead

No marked change has occurred the last week in the lead market, and conditions continue quiet. The tendency for the St. Louis price to be as high or higher than New York continues. The reasons for this were mentioned last week. July and early August metal seem to be scarce in the vicinity of St. Louis, and it is extremely doubtful if much could be obtained at the prices which we quote. Most of the metal now being sold is for September delivery, but the price differential between prompt and future lead is not as great as it was. Offers of lead for prompt delivery went begging in New York yesterday at 8½c. One fairly large cancellation has freed some metal, which has eased the market.

Zinc

The firm undertone continues, but business is quiet, especially for Prime Western. Brass special commands about 20 to 25 points premium, which is considerably greater than it was six months ago, and electrolytic is also in demand. No runaway market can be expected, for London today is more than a cent below St. Louis parity, the equivalent being about 6.70c.

Tin

Prices have shown an upward tendency, but little business has been done. Manipulation seems to account for the London variations, which are not always reflected in the local market. Fluctuations here are the result more of an extremely narrow market; Chinese No. 1 particularly seems entirely independent of London. Almost no electrolytic has been sold.

Straits tin for future delivery: July 8th, 48.75@49c.; 9th, 49.75@50c.; 10th, 50@50¼c.; 12th, 50.50@50.75c.; 13th, 49.75@50c.; 14th, 49@49¼c.

Arrivals of tin in long tons: July 3d, Straits, 150; China, 75; 6th, Australia, 200; 7th, Hongkong, 125; Singapore, 425; Liverpool, 50; 8th, Singapore, 50; London, 200; 12th, Liverpool, 25; London, 75.

Silver

The silver market continues dull and quiet, with only moderate demand from London, mostly for account of India Bazaar buying. The fluctuations in price have been quite out of proportion to the amount of business done, the very smallness of the business perhaps making the market unusually sensitive.

Reports from India are that the monsoon conditions are favorable, and if the rainy season continues, and good crops are assured, the demand for silver from India may bring about some improvement in price.

On the other hand, the China market continues dull, with exchange rates unchanged and at a level which does not warrant silver purchases by China banks at current quotations.

If the negotiations for the international loan to China are successful, this should help the demand for silver from the Chinese banks.

The demand for silver in the arts in this country continues dull.

Mexican Dollars—July 8, 71½; July 9, 63⅜; July 10, 69½; July 12, 70¼; July 13, 70⅜; July 14, 70¼.

Gold

Gold in London on July 8th, 104s. 1d.; 9th, 104s. 1d.; 12th, 104s. 3d.; 13th, 104s. 6d.; 14th, 105s.

Foreign Exchange

Sterling has weakened. Other foreign funds have been quiet. On Tuesday, in units to the dollar, francs were 11.92 and lire, 16.77. German marks, 2.58c. New York funds in Montreal, 13⅞ per cent premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32@32½c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7⅝@7¾c. W. C. C. brand, 9c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $2.50 to $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $300 per oz. No business.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$75@$80 per oz.

Platinum—Market weak at $80@$85 per oz.

Quicksilver — Market weaker; $90@$92 per 75-lb. flask. San Francisco wires $85. Firm.

Ruthenium—$200@$220 per troy oz.

[1]Selenium, black, powdered, amorphous, 99.5 per cent pure, $1.75@$2 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $18@$20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 72@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. June ore shipments were 9,233,566 tons; it is expected that July shipments will show an improvement.

Manganese Ore—75@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, $1 per lb. of contained sulphide.

[1]Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO_2, 2c. per lb. for ore. Rutile, 95 per cent TiO_2, 20@25c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6.50@$7.50 f.o.b. mines.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1 to $2.50 per lb. of metallic vanadium content.

Zircon—Washed, iron free, 10c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., July 10—Zinc blende, per ton, high, $51.10; basis 60 per cent zinc, premium, $46; Prime Western, $45; fines and slimes, $45@$40; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $43.02; calamine, $34.47; all zinc ores, $42.92.

Lead, high, $98.95; basis 80 per cent lead, $95@$90; average settling prices, all grades of lead, $97.37 per ton.

Shipments for the week: Blende, 9,404; calamine, 118; lead, 1,521 tons. Value, all ores the week, $556,830.

The mines all resumed operations this morning, though some were very short handed. The miners who dispersed to the harvest fields have not all returned. Operators are expecting more to return tonight and tomorrow.

Efforts of sellers to spring the market by holding out against $45 basis until 11 o'clock today are reported a maneuver to prevent price reductions. It is reported that a number will not resume night operation in the mines.

Platteville, Wis., July 10—Blende, basis 60 per cent zinc, $49.25 base for high-grade. Lead ore, basis 80 per cent lead, $90 per ton. Shipments for the week: Blende, 1,653; lead, 30 tons. Shipments for the year: Blende, 37,680; calamine, 2,240; lead, 3,364; sulphur ore, 988 tons. Shipped during the week to separating plants, 2,060 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $1,800@$2,500; No. 2, $1,100@$1,500; spinning fibres, $400@$700; magnesia and compressed sheet fibres, $300@$400; shingle stock, $100@$150; paper stock, $60@$80; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $25@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground,

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10 f.o.b. Maine; ground, $22@$30, car lots, f.o.b. Baltimore; ground, $22@$30, f.o.b. North Carolina points; $17 to $20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Kentucky and Illinois mines; ground, suitable for acid, chemical or enameling purposes, $60. Lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York; 80 per cent, 5c.; 90 per cent, 10c.; 30 per cent (dust polish grade), 1c.; 50 per cent (dust facing grade) 2c.; f.o.b. Ashland, Ala. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite. Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $50@$60, Chester, Pa. (Magnesite brick — See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $42 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, $9.50@$14 per ton; roofing grades, $8.50@$9; rubber grades, $9@$15, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, carload lots, $12 per ton; less than carload, $15, f.o.b. cars. Freight to New York, $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $10@$20 per ton.

Mineral Products

Arsenic—White arsenic, 14@15c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium[1]—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 19@20c. per lb. of chromium contained; 4 to 6 per cent carbon, 20@21c. f.o.b. works.

Ferromanganese—For 76@80 per cent, $225, freight allowed; Spiegeleisen, 18 to 22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$90; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, 85c.@$1.10 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$8 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22½c.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅝ to 3 in., 23¾c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$85@$90 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr.O., $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $45@$53 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $40. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$90@$100 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—Nine in. and 9-in. sizes, per 1,000, $51@$55, Birmingham, Ala.; $50@$55, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, July 13, 1920

The iron and steel industry is complaining more loudly of car shortage, as to shipments of its products rather than the securing of raw materials, and blames the decreased supply of open-top cars on I. C. C. Order No. 7, relating to car preference to coal mines, but on the other hand the coal operators claim they have experienced little if any increase in their car supplies.

Production of steel ingots in June was at the rate of about 42,400,000 gross tons a year, against rates of 41,050,000 tons in May, 37,550,000 tons in April and 45,200,000 tons in March, the last named being the highest rate since October, 1918. Production in the half year was at the rate of 42,100,000 tons a year.

Pig Iron — The market is one of prompt shipment only, consumers being interested solidly in deliveries, not in making commitments for the future. Bessemer, basic and foundry all remain quotable at $45, Valley, freight to Pittsburgh being $1.40, but a higher price might be paid occasionally by a consumer in particular distress, for immediate shipment. The production of coke and anthracite blast furnaces in June, according to *Iron Age*, amounted to 3,043,540 gross tons, or an average of 101,451 tons per day, as compared with 2,985,682 tons, or 96,312 per day in May.

Steel — The market is quiet, with large stocks of unshipped billets and sheet bars at mills. Quotations are practically nominal at $60@$65 for billets, $65@$70 for small billets and $75 for sheet bars.

Charcoal and Coke

Charcoal[1]—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$18.50.

Gold Movements

Their Recent Trend and Purpose—Marked Effect Upon the Gold Reserves—Interesting Relation Between Trade Balances and Bullion Movements—South America And the Orient Still Consuming United States Gold

THERE are two principal methods of settling a debt in a foreign country; the first is through the medium of buying "foreign exchange" and the second by the shipment of gold or silver coin or bullion. This latter method is almost exclusively used in settling international trade balances. It is a certain way of assuring the payment of a debt in a foreign country, but the incidental trouble of packing, carting, and insuring heavy shipments of bullion makes it an expensive expedient. At present the embargo on gold exports from foreign countries is prohibitive. Large banking houses are usually the only parties indulging in this mode of settlement. Nevertheless in view of the importance of gold movements upon foreign exchange, upon the gold reserve, upon the gold premium, and upon the policy of deflation which is being followed by many nations, their significance is marked and interesting.

The United States is the only country that has directly maintained the free gold market, and it is able to do this only by allowing the free movements of gold to and from this country. Other countries have taken advantage of this fact in frequently insisting upon payment in gold—witness the great drop in our gold reserve during the last twelve months. But preventing this condition through an embargo upon gold would immediately place our own currency on the same level with the depreciated currency of other nations.

Trade Balances and Bullion Movements

In 1919 it was noticeable that our largest gold exports were made to the Orient. The following important table strikingly brings out the close relationship between our gold and silver exports to the Orient and the adverse trade balance of the United States; that is, the excess value of the goods imported into, over those exported from, the United States:

RELATION BETWEEN U. S. ADVERSE TRADE BALANCES AND BULLION SHIPMENTS TO THE ORIENT IN 1919

Country	U. S. Excess of Exports Over Imports, 1919	Silver Shipments	Gold Shipments	Total Bullion Shipments
India	$240,633,415	$92,661,317	$28,756,570	$121,417,887
China	48,638,789	74,117,074	62,783,480	136,900,554
Japan	43,488,620	3,946,453	82,098,015	86,044,468
Dutch East Indies	5,016,067	.....	7,365,111	7,365,111
Philippine Islands	.....	.....	100,000	100,000
Totals	$337,776,891	$170,724,844	$181,103,176	$351,828,020

The Far East is spoken of as the great silver-consuming sponge, yet the gold absorption in 1919 from the United States was greater than the silver consumption.

The table indicates that with a total adverse trade balance in the Orient of $337,776,891 in 1919, there was shipped to the Far East $351,828,020 in bullion as a counterbalance. Thus the bullion exports for the year exceeded the adverse trade balance by $14,051,129. That the individual shipments do not balance, illustrates a general feature of gold movements—considerable gold and silver may be exported from the United States for the settlement of adverse trade balances accumulated by other countries, such countries using their credit to purchase gold here and ship it to the Orient, or frequently to South America.

The Purpose and Results of Gold Movements

The normal effect of gold movements is to bring foreign exchange rates back to mint par. Thus, bankers who engage gold for shipment to a foreign country do so to create balances against which more foreign exchange can be sold, and, by adding to the supply, pull the rate down. In normal times the cost of shipping gold limits the foreign exchange rates within so-called "gold points," a few cents greater or less than the mint value of the currency.

Often gold movements are undertaken to strengthen home gold reserves, and in such event the condition of the foreign exchange rate is a secondary consideration—as it was at the beginning of the war—and conversely the exports of gold often imperil the gold reserve.

Effect Upon the Gold Reserves

The recent heavy imports of English gold into the United States have had a perceptible effect upon the gold reserves of the United States and England. Lately the gold reserve of England dropped to the lowest point in half a century, due partly to this condition, and at the same time the gold reserve of the United States increased. At the end of April our gold reserve stood at $1,937,000,000, whereas $1,972,000,000 is recently reported. In June, 1919, the gold reserve was $2,202,000,000, but as the embargo on gold exports was then lifted, the gold reserve gradually declined, due to the insistent demand for payment in gold and the desire of the United States to strengthen exchange rates in several countries, until a few months ago, when it began to increase again.

Recent movements of gold to and from the United States are indicated by the following table:

IMPORTS OF GOLD

From	March	April
United Kingdom—England	$9,368,700	$48,353,408
Canada	6,370,387	364,492
Dutch East Indies	494,530	107,298
Mexico	334,584	388,492
Central American States	109,313	94,833
Philippines	106,714	.....
Colombia	1,002	150,049
Other Nations	199,992	766,606
Totals	$16,985,222	$50,225,178

EXPORTS OF GOLD

To	March	April
Argentina	$23,345,000	$29,850,000
Uruguay	9,750,000	2,000,000
China	3,457,179	1,764,950
Mexico	3,365,960	1,269,467
Hongkong	2,169,785	4,235,045
British fndia	1,453,673	1,533,300
Dutch East Indies	1,000,000	2,302,956
Japan	555,766	.....
Canada	425,348	461,783
Other Nations	1,526,515	706,078
Totals	$47,049,226	$44,123,579

Our heaviest gold imports are coming from England and Canada and the largest exports are going to South America and the Far East.

England's Heavy Shipments

Although in March the exports of gold from the United States exceeded the imports by $30,064,004, in April the direction of the movement was reversed, the excess of imports over exports being $6,101,599, which is the first time in a year that the imports of gold have exceeded the exports. Detailed figures for May and June (not yet available) are expected to show even greater "favorable" balances. The unusually heavy gold shipments that have been coming to the United States from England as part of England's financially courageous policy to extend her credit regardless of her slim gold reserve account for the excess of gold imports. This British attitude will also aid in restoring a free gold market in London, a result that would beneficially help sterling exchange. England's large gold exports to the United States have also been considered part of the plan to pay off the Anglo-French loan maturing next October.

That England is shipping the greatest percentage of her gold exports to the United States is shown by the following figures of the gold movements during April, 1920.

MOVEMENTS OF GOLD FROM THE UNITED KINGDOM

Country	Imports	Exports
United States	£520	£6,032,895
British India		1,620,213
Argentina, Uruguay and Paraguay		1,419,721
Straits Settlements	5,246	1,204,763
Transvaal	3,190,547	
Others	421,659	428,150
Totals	£3,617,972	£10,705,747

In spite of England's relative small gold reserve, there is a marked excess of gold exports over imports. Considering the financial position of the country and the heavy gold exports that have recently taken place, it is not strange that the gold reserve fell during July to the lowest point in half a century, 8½ per cent.

The Indian demand for gold has always been a big factor in drawing gold from London, but, as the demand has slackened, greater amounts of gold can move to the United States. The free gold movements to and from India were restricted until recently by the British government, the ban being lifted in June.

World's Gold Production Decreasing

Preliminary figures showing the production of gold throughout the world in 1919 have been made by the U. S. Geological Survey. The production in the United States was $58,285,196; Canada is reported to have produced $14,687,000; India, $10,028,000; Australia (not including New Zealand or the Islands), $29,268,000; the Transvaal, $171,640,123; Rhodesia and West Africa, $18,631,070. There was probably a large decrease in the production of gold in Russia and Siberia in 1919. Some increase was probably made in the output of Central America and South America, which, however, was doubtless offset by decreases in the output of other countries. The incomplete returns now available indicate that the world's production of gold in 1919 was between $345,000,000 and $350,000,000. The world's production in 1918 amounted to $380,924,500.

Information received during the first six months of 1920 indicates a still further decrease in the production of gold in the United States and that the output for the year will probably be less than $50,000,000. The production in Alaska, Colorado, California, Oregon, and Montana will be much less in 1920 than it was in 1919, because water is very short for placer mining and many stamp mills are closed. Canada as a whole may increase its output, although the production of the Yukon districts will be smaller than last year. The output of Russia can not be estimated. That of Australia will show a decrease. That of South Africa and South America will probably show no radical decrease. Indications point to a decrease in the world's production of gold in 1920 not so great as in 1919.

Latest Rand Gold Production

During June, the gold production of the Rand, in South Africa, amounted to 715,957 oz., an increase in output over the May figure, 699,041 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917 1920
(Fine Ounces)

	1920	1919	1918	1917
January	670,503	676,059	714,182	782,634
February	625,330	636,728	659,759	721,321
March	707,036	712,379	696,281	787,094
April	686,979	694,944	717,099	742,778
May	699,041	724,995	741,217	729,385
June	715,957	702,379	727,696	759,724
July		725,497	736,199	757,890
August		706,669	740,210	756,658
September		698,558	708,206	738,231
October		723,722	679,764	751,290
November		677,970	658,701	722,839
December		650,191	641,245	722,419

Current rate of production is below the war rate, despite the effect of the "gold premium."

COMPANY REPORTS

Alvarado Mining & Milling Co.

Silver; Mexico

The annual report of the Alvarado Mining & Milling Co. for the year 1919 shows a surplus, after payment of taxes, and reserves for depreciation and depletion, of $411,307. This is equal to 45c. per share earned on the $4,452,515 capital stock outstanding on Dec. 31, 1919. Gross earnings amounted to $2,741,774, from which was deducted mining costs, development expenses, and other charges amounting to $1,225,875 and taxes totaling $220,749, leaving an operating profit of $1,295,150. Further deductions due to a contract adjustment with the American Engineering & Operating Co. and to miscellaneous items, resulted in giving a net profit of $941,038. Allowing $442,787 as a reserve for depletion, and $86,944 as a reserve for depreciation, the surplus remaining amounted to $411,307.

During the year the company paid all of its floating debt, other than current operating accounts, and has arranged for the conversion of the $852,500 first mortgage 6 per cent convertible gold bonds. The par value of capital stock was changed from $5 a share to $20 a share and the shares were reduced from 1,200,000 to 300,000. The report states that the daily capacity of the milling plant will be increased from 600 tons to approximately 1,200 tons, and the mines will be equipped to supply the additional tonnage. The balance sheet shows that current assets are $931,041 in excess of current liabilities, representing an increase for the year of $636,064.

In a summary of operations it is stated that development work resulted in the discovery of new and large orebodies, which materially increased ore reserves. In the Alfarene and Presena mines large bodies of ore were discovered in the hanging walls, which are being stoped over widths varying from 25 to 60 ft. Development of a new vein in the Las Cruces mine has also begun.

Assets and liabilities are indicated as follows:

ASSETS	
Real estate and mines	$5,534,218
Buildings and equipment	1,055,640
American Engineering & Operating Co. stock	$5,210
Cash and U. S. Government securities	318,265
Accounts receivable	394,589
Bullion and ores	260,602
Supplies	198,304
Total	$7,486,835
LIABILITIES	
Capital stock (908,503 shares)	$4,542,515
First-mortgage convertible 6s; due 1926	$52,500
Reserves for conversion of bonds, depletion, and depreciation	1,944,146
Accounts payable	240,725
Surplus	266,949
Total	$7,846,835

Great Northern Iron Ore Properties

Iron; Minnesota

More than 4,000,000 tons of iron ore was shipped from the Minnesota properties of the Great Northern Iron Ore Properties Co. during 1919, and $6,000,000 was distributed to holders of Certificates of Beneficial Interest, according to the annual report of the company for the year 1919, just made public by the trustees.

This company is a trust created by directors and approved by shareholders of the Great Northern Railway Co. and controls the iron output of ten subsidiary companies.

The Mahoning mine at Hibbing, Minn., produced practically one-fourth of the total tonnage. The receipts from the proprietary companies for royalties and rents made a total of $5,844,249; administration costs amounted to $93,616. The report also shows that the trustees have on hand undistributed funds in the amount of $352,911, in addition to which each of the proprietary companies has ample emergency reserve funds. Since 1906 the trustees have received $28,002,833 and distributed $26,625,000 to certificate holders, the administration cost over that period being $1,024,922.

MINING STOCKS

Week Ended July 10, 1920

Stock	Exch.	High	Low	Last	Last Div.		
COPPER							
Adventure	Boston			*75			
Ahmeek	Boston	62½	62½	61½	June '20, Q		50
Alaska-B.C.	N. Y. Curb	1 7/16	1 3/16	1 3/16			
Allouez	Boston			28½	Mar. '19,	1	00
Anaconda	N. Y	58½	55½	57½	Feb. '20, Q	1	00
Ariz. Com'l	Boston	11½	10	11½	Oct '18,		50
Big Ledge	N. Y. Curb	1/16	1/16	1/16			
Bingham Mines	Boston			9	Sept '19, Q		25
Calumet & Ariz.	Boston	59½	57½	59½	June '20, Q	1	00
Calumet & Hecla	Boston	315	310	315	June '20, Q	5	00
Can. Copper	N. Y. Curb	1/8	1/16	1/8			
Centennial	Boston	12	11½	11½	Dec. '18, SA	1	00
Cerro de Pasco	N. Y	45½	42½	44½	June '20, Q	1	00
Chief Consol	Boston	3½	3½	3½	Feb. '20, Q		10
Chile Cop.	N. Y	16⅞	15½	16⅞			
Chino	N. Y	21½	29½	30	June '20, Q		37½
Columbus Rexall	Salt Lake	‡		*44			
Con. Ariz	N. Y. Curb			1/16	Dec. '18, Q		05
Con. Copper M.	N. Y. Curb						
Cop. Range	Boston	40½	38	39½	June '20, Q		50
Crystal Cop. (new)	Boston Curb	*40	*31	*33			
Davis-Daly	Boston	9½	9	9⅛	Mar. '20, Q		25
East Butte	Boston	13⅛	12⅛	12⅛	Dec. '19, A		50
First Nat'l.	Boston Curb	1	*90	1	Feb '19, SA		15
Franklin	Boston	2	1⅞	1⅞			
Gadsden Copper	N. Y. Curb			*71			
Granby Consol	N. Y	38	38	38	May '19, Q	1	25
Greene Can	N. Y	31½	30	31½	Feb. '19, Q	1	50
Hancock	Boston			4½			
Houghton	Boston Curb			*60			
Howe Sound	N. Y. Curb	3⅞	3½	3½	Apr. '20, Q		05
Inspiration Con.	N. Y	54½	49⅞	51½	Apr. '20, Q	1	50
Iron Cap	Boston Curb	9	8½	9	Feb. '19, M		25
Isle Royale	Boston	30⅛	30	30⅛	Sept. '19, SA		50
Kennecott	N. Y	27½	25⅞	26½	June '20, Q		50
Keweenaw	Boston	1⅛	1⅛	1⅛			
Lake Copper	Boston	3⅜	3¼	3¼			
La Salle	Boston	3	2¾	2¾			
Magma Chief	N. Y. Curb			*21			
Magma Copper	N. Y. Curb			29	Jan. '19, Q		50
Majestic	Boston Curb	*20	*18	*18			
Mason Valley	N. Y. Curb			2⅛			
Mass. Con	Boston	3⅛	3⅛	3⅛	Nov. '17, Q	1	00
Mayflower-O C.	Boston	6	5⅝	5⅝			
Miami	N. Y	22	20⅛	20⅞	May '20, Q		50
Michigan	Boston	4½	4½	4½			
Mohawk	Boston	65	60½	60½	Feb. '20, Q	1	50
Mother Lode (new)	N. Y. Curb	6	5⅛	5⅛			
Nevada Con	N. Y	13½	12⅞	13	June '20, Q		25
New Arcadian	Boston	2⅛	2⅛	2⅛			
New Baltic	Boston Curb			3			
New Cornelia	Boston	17	16½	16⅝	May '20,		25
Nixon Nev.	N. Y. Curb			*9			
North Butte	Boston	18½	17	17½	Oct. '18, Q		25
North Lake	Boston			*75			
Ohio Copper	N. Y. Curb			1/16			
Ojibway	Boston	1⅛	1⅛	1⅛			
Old Dominion	Boston	26	24	26	Dec. '18, Q	1	00
Osceola	Boston	39	39	39	June '20, Q		50
Phelps Dodge	Open Mar.	†195	†180		Apr '20, Q	2	50
Quincy	Boston	51	50½	51	Mar. '20, Q	1	00
Ray Con	N. Y	17⅛	16⅛	16⅛	June '20, Q		25
Ray Hercules	Boston Curb			*75			
St. Mary's M. L.	Boston	42	39	42	June '20, K	2	00
Seneca	Boston	14	13⅛	14			
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q		25
Shattuck Ariz.	N. Y	9	9	9	Jan. '20, Q		25
South Lake	Boston			2½			
South Utah	Boston			*14			
Superior	Boston	5⅛	5	5	Apr. '17,	1	00
Superior & Boston	Boston	3⅛	3⅛	3⅛			
Tenn. C. & C.	N. Y	10⅛	10	10	May '18, I	1	00
Tuolumne	Boston	*60	*58	*58	May '13,		10
United Verde Ex.	Boston Curb	32½	31	31½	June '20, Q	1	50
Utah Con	Boston	6⅜	6⅛	6⅜	Sept. '18,		25
Utah Copper	N. Y	70	67	68⅛	June '20, Q	1	50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17,		30
Victoria	Boston	2½	2	2			
Winona	Boston	*50	*50	*50			
Wolverine	Boston	16	15½	15½	Jan. '20, Q		50
LEAD							
Hecla	N. Y. Curb	4⅛	4	4 1/16	June '20, QX		20
St. Joseph Lead	N. Y	16	15½	15½	June '20, QX		50
Stewart	Boston Curb			*16	Dec. '15,		05
Utah Apex	Boston			1 1/16	Nov. '18,		25
ZINC							
Am. Z. L. & S.	N. Y	15	14	14⅞	May '17,	1	00
Am. Z. L. & S. pf.	N. Y	49	48½	48⅝	May '20, Q	1	50
Butte C. & Z.	N. Y	9⅛	7⅛	9⅛	July, '18, I		50
Butte & Superior	N. Y	23⅞	22⅛	23	Sept. '17,	1	25
Con. Interst. Cal.	N. Y	13⅞	13⅛	13⅛	June '20, Q		50
New Jersey Z.	N. Y. Curb	198½	194	197	May '20, SA	4	00
Success	N. Y. Curb	*5	*4	*5	July '16,		03
Yellow Pine	Los Angeles			1 02	June '20, Q		03

Stock	Exch	High	Low	Last	Last Div.		
GOLD							
Alaska Gold	N. Y	1½	1⅛	1⅛			
Alaska Juneau	N. Y	2½	2	2			
Carson Hill	N. Y. Curb	28⅛	27½	28			
Cresson Consol G	N. Y. Curb.			1⅞	June '20, Q		10
Dome Ex.	Toronto			*23½			
Dome Mines	N. Y	10	9⅛	10	Apr '20, Q		25
Golden Cycle	Colo. Sprgs.	‡		*73	May '20, Q		02
Goldfield Con.	N. Y. Curb	*10	*9	*10	Dec '19,		05
Hedley	Boston			4½	June '19,		10
Hollinger Con.	Toronto	5 65	5 60	5 60	June '20, BM		05
Homestake	N. Y	55	53	55	Sept. '19,		50
Kirkland Lake	Toronto	*45½	*45	*45½			
Lake Shore	Toronto	1 18	1 16	1 17	Oct. '19,		02½
McIntyre-Porcupine	Toronto	1 84	1 82	1 84	May '20, K		05
Porcupine Crown	Toronto	*29	*27	*28	July '17,		03
Portland	Colo. Sprgs.	‡		*60	Apr '20, Q		01¼
Reorgan. Booth	N. Y. Curb	*5½	*4½	*5½	May '19,		05
Silver Pick	N. Y. Curb	*6	*5	*5			
Teck Hughes	Toronto	*10	*9½	*10			
Tom Reed	Los Angeles	1 04	0 90	1 04	Dec. '19,		02
United Eastern	N. Y. Curb	3	2	2½	Apr. '20, Q		21
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q		01
West Dome	Toronto			*6½			
White Caps Min.	N. Y. Curb	*11	*9	*11			
Yukon Gold	Boston Curb			1	June '18,		02½
SILVER							
Arizona Silver	Boston Curb	*20	*12	*20	Apr. '20, M		03
Beaver Con.	Toronto	*41½	*40½	*41½	May '20, K		03
Conigas	Toronto		†2 35		May '20, Q		25
Crown Reserve	Toronto	*20	*20	*20	Jan. '17,		05
Kerr Lake	Boston			3½	Sept. '19,	1	00
La Rose	Toronto	†*37	†*36	*33	Apr. '18,		02
McKinley-Dar	N. Y. Curb			*48	Apr. '20, Q		03
Mining Corp.	Toronto	†1 95	†1 80	1 90	June '20, Q		12½
Nipissing	N. Y. Curb	9	8⅛	8⅛	Apr. '20, Q		25
Ontario Silver	N. Y.	6⅛	6⅛	6⅛	Jan. '19, Q		50
Ophir Silver	N. Y. Curb	1/16	1/16	1/16	Jan. '12,		10
Peterson Lake	Toronto	*12	*12	*12	Jan. '17,		01½
Sil. King Ariz.	N. Y. Curb			*48			
Temiskaming	Toronto			*34	Jan. '20, K		04
Trethewey	Toronto	*31	*29½	*30	Jan. '19,		05
GOLD AND SILVER							
Atlanta	N. Y. Curb	*2	*1⅞	*2			
Barnes-King	Butte	‡		1 28	Nov. '19, Q		05
Best & Mont.	N. Y. Curb.	*62	*60	*61			
Cashboy	N. Y. Curb	*6⅛	*5⅛	*6			
El Salvador	N. Y. Curb.	2	1⅞	1⅞			
Jim Butler	N. Y. Curb	*14	*12	*13	Aug '18, SA		07
Jumbo Extension	N. Y. Curb	*5⅛	*4⅛	*5⅛	June '16,		05
Louisiana Con.	N. Y. Curb	1⅛	1/16	1⅛			
MacNamara M	N. Y. Curb	1/16	1/16	1/16	May '10,		02½
N.Y. Hond. Rosar	Open Mar.	†13	†12		Apr '20, Q		50
Tonopah-Belmont	N. Y. Curb	1⅞	1⅞	1⅞	Jan. '20, Q		05
Tonopah-Divide	N. Y. Curb.	1 1/16	1 1/16	1⅛			
Tonopah Ex	N. Y. Curb	1⅛	1⅛	1⅛	Apr. '20, Q		05
Tonopah Mining	N. Y. Curb.	1⅛	1	1	Oct. '19, SA		15
West End Con.	N. Y. Curb.	1⅛	1⅛	1 1/16	Dec. '19 SA		05
SILVER-LEAD							
Caledonia	N. Y. Curb..	*24	*22	*23	June, '20, M		01
Consol. M. & S.	Montreal	26	25	25	Apr. '20, Q		62½
Daly-West	Boston	4⅛	4⅛	4⅛	Apr. '20, Q		15
Eagle & Blue Bell	Boston Curb			2 1/16	Apr. '20, Q		10
Electric Point	Spokane	34½	30	30	May '20, SA		03
Fed. M. & S.	N. Y.			13½	Jan. '09,	1	50
Fed. M. & S. pf	N. Y.	36⅞		36	June, '20, Q	1	75
Florence Silver	Spokane			*45	Apr. '19,		01½
Iron Blossom	N. Y. Curb.			⅛	Apr. '20, Q		02½
Judge M. & S.	Salt Lake	‡		4 00	Apr. '20, A		12½
Marsh Mines	N. Y. Curb	*12	*10	*12			
Prince Consol.	N. Y. Curb.	1/16	1/16	1/16	Nov. '17,		02½
Rambler-Cariboo	Spokane	*12	*12	*12	Feb. '19,		01
Rex Con.	N. Y. Curb	*7	*6	*6			
South Hecla	Salt Lake	‡		*94	Sept. '19, K	0	15
Stand. S. L.	N. Y. Curb.		⅛	⅛	Oct. '17,		05
Tamarack-Custer	Spokane	2 45	2 40	2 45	Dec. '19, K		03
Tintic-standard	Salt Lake	‡		3 10	June '20, Q	0	10
Wilbert	N. Y. Curb.	*4½	*4	*4½	Nov. '17,		01
NICKEL-COPPER							
Internat'l Nickel	N. Y	18½	17½	18	Mar. '19,		50
Internat'l Nick.pf.	N. Y			82	May '20, Q	1	50
QUICKSILVER							
New Idria	Boston	5⅛	5	5	Jan. '19,		25
TUNGSTEN							
Mojave Tungsten	Boston Curb			*10			
VANADIUM							
Vanadium Corp.	N. Y.	93½	89½	90	Apr. '20, I	1	50
ASBESTOS							
Asbestos Corp	Montreal	88	82½	87	Apr '20, Q	1	25
Asbestos Corp. pf.	Montreal	97½	92	97	Apr. '20, Q	1	50
MINING, SMELTING AND REFINING							
Am. S. & R.	N. Y.	63½	60	62	June '20, Q	1	00
Am. S. & R.pf.	N. Y.	92	92	92	June '20, Q	1	75
Am. Sm. pf.A	N. Y.	76½	74½	76½	Apr. '20, Q	1	50
U. S. Sm. R. & M.	N. Y	60	57⅛	60	Apr. '20, Q	1	50
U.S.S.R.& M. pf.	Boston	44	43	44	Apr. '20, Q		87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

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A Weekly Journal of the Mining and Mineral Industries

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Volume 110 New York, July 24, 1920 *Number* 4

The Fixed Price of Silver

HOW much better it is to act than to argue was illustrated by Senator Pittman when he quietly put through the legislation under which American silver is now selling at the fixed price of a dollar an ounce, a condition which will probably last for four years or so under the existing act. The Government mints will buy gold at $20.67 and silver at $1; and a fixed ratio is established, after many years of the single standard, a ratio of 20 to 1. The silver so bought will be minted into coins or placed in the Treasury vaults as a reserve against the silver certificates, outstanding or to be issued. Silver is, therefore, remonetized, and all American silver will be turned into currency. The silver that goes into the arts will be foreign silver, purchased on account of its cheaper price in the New York market. Should the world price of silver go above a dollar, our Government would automatically cease to buy, for none would be offered it; but at any fall below a dollar domestic producers could take advantage of the Government-fixed price.

Government price-fixing in general is artificial and injurious, as the war experience demonstrated. But one thing must be fixed—a standard on which all other prices are calculated. Hence the inevitable fixed price of gold. But silver is also a necessary currency metal; its principal use is as a medium of exchange. Hence, the fixing of its price appears proper.

In view of the political and forensic war that has been waged over the question of bimetallism, the fixed silver ratio, and free coinage of silver, no deliberate presentation of a proposition to again fix a ratio in this country would have been listened to for a moment. But the thing is done.

Is there anything but benefit in it? We are of the opinion that other nations would do well to follow suit. France has suffered the loss of most of her silver coins because they were worth more as bullion, for the use of the arts. Most countries are so poor in gold that their financial systems are shaky, and the restoration of exchange rates is one of the world's principal problems. Meantime the operation of gold mines is becoming more and more difficult, and the production of gold ever less. The firm knowledge that all of our silver, as well as all of our gold, was definitely back of currency and bonds would help this country, and the same principle would help the world more than us.

The system is working with us now. We will not call it bimetallism, or any other word by which it was formerly discussed—words are more obnoxious, and more fatal, than ideas. But we actually have a gold standard supported by a silver currency at a fixed ratio to the gold. All the single-standard exponents of the stability of our national system of currency point out that the silver notes are sound, being secured, dollar for dollar, by silver deposited in the Treasury; thereby acknowledging silver as a basis of exchange. We have the system in practice, then. Is there anything injurious about it? We shall have plenty of opportunity to study it during the next four years; for although some of the theorists who wake up to the fact that something has been "put over" on them are clamoring for a repeal, the act will not be repealed, as there is no sensible reason for doing so. We shall find it to be a stabilizer, rather than a disturber; and at the expiration of the period provided for in the Pittman Act we assume that Senator Pittman will move for an extension of the fixed price.

The Bureau of Safety First

IF YOU, Mr. Engineer or Mining Man, were asked to lay out a program for a Government institution devoted to the mining industry, you would among other things establish a weighted ratio between different parts of that industry; i.e., so much time and money for mining problems, so much for ore-treatment, so much for marketing problems, so much for problems involving national policy and assistance. Whether you would make these proportions 30, 30, 30, and 10 per cent, whether you would make a more careful and more varied assignment, is beside the point; but you would lay out the work, as the first thing to do. You would devote so much to metal mining, so much to coal, so much to oil, and so much to the other non-metallic minerals. In short, you would have a program.

Has the Bureau of Mines a program? Looking over the appropriations, both for 1920 and 1921, it is conservative to say that it has not. The fault may be with the Bureau administration, or with the committees on mines and mining, but most citizens would be induced to think that the responsibility lies in the former place. We do not as a rule expect much from Congress or a Congressional committee. Plans and estimates are laid before them by the bureau chief, and they approve some, whittle down some, and reject others. Each Representative or Senator will approve of anything which feeds into his particular home district; therefore items of appropriation which have a local color are easier to obtain than those of only general interest. The initial planning and balancing is the province of the heads of bureaus, who alone have a clear oversight over their own field.

The accompanying graphs show the Bureau of Mines allotments for the fiscal year 1921, which differ only in detail from those for 1920, and also further back. The biggest allotment, it will be seen, is for mine accidents, constituting one-third of the whole; but the third largest appropriation, for mine rescue cars, is also for mine accidents, which brings up the total to 43 per cent, as shown in Fig. 2. Sixth in the list of allotments, in

proportion to magnitude, comes mineral mining, with $125,000, constituting only 19 per cent of the whole. When it is considered that this allotment is for coal mining, metal mining, and the mining of the earthy minerals, the percentage devoted to the dominant metal-

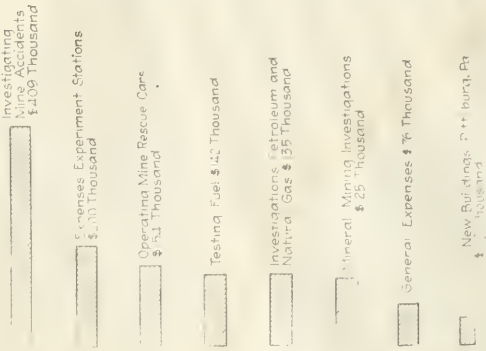


FIG. 1.

mining industry is seen to be small. Actually, attention to coal mining has always exceeded that of other mining in the bureau.

One allotment that will not offend our sense of proportion is that for petroleum investigations, which stands fifth on the list; and the petroleum division of the Bureau has always been considered efficient and creditable.

As for experiment stations, their multiplication is not in the interest of economy and efficiency; but is intended to secure the support, political and financial, of certain regions. Such support may savor of the pork-barrel, but it appeals more to the Representatives and

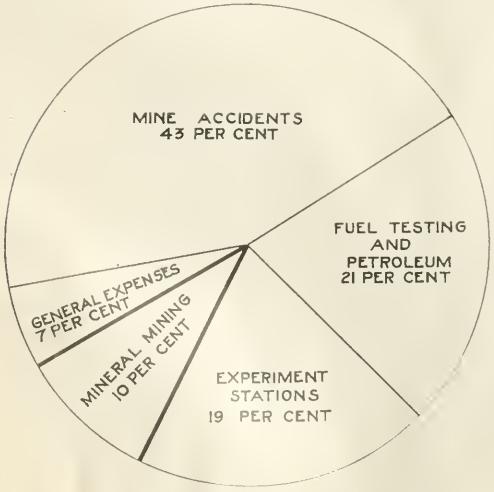


FIG. 2.

Senators of the region involved than do appropriations for general Federal purposes. The multiplied administrations involve heavy overhead and general charges, and loose co-ordination. Work of similar character is often carried on at two or more stations; and the required co-operation, which involves close arrangements with local institutions, especially state universities and mining schools, injects the element of state politics into the management of each, to further complicate the situation. We do not favor the system.

In Fig. 2 we have not only grouped the two mine-accident appropriations, but have joined the two fuel appropriations, to give a general view of how the money that represents the mining industry is segregated. Frankly speaking, is not this graph a deformed monstrosity? The first thing that should be done is to call in an expert from outside to lay out a program; the second, to have the courage to "hew to the line, let the chips fall where they may."

The Engineer in Politics

IN A RECENT communication to the *New York Times*, Dana W. Robbins, referring to the defeat of Herbert Hoover as Republican nominee for President, says that "the advent of the engineer into high political places is once again postponed." The choice of the word is a particularly happy one, and the sentiment expressed by its use is one with which most engineers heartily agree. Our good friend Webster defines "postponed" as merely a putting off; an eventuality which shall some time be realized.

In the meantime it is not improbable that the events immediately preceding and terminating in the Chicago convention will be given careful consideration, and, likely enough, by engineers.

Organization is a well-balanced arrangement, depending on certain vital principles for its proper functioning, whether it be an industrial or a political concern. Any successful engineering enterprise requires the services of an organization, part of which, at least, is made up of engineers. The actual engineering work is not planned and executed by lawyers, by professional politicians and orators, but by engineers. These others may contribute their share toward the entire undertaking, and generally —nay, always—receive their full share of credit.

Engineering was recognized as a profession, but purely as such—if at all—by the great bulk of the people until the affairs of the Great War showed in a startling manner the vital need for engineers. In general, the engineering profession was regarded as a necessary evil, an outlet for the youths of the country who displayed some desire to dabble in science and were unwilling to enter the medical or kindred professions. Engineers did their work well and in an unostentatious way. Rivers were spanned, buildings were erected, transportation systems devised, mines developed and the industrial life of the nation progressed, while the engineer, intent on his individual problems, paid little heed to other affairs which depended so greatly upon the conscientious performance of his task.

But an awakening has come, and the engineer of today feels that "the best is none too good." He requires more than a mere pat on the back; he demands a recognition that is compatible with his accomplishment. And so it was that Herbert Hoover was proposed as the candidate best fitted to represent the profession, in the "highest of the high political positions."

Mr. Robbins continues:

"Nevertheless, a glorious opportunity was shamefully disregarded. That opportunity was the chance for an engineer to demonstrate to the world that if the profes-

sion was not to be recognized in the choice for high office it was because the members of the profession were not accustomed to the light casting aside of their conviction to obtain any office or to ingratiate themselves into the good graces of any group of men, however powerful."

Engineering, as a profession, recognizes no forces save those of nature, and if it is true, as Mr. Robbins says, that "the great problems before the country today are engineering problems—pure and simple," there is little reason to suppose that engineers can be expected to "ingratiate" themselves for the sacrifice of a principle. Such a transition *may* come gradually, as the engineer learns more of the inner workings of the "system," but, on the other hand, there is an insistent demand, ever increasing, for principle in politics. Subservience to the wishes of those who would further their own interests to the detriment of the state does not conform to true engineering ethics.

The Joy of Doing

MUCH of the so-called unrest of the present is due to the loss of the sense of relative values. There is joy in accomplishment, whether it be large or small. The late Theodore N. Vail, out of a lifetime of experience, said in an interview a short time before his death:

> Any man who is not doing his level best is stunting his mental, moral, and spiritual development, to say nothing of his ability. Great heavens! The very greatest satisfaction that a man can get out of life is the knowledge that he is accomplishing something worth while. It makes me impatient to hear and read the utter nonsense so common about money and what its possession can mean and do for a person.
>
> By accomplishing something I do not mean that you must necessarily have done something great, something big, or something unusual. Accomplishment is relative. The boy who delivers messages, the girl who types letters, the mechanic who turns a lathe, the worker who walks the railroad tracks, the telephone operator at the switchboard, the man stringing wires, can earn this feeling of satisfaction that comes from worthy accomplishment just as much, just as keenly, as the chief executive of the great industrial enterprise or the president of a railroad or the famous author.
>
> One's sphere matters little. Everybody wants to feel that he or she has accomplished something. Go into any family in the land, no matter how humble, and before you have been talking very long with them they are sure to begin to tell you of something that either the head of the house or some other member of the family has done. If there is no accomplishment, if none of them has *done* anything they can talk about, then they will at least tell you of something bright or clever that some relative of the family has said.

It is refreshing to hear this sound philosophy from one who has accomplished so much. There is a real joy in work, whether it is barring down a loose slab from the roof of a dangerous working, or pouring bullion into molds. Workmen formerly took pride in their own work; and many of them now, if the truth were known, do have that same feeling toward the tasks that fortune has brought to their hands. We fear that there has been a considerable destruction of this wholesome feeling without an equivalent replacement by something equally substantial. There is too much looking ahead without appreciating what is closest at hand. It is those things which are a part of our every-day life that will bring the joy to each day and produce, as Mr. Vail so well expressed it, "the very greatest satisfaction."

Platinum vs. Gold vs. Silver Monetary Bases

IT IS customary, in speaking of the currency reserve, to picture heavy yellow bars of gold acting as the bulwark and foundation of the monetary system. Hence any announcement which presents another conception of metallic base for exchange mediums is novel—yet according to a recent news item the currency reform law of the Zemstvo government, a Russian provincial administrative assembly, the new money is to be backed by a combination gold, silver and platinum reserve, valued at 71,000,000 rubles. This is an interesting departure, to say the least, and one wonders what prompted the step.

Of the two really noble metals, gold and platinum, the latter is by far the more valuable, and has characteristics that would make it ideal for coinage purposes were it not so scarce, and consequently expensive. Platinum coins are by no means novel—in 1828, after the discovery of platinum in the Urals, the Russian government issued a platinum coinage. At that time the metal had a value a little over one-third that of gold, or about $7.15 per troy ounce. Three-ruble, six-ruble, and twelve-ruble pieces were issued, and the system worked splendidly until the middle of the last century, when the coinage was stopped, for platinum had risen so much in value that the platinum coins were exported for their metallic or bullion content. No doubt the great demand for platinum in industrial uses which was just then beginning to be felt caused the value of the metal to ascend rapidly enough to disturb the existing Russian currency system.

A very few months ago platinum was worth around $150 an ounce—contrast this with $7.15 in the year 1828—and present quotations are between $80 and $90. There is no doubt that platinum admits of great variation in value—so does silver, for that matter—and it would be of particular interest to know what ratio of valuation is to be adopted in the utilization of the platinum reserve or platinum-gold-silver reserve. The introduction of platinum will involve many complexities of a financial nature, but it is far better to build upon platinum than upon paper, which has characterized the procedure of so many European nations, to the detriment of their prosperity.

Safety in Cities

THERE is a vast amount of safety propaganda, and the organization of safety-first associations, committees, and the like goes on apace. All such bodies are doing a good work, and they should call attention to the unnecessary wholesale killing and maiming of pedestrians in our cities. Last year 1,400 persons were killed by automobiles in New York; in June, 1920, the deaths so caused totaled 100, which indicates a lull. Injuries are not taken into account. The pity of it is that it is unnecessary. Except on a few corners of New York, no regulation of its traffic with a view of protecting pedestrians is attempted. On many a corner the "traffic cop" rules over the cross-stream of motor traffic, pedestrians dodging the cars as best they may.

Certain thoroughfares might be reserved for pedestrians, and no vehicles allowed on them. In the ideal city, the sidewalks will be on the second story, on which all retailing will be done; bridges will provide for crossing the street, and the ground floor will be given up to delivery and receiving and general business in which the public does not participate.

WHAT OTHERS THINK

Making Miners Out of Farmers

What a Colorado miner finds when he comes to Arkansas to do work for a company engaged in prospecting is told in the story of W. A. Roderick when he pumped and cleared out the 225-ft. shaft of the old Confederate mine, about eleven miles north and east of Little Rock.

The old mine had been idle for thirty years, and had filled with water. It was virtually covered over when Mr. Roderick arrived on the scene and began to work. That was last December, and it was not until early in June that the water was pumped out and the shaft cleared, all the work having been done by Mr. Roderick alone.

It was amusing to hear Mr. Roderick tell of his experiences with Arkansas miners. He advertised for help, asking for men who had experience in mines. Several answered, but when he took them to the shaft and told them what was to be done, the "miners" developed a strong and fixed determination to remain on top of the earth.

After spending several days in coaxing and persuading, Mr. Roderick began work himself. He used one or two men on the surface to care for the engine and let down proper material to him, but the real work had to be done by himself.

Men stood back from the shaft and laughed at him for going down in the "hole." A "durn fule," a "reckless feller" and "he thinks less of his life than I do of mine," were told him repeatedly, but the 200 or more pounds of Mr. Roderick went down the shaft, tended the pump as it was lowered, noosed heavy timbers, built levels and ladders, endured floods of rain-water that came in the shaft after heavy rains, and never faltered one minute. There were times when the one-man fight against floods and troubles was almost too much for him, but he persisted with grim determination, and about the first of June the original bottom was reached.

The next problem was to get men down to the bottom of the shaft to commence the drifting. Mr. Roderick advertised again, but men would come only to the shaft, crawl to the edge, and look over. After that it was useless to ask them to go down. They had never before heard of mining by digging holes in the ground and never expected to get that far away from sunshine and light.

It would have been a bad job for Mr. Roderick had not a young man appeared who had some courage. Together they descended to the bottom. For three days Mr. Roderick stayed with him to keep him from becoming frightened, and then, just as he thought him to be accustomed to being underground, a pebble fell. Had tons of loose back fallen in the mine, it could have been no worse. The young man wanted to get out immediately, so Mr. Roderick had to repeat the process all over again.

Another three days of training, and he stayed down by himself. After that others went down, and thus it was that a Colorado miner introduced underground mining to Arkansas. If nothing happens, Mr. Roderick believes that he has really made underground miners out of Arkansans.

GEORGE ALLEN.

Little Rock, Ark.

Hot Times in Ciudad Juarez

I hear a good deal of talk and see many articles in the daily papers relative to a "revival of interest" in Mexican mines, owing to a confidence in the new government, but I have no knowledge of any new work that would tend to confirm these statements. An occasional scout is seen here, but I have heard of no deals resulting from the recent visits of any of these gentlemen.

A few months ago, several buyers of manganese appeared here, but it seems that the deposits of this mineral in Arizona and New Mexico are too low grade to be profitable. Two properties are being worked on the Mexican Northwestern Ry., between here and Casas Grandes, by local people. Shipments of ore between 40 and 42 per cent Mn, and low in silica, have been made. It is planned to ship twenty-five tons per day from each of these properties, but one of them is already in trouble, and I expect operations to be suspended, owing in part to incompetent management. Another manganese property is being worked at Arados station, on the Mexican Central, between El Paso and Chihuahua City.

Some silver and silver-lead prospects are being worked along the line of the Mexican Northwestern Ry., and in the vicinity of Villa Ahumada, on the Central.

The country is quiet, but, on the whole, mining is almost at a standstill in northern Chihuahua. Little interest is manifested in El Paso in either oil or in mining.

The only lively section of the country, hereabout, is Ciudad Juarez, Mexico, across the line from El Paso. Aside from many El Paso residents who have the habit, even staid church-going tourists "de peso" and relatives, even to the third and fourth generations, seem to be carried away by the liberty and license of Juarez to such an extent, that the very many saloons can pay divers and heavy taxes and still make money, while the gambling hall, which furnishes craps, faro, roulette, stud-poker and other games, pays $50,000 U. S. currency per month for the mere privilege of being permitted to do business.

No celebration was staged in El Paso on the Fourth, so that Juarez was jammed with a wet and happy crowd; saloons—gambling hall—bull ring and auto races being generously patronized. The H. C. L. bothers everyone, but I venture to say that Juarez gets an average of $500,000 U. S. currency per day which El Paso would be glad of the opportunity to garner from our sturdy "Give me liberty or give me death" compatriots."

El Paso, Texas. VICTORIO ROMAGNA.

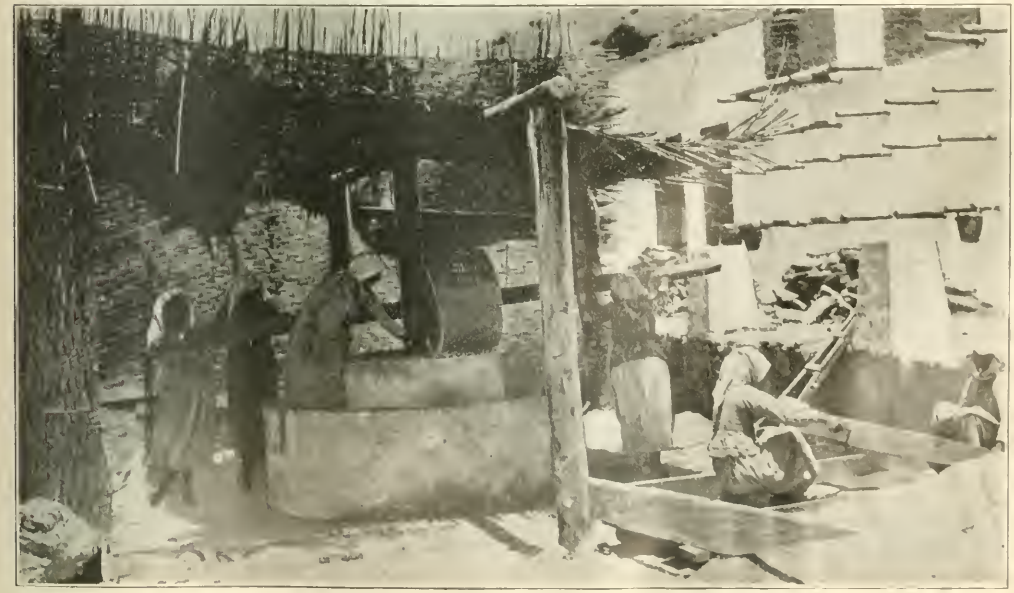
Ancient Principles of Modern Machinery

By K. S. Twitchell

Written for *Engineering and Mining Journal*

THE FORERUNNER OF THE BEVEL GEAR

The horizontal wheel is revolved by donkey or mule power, the vertical pins engaging the horizontal pins of the vertical wheel, causing it to revolve. Attached to the latter is an endless chain provided with earthenware water buckets. This prototype of the bucket elevator has been used in its present form from time antedating the records of man.



A FOUR-WOMANPOWER CHILEAN MILL CRUSHING SULPHUR

PART OF ANCIENT ROMAN WATER SYSTEM, CYPRUS, SHOWING CISTERN AND PIPE

THE EMBRYO DISK CRUSHER. REVOLVING DISKS ARE USED IN THE NEAR EAST FOR CRUSHING GRAIN

The engineer who visits the countries bordering upon the Mediterranean is often forcibly reminded of the fact that many of the principles involved in machinery and construction of the present inventive age were practically applied hundreds or even thousands of years ago. Perhaps it would be more appropriate to call our period the age of rediscovery rather than the age of invention. The cracked and broken concrete roadways laid during the summer of 1919 around New York City stand in strong contrast with the Roman concrete water systems. The cistern shown in the foreground of the upper left-hand illustration was absolutely uncracked when recently uncovered. To the right of the concrete trough lies a terra-cotta pipe, so similar in type to some of the modern cast-iron water pipes that one might imagine himself standing at the brink of a New York subway excavation. Perhaps the disk crushers which are now on the market are, after all, merely patterned from the flour mills of the Near East. The mill shown in the upper right-hand corner has the disks revolving on each other with the center slightly coned to take the feed from the central feed opening. The crushing of wheat in the Near East is done mainly in similar but larger mills driven by water power. The water, however, is not applied in the old over-shot or under-shot method, but as in the impulse type of wheel. The ancients may not have used the counterpart of our hydraulic presses, nor developed machines for testing materials, but they evidently knew how to develop a considerable squeeze, as is evidenced by the primitive screw shown below, which is a part of a press used in making the famous "Commanderia" wine of Cyprus.

WINE PRESS AT KYKKO MONASTERY, POLEMI, CYPRUS. AT THE LEFT IS SHOWN THE WOODEN SCREW, BY MEANS OF WHICH THE NECESSARY PRESSURE IS OBTAINED

AN ANCIENT GANG SAW IN ACTION

KEYWAYS AT THE TEMPLE OF THE SPHINX

The modern gang saw is seen in the upper left-hand picture in its primitive form. This explains why southern Europe still has timber that will square two feet. Of even more ancient origin is the idea of keying together heavy stonework. At the right is shown the keyways used for the purpose of holding in place the huge granite blocks in the Temple of the Sphinx, which is supposed to have been built about 2800 B.C. The gyratory crusher is another mechanical device of antiquity, its ancestor being shown below. These mills were constructed of a very hard eruptive rock which served admirably for the crushing of grain. The shell revolved upon a stationary spindle, the wheat being fed upon the center of the spindle, while the flour discharged at the periphery between it and the shell. There was no gyratory motion, but this is a mere detail of the modern crusher.

EARLIEST TYPE OF GYRATORY CRUSHER

LOOKING DOWN CASSITERITE CREEK TO THE LOST RIVER VALLEY

Alaska Tin Deposits

Steep-Dipping Quartz Porphyry Dikes in the York Mountain District Show Presence of Cassiterite Near Contacts—Deposits, Still in Prospective Stage, Are of Low Grade and Would Require Large-Scale Operations To Be Profitable

By Frederick C. Fearing
Written for *Engineering and Mining Journal*

AMONG the raw materials sorely needed during the critical days of the war, tin should be placed among the most important, but despite this fact it is doubtful if more than a handful of laymen realized prior to 1914 how much modern civilization owes to this metal, whose early technical history is lost in the mists of antiquity.

Before the war the United States consumed annually nearly half of the world's production without itself augmenting the supply by more than a few insignificant lots of medium-grade tin concentrates. Nowhere in this country are there producing tin mines of even passing consequence. It therefore soon became apparent to those in charge of war industries that every effort should be made to counteract this defect by finding and developing new deposits, if possible within the territorial boundaries of the United States.

Presence of Tin in Alaska Previously Known

The existence of tin outcrops in Seward Peninsula, northwestern Alaska, had been a matter of record with the U. S. Geological Survey since 1900, and by the time of this country's entry into the European conflict a point had been reached in the development of some of these prospects which made examination and study of marked importance and advantage. Accordingly, through the efforts of James F. Halpin, of Nome, Alaska, an extensive expedition was organized by private capital to examine and report upon the possibilities of the situation.

The tin areas which are the subject of this paper are located in the heart of the York Mountain district, Seward Peninsula, Alaska, about seven miles inland from Bering Sea, on Cassiterite Creek, a tributary of Lost River. The location of the district and the available steamship route are shown on the accompanying map of Alaska.

History of Claims in Lost River District

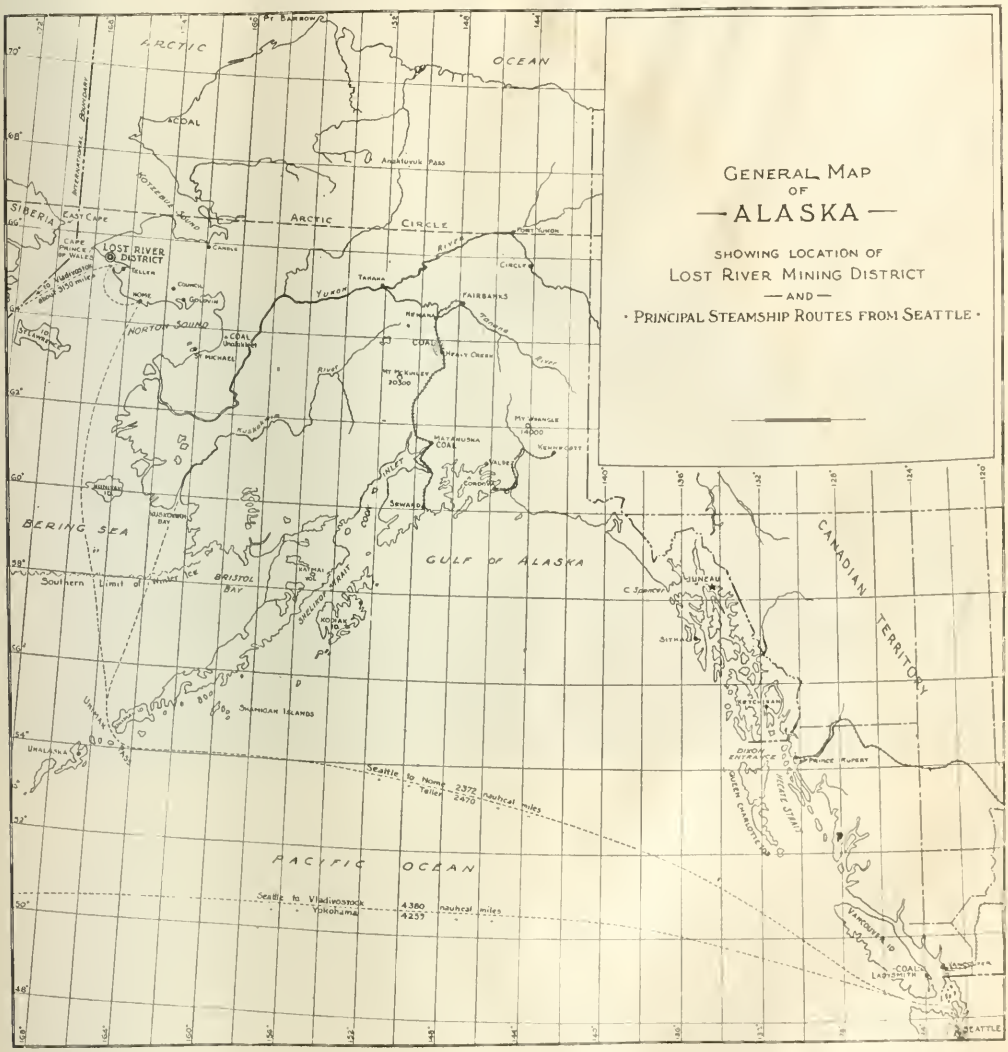
Soon after the discovery of tin in the York region, three prospectors, Leslie L. Crim, Charles Randt, and William O'Brien—with a horse, worked their way through the defile just above the mouth of Lost River and finally staked a group of claims. They found themselves in a country entirely devoid of timber and capable of supporting only a few sporadic patches of rank Arctic grasses and reindeer moss in some portions of the valleys. Sharp, frost-cracked rubble covers the slopes of the mountains, which look as though some giant crusher had been at work throughout the region. Arctic hurricanes of breathless suddenness, long duration, and extreme violence, with wind velocities as high as 120 miles an hour, frequently sweep down from the North. During the summer months, when the slope detritus has thawed out, wind erosion can be observed hard at work moving tons of debris from the heights down into the valleys. Except when frozen, many portions of the hillsides are continually on the move.

Nevertheless, the district is a decidedly healthful one, with excellent water and good drainage. Often, in June, July, and early August, come wonderful days, when the sun eats up the last remaining snowdrifts, and the streams are flooded and the deep violet tones characterizing the Arctic landscape make one forget that the distant hills are not forest-clad. There are still other compensations, for even the athletic Alaskan

mosquito finds the Lost River "chow" exceedingly scarce, and in consequence makes himself conspicuous by his comparative absence.

A small cabin, shown in one of the photographs, was erected by the three prospectors from driftwood packed in from the Bering Sea beach, and mine timbers were similarly obtained. Powder, fuse, caps and supplies were brought from Nome, and development work was started by means of adits and carried on under the most difficult conditions of hardship and financial strain.

One day in 1908, in the dead of winter and while an Arctic blizzard was raging, O'Brien went up the side of Cassiterite Mountain to No. 1 adit, leaving Randt in the cabin and Crim at work on the greenstone. While O'Brien was kneeling over the thawing kettle, eleven sticks of 40 per cent gelatine exploded. It blew out one eye and temporarily blinded the other; it tore the flesh from the thigh to ankle; it crippled one hand. Why it did not kill him Heaven only knows. In this condition he managed to grope his way back down the mountain through the storm, and was finally found by his partners and taken to the cabin. Then followed a 120-mile journey to Nome strapped to a dog sled, and months in the hospital there, with more months recovering later in Seattle; but O'Brien finally returned to the mines to begin again. Crim died, Randt died, and their heirs began a legal battle for control of the property. The old horse which had accompanied the original prospecting party was finally pensioned off. Without adequate financial backing, but with grit enough to spare, O'Brien fought it out alone. By the time of our visit nearly 2,000 ft. of underground work had been accomplished entirely by hand, in spite of all obstacles covering a period of 18 years, and O'Brien was still on the job.



still the hopeful, determined, dignified, and honorable gentleman that the mining engineer not infrequently meets on the frontiers of civilization and remembers always with pleasure and respect.

Geological Formations in the Lost River District

The sedimentary rocks of the district consist primarily of the Port Clarence limestones, of Ordovician Age, whose thickness has been estimated by Knopf[1] at 2,000 ft. That this figure should not be increased is probably wise, for the reason that greater estimates have been found subsequently to have been based on traverses wherein considerable faulting was overlooked. The Port Clarence limestones rest comformably upon a series of older slates, into which argillaceous, banded horizons comprising the more basal limestones, appear to grade. These slates, however, have not yet been encountered in any development work at Lost River, granite[2] itself contains 0.3 per cent of tin and, further, as the intrusive is cut by a later quartz-porphyry dike showing considerable marginal chilling and devoid of mineralization, it is thought probable that this particular granite body is of small size; that it was subjected to rapid cooling through contact with the invaded limestones, and that consequently all but a small amount of its dissolved tin content was "frozen" in the original magma without having had a chance to separate from it and form orebodies.

The probable order in which the igneous rocks were intruded in this region were: First, the granites, or perhaps the feldspar-porphyries, and finally, the basalts.

Though reverse faulting of some magnitude characterizes the district, none of it has been observed as having offset any tin-bearing occurrences. In one instance, a tin vein cuts directly across a well-defined fault plane without showing displacement. Similarly, an in-

HEADQUARTERS, ON CASSITERITE CREEK. CABIN OCCUPIED BY THE THREE PROSPECTORS FOR MANY YEARS, SHOWN AT RIGHT

and no outcrops of them are known to exist in the immediate vicinity.

Igneous rocks have invaded these sediments at many points, of which the most important are a series of quartz-porphyry dikes, striking generally east and west and having steep dips. A few of these carry tin, but the majority are entirely barren. They are persistent, however, and vary in width from a few feet up to thirty feet. Some of them have been found to intersect, and hence they cannot all be considered as of strictly contemporaneous origin. One of these dikes, named the Cassiterite Lode, has cut through an older feldspar-porphyry along a portion of its course.

Throughout the world, tin ores are closely associated with granitic rocks, and the top of such a formation, laid bare by erosion, is found southeast of the mine cabin. Here, tin occurs in veins in the limestone, near the contacts, but in small amounts only. As the area of contact metamorphism is not great, and as this trusive rock, from which some tungsten-bearing veins reach out into the limestones, has re-cemented the breccia of a fault outcropping along the bed of Cassiterite Creek. Again, a quartz-muscovite dike has occupied a reverse fault. One slip, of normal type, which is probably of small displacement, has cut off the mineralized intrusive rock exposed in the greenstone workings, and is the only one observed. It is thought that the larger slips, which might otherwise have caused dislocation and high development costs, being older than the tin mineralization, should not be expected to have an adverse effect upon the economical extraction of the ores.

Variety of Minerals Abundant

The locality exhibits a surprising number of minerals. Fifty-two varieties, of which sixteen had not been found previously in Alaska, were reported by Knopf in 1908, and two of these were then new to science. All but a

[1]U. S. Geological Survey Bull. No. 358, p. 12.

[2]U. S. Geological Survey Bull. No. 229, p. 22.

few on the list have already been identified within the Lost River area. Such a variety as this not uncommonly accompanies tin deposits. In the area under discussion the ore-forming solutions were unusually rich in fluorine, chlorine, boron, lithium and potassium, arsenic, sulphur, aluminum, iron, manganese, silicon, calcium, tin, and tungsten, and carried also small amounts of copper, lead, zinc and, in one case, a considerable amount of silver.

These elements gave rise to abundant topaz, fluorite, tourmaline, sericite, albite, cassiterite, and wolframite, which are representative of intense hydrothermal and pneumatolitic genesis. Many of the crystals, especially the quartz, contain liquid and gaseous inclusions. Fluorite and tourmaline are usually intimately interwoven, and sericite mica is prominently developed in close association with both topaz and fluorite.

Thin sections from the more highly mineralized areas invariably show that the original constituents have been completely destroyed, leaving but the faintest pseudomorphic outline, and that this took place before the advent of the tin mineralizer epoch. Other evidence of more than one stage of mineralization was obtained from the veinlets cutting the limestones. Many of these are of contact metamorphic origin, containing principally fluorite and topaz, with no tin, and some were noted to have been cut by a later veinlet rich in tin and carrying also some tungsten. In this further connection the Geological Survey has noted similar contact phenomena elsewhere in the Seward Peninsula tin region—at Ear Mountain—where contact limestones exhibit large quantities of fluorine, chlorine and boron minerals, originally unaccompanied by tin, the metal coming in at a later date.

Tin Occurrence in Dike Walls Shows Contact Effect

From the foregoing outline it is thought that the relatively small amount of cassiterite in the highly fluoritized walls of the dikes is indicative of early contact effects, doubtless produced at the same time that the barren fluorite-topaz veins were forming in the limestone, and that these wall-rocks were thus previously rendered unfavorable for the deposition of tin and tungsten minerals that subsequently took place along the old channels.

The situation may be summed up as follows:

1. The injection of the main quartz-porphyry dikes represents the final intrusive effort of an underlying magma.

2. Following this, aqueo-igneous gases and vapors carrying principally fluorine, chlorine, and boron, but very little tin or tungsten, became active along lines of weakness, both within the solidified dikes—especially along their walls—and also in contraction fissures in the cooling and shrinking limestone. Destruction of many of the original minerals encountered, together with marked contact alteration effects in the sediments, is the principal feature of this period of mineralizer activity.

3. Meanwhile, concentration of tin and tungsten was taking place in the underlying parent intrusive, and finally, as cooling and contraction progressed, these were forced out under heavy pressures and at high temperatures and formed minute vein and impregnation deposits of cassiterite and wolframite within the dikes and rich tin veins in the younger cracks within the limestones.

4. The ores show that a great abundance of mineralizer agents were present during their period of formation and that unusual combinations of minerals resulted; that the deposits vary greatly in texture and composition within short distances, vertically as well as horizontally; that they are of striking pegmatitic habit and might perhaps be best described in the language of Dr. Charles P. Berkey, of the Geological Department of Columbia University, who examined the specimens through the miscoscope, as "aqueo-igneous origin," accompanied by "important pneumatolitic effects."

Metallic Content of the Ores

Up to the time of our visit, the Cassiterite Lode had been developed by adit levels, raises, and winzes, comprising about 1,500 lineal feet, and resulting in the opening up of about 80,000 tons of ore averaging 1.5 per cent tin. For a distance of 363 ft. in No. 3 level, samples, taken at five-foot intervals, showed the presence of an ore-shoot containing 1.75 per cent tin and 0.423 units of tungstic acid per ton. Tin assays as high as 5.48 per cent. were obtained. Nevertheless, this is low grade, and the mine would have to be worked on a large scale before attractive earnings could be expected.

Preliminary milling tests showed that crushing should be carried to about 50-mesh, at which point a clean table concentrate of tin and tungsten can be obtained. The percentage of slimes was encouragingly low. Magnetic separation of the wolframite from the cassiterite should be included in any treatment program. It might be advisable, also, to re-grind the tin concentrates, to break loose small amounts of copper and lead sulphides and arsenical pyrites with which the cassiterite is intimately associated, and then to eliminate these impurities by means of flotation.

Cassiterite has generally been looked upon by geologists as a deep-seated mineral. In Cornwall, England, the lower limit of economical tin mining has nearly been reached at 3,000 ft. below the outcrops. In Bolivia a few of the lodes were first worked for their silver, but as depth was gained silver decreased and the tin content increased. Though the Lost River deposits cannot be said to resemble the Cornwall ores, their complexity of mineralization and mode of occurrence, together with the finding of a rich silver-lead stringer-lode in the vicinity, carrying appreciable amounts of tin and tungsten, impart to them a degree of similarity to a few of the Bolivian mines. On the other hand, in its contact metamorphic aspect, there is quite a resemblance to a secondary impregnation deposit of tin at Schwartzenberg, Saxony. In any event, there appears to be no suitable criterion outside of Seward Peninsula itself from which analogy may be drawn as to the probable depth of the ores in question.

Mode of Occurrence

Evidence gathered by Knopf from Cape Mountain, at Cape Prince of Wales, however, is considered pertinent. In this locality cassiterite occurs, as at Lost River, in quartz-porphyry dikes and in quartz veins cutting limestones. What is perhaps of more importance is that it has also been found within the main intrusive granite mass near the contact borders and as impregnations in the granite walls of fault planes. This latter mode of occurrence is the normal one in the principal tin-producing districts of the world. As it is probable that the Seward Peninsula tin deposits owe their origin to granite intrusions of approximately

the same age, and as the instance mentioned shows that tin ores have been found in this region in the underlying parent rock, as well as above it in the invaded sediments, a continuation of the Lost River ores to and even into the underlying magma could not be surprising. The further fact that the tin in the Cassiterite Lode is associated most intimately with the oldest and most persistent of the existing primary minerals lends additional strength to the possibility.

Depth Rather Than Lateral Development Recommended

The Lost River tin lodes present features of unusual geologic interest and display oreshoots of considerable size. The ores are low-grade, and would have to be mined on a large scale to be interestingly profitable, assuming an average base price of 39.5c. per lb. for tin and $7 a unit for tungstic acid. The deposits are still in a prospective stage and will probably remain so until something definite has been made known through exploration at depth. If prospectors, endeavoring to develop mineralized dikes, would change their tactics and do five feet of sinking for every foot of drifting, in place of doing all of their development by means of adit levels and raises, it is thought that they would benefit materially thereby. If half of the existing development at Lost River had been in the form of a winze, a definite economic status might have been assignable to the lodes long ago. It is hoped that more work of this nature will be done, and that the region's prospects as a tin producer will be further investigated and determined.

Disposal of Used Explosives Containers

There is an element of danger in the use of wooden boxes which have contained high explosives, for very often nitroglycerin exudes from the dynamite sticks and is absorbed by the wood of the box. Although a box that has not absorbed nitroglycerin is safe, yet there is always the danger that a person will get a box that is partly saturated, writes C. L. Colburn in the U. S. Bureau of Mines *Reports of Investigations*.

On account of this danger, all mining companies should use extreme care in giving away used explosives containers. A box that shows any stain of nitroglycerin should be destroyed by fire. Other boxes that are free from nitroglycerin or dynamite can be used.

The condemned boxes, together with the paper linings of all boxes, should be burned in a place sufficiently removed from all buildings.

Care should also be exercised in the disposal of black blasting powder kegs in which loose powder has been shipped. It is difficult to get the last few grains and the dust of black powder out of the keg, and serious accidents have occurred by these kegs coming into the possession of children and others unacquainted with black blasting powder. All used black blasting powder kegs should be thoroughly washed with water before giving them away or utilizing them for other purposes.

Japan's Graphite and Tungsten

Japanese transactions in tungsten and graphite show a marked falling off. Figures available up to Sept. 30, 1919, show a decrease of $747,750, compared with 1918 in the export of tungsten, and for the same period graphite shows a decrease of $254,235.

Porcelain Crucible Recommended For Bullion Assaying

Boiling, Parting and Washing Operations Can Be Performed Most Conveniently and With Absence Of Bumping by This Means

By Roscoe Wheeler

Written for *Engineering and Mining Journal*

IN MAKING bullion assays considerable trouble is often encountered from bumping in the flask, even when means are taken to prevent it. The standard platinum cups and tray are not a solution of all difficulties, for gold cornets can break up in platinum cups as well as stick to them, if not manipulated with the utmost care. I have found from experience that the boiling and parting, as well as the washing of the cornet, can best be carried on in a high-form porcelain crucible or cup, glazed inside and outside. The crucible should be at least 1¾ in. in diameter across the top, 1⅝ to 1½ in. high and of at least 30 c.c. capacity. The upward outward sloping sides allow the bubbles free egression, thus preventing any serious bumping or upsetting. With the flask the top is the narrowest part; the gases and bubbles on ascending are compressed, strike the sides, and bumping sets in no matter how many burnt peas or lentils are used.

One trying such a cup for bullion assays will wonder why it was not thought of before. I can guarantee that the results will rank with the best when such a minimum-sized porcelain cup is used. It is the result of my own practice as well as that of a number of young and old-time assayers whom I have induced to use it. Try it. No regrets will follow.

The British Iron-Ore Situation

Great Britain has for some time been dependent on foreign ores to maintain its production of pig iron, according to *Commerce Reports*. The importation of these ores during the war was curtailed because of the shortage of cargo space, and the country was obliged to fall back on its own low-grade ore and the manufacture of larger quantities of basic iron from these ores. Pig iron cannot today be obtained in adequate quantities from the blast furnaces, because imports of ore are still greatly restricted. A slight improvement in this respect can be noted by a study of the import figures for the last three or four months, and a larger number of ore-laden vessels has arrived from Spain. Despite this, supplies are still below the demand.

Here again, the shortage of British coal is largely responsible. The export of coal from Great Britain and the import of ore from Spain and northern Africa are, in a sense, a form of barter. The same British vessels which take homeward-bound cargoes of ore take outward cargoes of coal. The ore is necessary for the country which exports the coal, and the coal is essential to the ore-producing countries; but when Great Britain cannot produce adequate supplies of coal for export the barter system must necessarily break down. Because of the diversion of vessels to trades on which they obtain cargoes both ways, there is not sufficient tonnage available, even when there is ore for shipment, as, if such vessels remain in the ore trade, they are obliged to go in ballast on the outward voyage and thus raise the shipping cost on the home cargo of ores.

Stories From a Laboratory—II

Salting

By Albert R. Ledoux

Written for *Engineering and Mining Journal*

THE devious ways of the man who would falsify samples and take advantage of the buyer have often been enumerated, and many of them, of course, were tried on our laboratory. One day a man came in with the statement, which we have often heard, that gold existed much more widely distributed than was realized, but in a form which did not permit of its detection or determination by fire assay. This man stated that even the ordinary granite used in the paving stones of New York City contained gold which he could save by his special process. He wanted us to test this process, and, if it was demonstrated that he was correct, to give him a certificate to that effect. He stated that he wished to be present during the testing, but would not in any way interfere.

Under the pretense of wanting to familiarize ourselves with the process, we got from him his complete formula, which seemed utterly foolish from a scientific point of view. We arranged with him to make the test at a certain hour on a certain day, and he brought in an ordinary paving block from the street. Before the appointed time we went through the test exactly as the instructions prescribed, and, of course, got no gold whatever. The remainder of the rock was set aside, and the next day, when the alleged inventor appeared, we repeated the test exactly as before. The man did not wait until we had actually finished the final clean-up, but paid his bill and asked us to send our certificate, whatever it might be, to the old Astor House.

Very much to our astonishment the second test produced a large button of gold. Two of our assistants had done nothing but watch the man; he had not gone near the test or the furnace, and it did not seem possible that he could have salted the sample before our eyes. However, we sent him a certificate something to the effect that we had tested Mr. So and So's process twice, using the same chemicals and apparatus; that the first test was made in his absence, and no gold whatever was found; that the second test, run while he was present, yielded gold to the value of so much per ton of granite. The man never came back, nor did he write us.

One of the most amusing things was our assay of "Gabriel's Sword." The *New York Herald* and the *Kingston Freeman* published a statement, which excited a great deal of interest, to the effect that two residents of Kingston or vicinity who were out late one night and were passing by a pond were startled by a bright light in the sky, and in a few seconds saw a brightly illuminated object fall into the water near the edge of the pond, with a hissing sound. They had concluded that it was a meteor, and the next day had gone back and had found a strange sword. It was five or six feet long, two edged, with a guard above the handle about eight inches long. It was somewhat bent and very much rusted, but on rubbing off some of the rust strange characters and hieroglyphics were observed upon the metal.

Some time after this a man came into our office, carrying on his shoulder a long box, and asked to borrow a screwdriver. On opening the box he produced this sword. He stated that he was one of the discoverers; that he was exhibiting the sword, charging admission to see it, and that he had been a blacksmith and knew a good deal about metals. He wanted the sword analyzed and a certificate given as to its composition. He was sure it was of celestial origin, "Perhaps dropped by Gabriel," because it was an alloy of iron and silver.

He suspended it and called my attention to the fact that when struck it had a ring like steel, although, as stated, he had reason to believe that instead of being steel it was an alloy of silver and iron. He said he would be satisfied if our certificate would show that it contained any considerable quantity of silver. He showed me the hieroglyphics and letters, which looked like imitations of Chaldean or other ancient script; on running my finger over the characters I could feel a little roughness, and they looked as if they might have been made by penetrating the metal with some fine-pointed tool. They were outlined just as one might outline a diagram on a piece of paper by consecutive pin pricks.

My visitor asked for a file. He said that, of course, he would not ask me to assay filings from the surface of the sword or its handle, because the suspicion might lurk in my mind that he had coated the exterior with some chemical containing silver. He called attention to the fact that the guard was apparently forged or cast as part of the blade and handle, and differed in no respect in appearance from the rest of the sword. He stated that if it would satisfy me he would file off one end of this guard; that we could then put it into a crucible and melt the whole thing and report to him as to its silver contents.

When he took the file I noticed that he examined the two ends of this guard critically before he decided which he would cut off. The file went through the metal with ease, and he handed me a cube, bright where the cut had been made but brown with rust on the other five sides. This was sent to the assay room, and the assayer, fearing that something might happen to the crucible and the assay be lost, as a precaution put the cube on an anvil and cut it in half with a cold chisel, expecting to assay half at a time. To his astonishment he found that the cube had been drilled through by a ¼-in. drill, a plug of silver had been inserted in the drill hole, and where the ends protruded the surface had been smoothed off and smeared with iron rust so that the difference between these two and the other sides did not show.

When the man came for his report we showed him this plug of silver and told him that we regretted we could not give him a certificate and feared that the spirits or someone had been fooling him when they intimated that he had to do with a new alloy and not with a steel which had been forged in some blacksmith's shop in the Catskills.

Of course we all know of innumerable instances of samples salted by vendors. We have detected in placer concentrates the milled edges of gold coins which had

been cut up and added to the sample. We have found the interiors of bags which had been sent to us carefully sealed, all black with nitrate of silver which had been squirted into the sample by inserting the point of a syringe between the meshes of the bags without breaking the seals.

Some of our problems did not have to do with ores or metals, and we were often called upon to do what seemed impossible things. For instance, the agents of a large importing house in Newfoundland sent us a sample of molasses and asked us to determine whether it was New Orleans or Barbados in origin. What we did not know about the comparative characteristics of these commodities would fill a book! We made an inquiry from the New York agents of the shippers as to what, if anything, was the matter with the molasses. They stated that the Newfoundlander of those days sweetened his tea with molasses instead of sugar; that he had always preferred Barbados molasses; that this particular shipment turned the tea black, and that, therefore, the Newfoundland fishermen and farmers refused to buy it. The trade knew very well that New Orleans molasses, though of better flavor and of higher price than Barbados, would turn the tea black, whereas Barbados would not. The analysis showed considerable iron in the sample, and later I learned that the man who had received the order for this commodity had thought to please his new customers by mixing with the cheaper Barbados article a large proportion of the New Orleans product, because he thought it would give a better flavor and would secure for him a continuance of patronage. The Louisiana refiners in those days used iron kettles; the Barbados refiners, copper.

We were once waited upon by a committee of prominent New Yorkers, among whom I remember were General Grant, S. B. Eaton, and Norvin Greene, with the request that we should make a test of a special process for extracting gold from certain southwestern deposits. The committee told this interesting story: They were operating a mine in the Southwest, and had sent their engineer to make some further locations and to register the claims. This engineer, when he went to the local land office, was asked if by any chance he spoke French; as a French count was there with a private car and his countess and servants, and was trying to do some business with the registrar, but could not make himself understood. The engineer called upon the count in his car and offered to be of service. To his surprise the count wanted to register certain locations in an alkali desert, where the engineer knew that very little existed below the sage brush excepting sand and alkali and gypsum. These claims were to be located for gold. The engineer was invited to dine with the count, and in the intimacy of the hour the latter told him this story:

His daughter had married a well-known French engineer. This man had been in the war of 1870, had lost an eye, and, returning to civil life, had done some discreditable things in Paris, had disappeared, and had not been heard of for several years. One day, the count received a letter from the man, postmarked in Arizona or New Mexico, stating that he had been in America experimenting with a process of his invention to save "volatile gold," and had discovered a great area where gold existed in large quantities theretofore unsuspected. It could not be detected by fire assay, but could be got by his process. He inclosed a description of his process and was mailing some of the samples. He desired his father-in-law to divide these samples and first have them assayed by any reputable French assayer, and then, when the latter reported—as he would—that there was no gold present, to give him the sealed envelope containing a description of the process and ask him to repeat the tests.

The count followed these instructions, receiving the report in the first instance that no gold was present and in the second instance that, much to the surprise of the assayer, the samples had yielded a very considerable quantity of the precious metal. Upon reporting these facts to his son-in-law by mail, the latter wrote that he wished his father-in-law would come out and see what he was doing; that their everlasting fortunes were made. The count therefore had arrived with his cook and valet and his charming wife, and in gratitude for the assistance which had been given by the engineer he offered to show him these properties and let him locate some claims for himself or his employers. The engineer had gone out into the desert with the count, found the son-in-law in a little shack surrounded by various chemicals, and this Frenchman produced buttons of gold before the eyes of the engineer. The latter had fallen for the swindle, had located a lot of claims for his employers and taken samples from them. These had been sent to an assayer in the West, who reported gold in all of them by ordinary processes, although the report of the son-in-law, who had kindly assayed these samples for the engineer by his alleged process, showed much larger results. So the engineer came back to New York and reported what he had done, and they had come to consult me.

I told them that of course the chances were a thousand to one that the whole thing was fake, but that I believed the engineer to be honest even if not shrewd. As these claims had been located, I advised that they get a man from Los Angeles or somewhere to go out and take other samples and bring them away without going near the French assayer or giving him an opportunity in any way to salt them. In due time the samples came, and in the presence of a distinguished sub-committee of the owners, and of the engineer, we went through the form of testing the process, particulars of which had been furnished, and of course got no gold whatever; nor did we by fire assay. It was a plain case of salting or sleight-of-hand in the previous development of the scheme.

In the meantime the French count had gone home, and when the American engineer, or his employers, reported to the count the result of this independent sampling and test, very much to their astonishment a cable came back saying that the count had absolute faith in his son-in-law's wonderful discovery; that if the New Yorkers would cable him the amount of money they had expended on the locations, sampling and our test, and would send him assignments of the claims, he would reimburse them in full. This was done, and these lucky New Yorkers got their money back, and the count must later on have discovered that he and such friends as may have joined him were victims of a swindle.

The old gold-brick swindle has not passed us by. A reputable physician from Albany came to us with some borings, which, while he waited, were tested for gold. Asked by him to calculate the value of a bar of such-and-such dimensions, assuming its fineness to be that of the borings we had assayed, we made it up in the thousands of dollars. The doctor said that he had

met a red-shirted miner who had come from the West with all his savings in this bar of gold. He needed money and would sell it for $5,000, but of course did not expect the doctor to pay for it without a test. He proposed that they come to a machine shop where the bar should be bored through. The doctor could take the borings to an assayer and upon his return pay for it if satisfied as to its value.

I warned this doctor that he was on the edge of being swindled, but nothing would convince him. Back he came in a few hours, carrying a satchel and triumphantly produced the bar. One look at it showed that it was brass, and an assay yielded no gold. Later, the victim discovered at the machine shop that while he was away getting our assay the "miner" had taken another bar out from his bag, of the exact dimensions of the original gold bar, and had had the second bar drilled through with holes exactly duplicating in location those made in the previous bar.

I had the curiosity to communicate with the doctor some months later, and found, as was to be expected, that neither through the police nor otherwise was he able to discover who had swindled him.

Ontario's Metal Production

METALLIFEROUS mines, smelters, and refining works of Ontario show an increase in the value of output for the first quarter of the year of nearly $1,000,000 over the corresponding quarter in 1919. Returns received by the Ontario Bureau of Mines for the three months ending March 31, 1920, are tabulated below. For purposes of comparison the quantities and values are given for the corresponding period in 1919.

SUMMARY OF ONTARIO'S METALLIFEROUS PRODUCTION, FIRST QUARTER OF 1920

	Quantity		Value	
	1919	1920	1919	1920
Gold, oz.	98,188	142,840	$2,026,536	$2,953,036
Silver, oz.	3,105,002	2,280,665	3,152,700	2,954,695
Platinum metals, oz.		100		7,172
Copper, blister, lb.	1,724,631	1,508,014	270,493	242,630
Copper in matte exported, tons	2,674	1,976	588,280	553,280
Nickel in matte exported (a), tons	5,610	4,571	2,692,800	2,285,500
Iron ore exported, short tons	4,840	44	41,118	322
Iron pig (b), tons	14,170	13,428	399,963	344,241
Cobalt, metallic, lb.	13,594	46,479	20,889	108,430
Cobalt, oxide, lb.	127,954	213,024	186,036	340,232
Nickel oxide, lb.	5,070	1,788,183	1,421	413,944
Nickel, metallic, lb.	1,830,569	2,159,316	756,062	753,169
Other nickel compounds, lb	33,716	159,183	5,804	15,308
Other cobalt compounds, lb	14,189	1,417	9,827	1,417
Lead, pig, lb.	567,716	509,075	34,684	48,278
Totals			$10,186,613	$11,021,654

(a) Copper in matte was valued at 11c. and nickel at 24c. per lb. in 1919. For 1920 the values have been placed at 14c. and 25c. per lb., respectively. The total matte produced contained 7,038 tons of nickel and 3,631 tons of copper.
(b) Total output of pig iron was 152,022 tons, worth $3,897,211. Figures in the table represent proportional product from Ontario ore.

Gold

Owing to Ontario's contribution, Canada was the only country able to report an increased output of gold in 1919. Production for the quarter shows an increase of nearly 46 per cent over the first three months of 1919. Of the total output of $2,953,036, Porcupine contributed $2,694,665; Kirkland Lake, $247,339; and the balance, $11,032, came from the Argonaut mine, in Gauthier Township, and from refining of nickel-copper matte. The output from Porcupine came from the following mines: Hollinger Consolidated, McIntyre, Dome, Dome Lake, Porcupine Crown, and Davidson Consolidated. At Kirkland Lake the producers in order were Lake Shore, Teck-Hughes, and Kirkland Lake. Production is still hampered by insufficient labor, and, although the wage scale has been increased to equal that at Sudbury and Cobalt, the effect has not been appreciable. In addition, gold mines produced 24,913 oz. of silver, valued at $31,373. The total tonnage of ore milled was 360,327 tons. As regards mill equipment, the producers report 5,485 tons' daily milling capacity, which includes 210 stamps, capable of treating 3,880 tons. Ball and tube mills installed have a capacity of 1,605 tons daily.

Silver

The quantity of silver marketed during the period shows a falling off, despite the high price of the metal, which averaged $1.30 per fine ounce. When the price began to recede, some of the larger producers held a considerable proportion of their output in the hope that the market would recover. The course, however, has continued downward, the present level being about $1 per ounce. The average price was $1.01 for the corresponding period in 1919. Of the total of 2,280,665 oz., Cobalt and Gowganda contributed 2,244,709 oz., and 11,763 oz. was recovered from nickel-copper refining and 24,193 from gold ores. In addition, certain silver producers were paid $7,111 for 54,518 lb. of cobalt contained in the ores and concentrates sold.

Refineries: At Deloro, Thorold, and Welland the three operating silver-cobalt refineries treated 219 tons of ore, 655 of concentrates, and 626 of residues, for a total recovery of 829,142 oz. of silver, in addition to arsenic, cobalt, and nickel in various forms. Only 5,535 lb. of nickel oxide was marketed in this form, the major part of the output, as noted in the table, coming from the Port Colborne nickel-copper refinery. Metals Chemical, Ltd., at Welland, has sold its plant to Ontario Smelters & Refiners, Ltd., which will carry on the business in future, using a different process. The new company also owns the plant at Chippawa formerly operated by the Standard Smelting & Refining Co.

Nickel-Copper

During the quarter, 301,133 tons of ore was raised and 238,700 tons smelted, as compared with 229,822 and 226,954 tons, respectively, for the corresponding period in 1919. Shipments of matte totaling 10,168 tons were made to the refineries in Canada, United States, and Great Britain. The British America Nickel Corporation is producing matte at Nickelton and shipping to the refinery at Deschenes, Quebec. The latter is now in operation, although there was no output for the first quarter of the year. A considerable part of the nickel oxide produced at the Port Colborne refinery of the International Nickel Co. of Canada is marketed in that form in England. Precious metals—gold, silver, platinum, palladium, rhodium, ruthenium, osmium, and iridium—were recovered at Port Colborne.

Iron Ore and Pig Iron

The Algoma Steel Corporation and Moose Mountain, Ltd., carried on iron mining, 53,754 tons being raised. Only a small tonnage of briquettes was shipped. No shipments of ore were made.

Seven blast furnaces owned by the Algoma Steel Corporation, Canadian Furnace Co., and Steel Co. of Canada were in operation. These smelted 28,608 tons of Ontario ore (8.8 per cent of the total) and 295,273 tons of foreign ore, producing therefrom 152,022 tons of pig iron, worth $3,897,211. The steel product was 179,244 tons, valued at $6,035,308.

The Electrolytic Copper Assay—A New Modification

Proposed Method of Special Advantage in the Presence of Impurities Such as Arsenic, Antimony, Bismuth, Selenium, and Molybdenum—Simplicity and Accuracy Features—Precipitation of the Iron by Novel Process

BY F. G. HAWLEY*

Special contribution to *Engineering and Mining Journal*

WHEN assaying copper ores and products, the analyst has the choice of several methods, varying in speed and accuracy. If accuracy is of prime importance, the merits of the electrolytic method are so great that all bullion, and a great deal of ore and matte, are sold with the specification that this method shall be used in determining their value.

Used on ore containing no interfering elements, the method is simple and satisfactory. A greater weight of sample can be used than with most processes; and this is a great advantage on samples of concentrates that contain a variety of minerals, rendering it difficult to get a small sample to represent the whole. This is especially true with flotation concentrates, which are difficult to mix thoroughly.

Unfortunately, the electrolytic method is subject to a serious limitation. A number of metals will, if present, precipitate wholly or in part with the copper, and vitiate the assay. The most common of these are arsenic, antimony, bismuth, selenium, and molybdenum. These metals are seldom found in large quantities associated with copper minerals, but many ores contain small amounts. Flotation concentrates usually contain much more of the metals mentioned than jig and table concentrates made from the same ore. Silver, tin, and mercury also precipitate, but are usually absent, or present in insignificant amounts. They can be eliminated in a number of ways, but all are tedious and require much care and attention. A slight loss of copper is probable, either chemically or mechanically. This loss may not be great enough to be objectionable for some work, but where the greatest accuracy is required would not be permissible.

Most of the interfering metals do not begin to precipitate until nearly all of the copper has been deposited; then they precipitate with, and on, the last portion of the copper. For this reason, a little impurity usually can be seen easily. However, until one has had considerable experience, it is difficult to judge how much the accuracy of the assay is impaired. Sometimes a cathode which is considerably discolored will contain only a little impurity, whereas a cathode having a much lighter and better-looking deposit may contain several times as much.

EFFECT OF IMPURITIES ON APPEARANCE OF COPPER

If the deposited copper has a smooth, even surface, the different metals form a coating that may vary considerably in appearance, and which is sufficiently characteristic to identify the metal. This does not occur if the copper deposit is rough, for then all impurities give about the same dark color. The precipitation differs with the acids and salts present, but as the almost universal practice is to have the solution contain small amounts of both sulphuric and nitric acid, with some ammonium nitrate, precipitation from this solution only will be discussed.

When arsenic is present in the sample, in amounts less than from 0.2 to 0.3 per cent, little or none of it will precipitate. If present in larger quantities, a few tenths of 1 per cent will remain in solution and the rest will precipitate on the copper. Small amounts give the copper a light grayish appearance somewhat like fine dust, which might easily escape notice even when from 0.10 to 0.15 per cent is present. With larger amounts the color is much darker.

EFFECT OF ANTIMONY AND MOLYBDENUM

Antimony acts much like arsenic, part of it remaining in solution and part precipitating. It will give the copper much the same appearance as arsenic does. The color is somewhat darker, but still a little may escape notice easily.

Molybdenum, in small quantities, is found much more frequently in copper ores than generally is supposed. In the electrolytic assay it acts like arsenic and antimony, part precipitating and part remaining in solution. When too much is not present, the addition of a small amount of any chloride will prevent its precipitation entirely. One milligram of sodium chloride will prevent about six milligrams of molybdenum from precipitating. This small amount of chloride is insufficient to injure the copper deposit. When molybdenum precipitates, the color varies with the amount present. With very little, the color is a chocolate brown that rarely extends to the edge of the cathode. With still more, an iridescent, steel-blue color is evident, that approaches black as the quantity is increased.

When an electrolytic copper deposit that is good otherwise is contaminated with any, or all, of these metals, to an amount not exceeding 0.10 to 0.15 per cent, generally the copper may be purified in this manner:

Place the cathode in a tall 150-c.c. beaker containing enough boiling water to cover the copper. Cover the beaker with a watch glass containing a notch in the side, or a hole drilled through, to let the cathode stem project. Add 10 c.c. of a mixture of equal parts of nitric acid, sulphuric acid, and water, and let stand until all copper dissolves. This takes place so slowly that no copper can be lost by violent action of the acid. Rinse off the watch glass, cool, and again electrolyze. This deposit should be practically pure.

When bismuth is present in the copper assay it does not act like the metals just mentioned. Practically all of it precipitates with the copper, and a second solution and deposition will not improve the assay. When only small amounts are present, the copper has a brick-red color and is covered with small black spots with little streaks projecting from them. These streaks, which average about $\frac{1}{8}$ to $\frac{1}{4}$ inch in length, point in various directions—up, down, and sideways. Under some conditions, finely divided sulphur and some sul-

*A paper read at the Ajo meeting of the Arizona Section of the A. I. M. E.

phur compounds will cause dark spots with streaks, but these are different from the bismuth streaks, as they always point upward, and are much longer. When more bismuth is present, the whole deposit is very dark, and the spots do not show.

When selenium or tellurium is present they precipitate at the beginning of the electrolysis, so if an assay darkens at the start, one may suspect the presence of these elements. As when bismuth is present, redepositing the copper is of no avail.

Several procedures have been evolved for removing interfering elements from copper previous to electrolysis. All are rather tedious, and none are as satisfactory as could be desired. One method used extensively is to precipitate the copper from an acid solution by sodium thiosulphate; then filter, ignite, and again dissolve and electrolyze as usual. As a means of eliminating impurities, not much can be claimed for this method, for nearly all of the interfering elements are also precipitated by the thiosulphate. On igniting the precipitate, most of the arsenic is volatilized, with possibly a very little antimony and selenium. All of the bismuth and most of the antimony will remain with the copper. A possibility of loss of copper by oxidation during filtering must be considered, and also a chance for mechanical loss while igniting the precipitate.

Another method frequently employed is to precipitate the copper as cuprous thiocyanate; filter, and either dissolve the precipitate directly or after ignition; then electrolyze. The separation is usually complete, but small losses of copper are to be expected, as cuprous thiocyanate is slightly soluble, and there is a slight tendency to run through the filter and to creep up the filter on to the funnel. If it is decided to dissolve the cuprous thiocyanate in acid without igniting, it will be necessary to boil almost to dryness completely to decompose cyanogen compounds, for if even a little cyanide remains, it causes the copper to deposit in a loose, spongy form that does not adhere well to the cathode.

Precipitating Copper With Hydrogen Sulphide

Another method sometimes used is to precipitate the copper with hydrogen sulphide; filter and dissolve out the arsenic and antimony with sodium sulphide, then separate the copper and bismuth sulphides by potassium cyanide, and proceed as before. This method is tedious, and mechanical loss is likely to occur.

All of these methods eliminate iron from the assay, which is an advantage, as an excessive amount exerts a disturbing influence on the copper precipitation. Small amounts of iron are not objectionable, and, in fact, may be advantageous, as iron somewhat retards the precipitating of arsenic and antimony. In a standard method for assaying impure copper bullion, a little ferric iron is added to the assay. An excess of ammonia is added and the solution filtered. The precipitated iron hydroxide will retain all arsenic, antimony, bismuth, and selenium, leaving the solution free from these metals. The hydroxide is dissolved and reprecipitated once or twice, to free it from all retained copper, after which the combined filtrates are electrolyzed.

Working according to the procedure indicated, I have formulated a new method for the electrolytic assay of impure ores. I consider this to be the most accurate for the determination of copper in impure ores with which I am acquainted. The time required is about the same as that of any other process in which impurities are removed. It is eminently suitable for control assays, umpire work, and any determination in which the greatest accuracy is required. It has been used for two years in two laboratories, and has always given satisfaction.

Details of the Proposed Method

The method is as follows:

Weigh 1 to 3 g. of the sample into a tall 300-to 400-c.c. beaker. I prefer a Phillips form, but it is not essential. Add approximately 1 g. of sodium bisulphate, 1 g. of ammonium sulphate, and 5 c.c. of 70 per cent sulphuric acid, and shake gently to mix. Add about 5 c.c. of nitric acid saturated with potassium chlorate; after waiting a minute or two, add 10 c.c. more. Cover beaker and set in a warm place for a short time; then gradually heat to boiling and boil off most of the nitric acid. Remove the watch glass, or, better still, set it on edge in the beaker, using the lip to make it stand upright. This is more easily done if a small segment is cut from the watch glass by an emery wheel.

The beaker is placed in a somewhat cooler place, evaporated to sulphuric fumes, and then heated a little stronger until the residue is so pasty it scarcely will flow. Remove and cool. The iron now exists as anhydrous ferric sulphate, which is insoluble in concentrated sulphuric acid, and only slowly soluble in dilute acid. Add about 1 c.c. of water and immediately follow with 50 c.c. of an alkaline mixture made as follows: Ammonia, 2 l.; water, 4 l.; and ammonium nitrate 100 g. Be sure that the pasty acid residue and the ammonia are mixed, then heat to boiling for a few seconds, cool slightly, add 5 c.c. of ammonia, and filter through a 12½-cm. filter into a 250-or 300-c.c. tall beaker; wash once with a little water, then once with warm ammonia diluted with an equal amount of water, and again with water. The main part of the copper is now in the filtrate, whereas a little copper and all of the interfering metals are retained by the iron hydroxide.

Place a watch glass on the beaker, heat to boiling, and continue until most of the ammonia is expelled. If loss is feared from spraying, the solution may be evaporated instead of boiled. Cool the solution and acidify, using an excess of 3 c.c. of sulphuric and 3 c.c. of nitric acid, and place in a cooling trough. While the boiling and cooling is being done, extract the small amount of copper retained by the hydroxide in the following way: Rinse it into the original beaker and place under the funnel. Pour dilute nitric acid around the edge of the filter to extract traces of copper which may combine with the cellulose of the filter and which will not wash out entirely unless acid is used. Wash once, then heat the solution somewhat to dissolve the hydroxide; add an excess of ammonia to re-precipitate the iron and enough 2 per cent solution of potassium cyanide to combine with most of the copper. From two to eight drops will be sufficient. Transfer the solution with the hydroxide to a 200-c.c. tall beaker and electrolyze warm on a rotating electrolytic machine at 0.2 ampere for from twenty-five to thirty-five minutes. All copper, with possibly a little zinc, will be deposited on the cathode, but the impurities remain with the hydroxide.

The next step is to unite all copper in one solution. Switch off the current and remove the beaker con-

taining the hydroxide, but leave the cathode in place. The main part of the copper is still in the beaker containing the original filtrate, which has been boiled and acidified. Put this on the electrolytic stand in place of the one just removed. Switch on the current again, but in the opposite direction, which will dissolve the small amount of copper on the cathode in a few seconds. Switch the current again to the original direction, increase to 1 to 1.5 ampere, and electrolyze until all copper is deposited; which takes from one to one and one-half hours. Remove the cathode, dry with alcohol, and weigh as usual. The deposit should have all the characteristics of perfectly pure copper, showing no signs of impurity. If the sample contains much oxidized mineral it may be necessary to treat with hydrochloric acid before adding the nitric.

If the sample does not contain four or five times as much iron as impurities, it may be necessary to add a little to be sure of removing all interfering elements; however, this is seldom necessary.

The method as given does not remove molybdenum. If this is present, add a small amount of a soluble lead salt just before adding the ammonia solution; then proceed as before.

Necessary Operations Are Numerous But Simple and Quick

The operations required in this method, though numerous, are all simple, easy of execution, and require little time. The possibility of loss of copper, either chemically or mechanically, is, I think, less than with other methods. The complete precipitation of the small amount of copper from the alkaline solution containing the iron hydroxide is done quickly and easily, and the copper in the main solution is precipitated faster and better than it would be if the iron had not been removed.

One of the novel features is the way in which the iron hydroxide is precipitated. When ammonia is added to a solution of iron sulphate, the normal gelatinous hydroxide is precipitated, but if the ammonia is added, as directed, to the pasty residue in which the iron exists as anhydrous ferric sulphate, it is changed to a dense, granular hydrated oxide whose volume is only about one-third as much as the normal hydroxide. It is much easier to filter and wash and does not retain as much copper as does the hydroxide precipitated from solution.

The mixture of sodium bisulphate and ammonium sulphate has several functions to perform. Besides aiding in decomposing the ore, it helps the iron to crystallize out and also has a tendency to prevent spitting, which often occurs with samples high in iron. If much water is present in the assay, the ferric sulphate will form with water of crystallization. This is expelled violently when the temperature rises, and is one cause of spitting. Were it not for this, the addition of water would be beneficial, as it causes the ferric sulphate to crystallize out in larger particles. On adding ammonia, this would result in a more granular ferric oxide, which would be easier to filter and wash.

The nitric acid should not be boiled off too rapidly at the beginning, for if that be done some particles of sulphide might become coated over with insoluble sulphate before they were entirely decomposed.

The reason for adding potassium cyanide is twofold: First, it aids in the extraction of all copper from the alkaline solution, for copper combined with cyanide is not occluded by ferric hydroxide. Second, copper deposits better from a cyanide solution than from one containing only ammonia and ammonium salts. An excess of cyanide should be avoided, as potassium ferrocyanide then would be formed, which has a disturbing effect on the assay. One or two drops excess would not be enough to cause trouble. Although the precipitation of small amounts of copper from a cyanide solution is complete and satisfactory, large amounts cannot be deposited practicably in this way.

If the alkaline solution contains zinc, some of it may precipitate with the copper, but this does no harm, as it is held in solution later, when precipitating from the acid solution.

If no rotating machine is available, the work can be done with stationary electrodes, provided the iron hydroxide present is not enough to interfere with the free circulation of the solution. The alkaline solution should be electrolyzed for an hour or two in the afternoon, with occasional stirring; then changed for the main solution and electrolyzed all night.

Many tests were made to prove the accuracy of the method, but only a few representative ones will be given. The first tests were made on known amounts of pure copper to which impurities were added:

TEST No. 1

In each case 0.2 g. Fe was present

No.		Cu Taken	Cu Found
1	.....	0.2606 g.	0.2607 g.
2	.....	0.2589	0.2591
3	.....	0.2996	0.2996
4	0.030 g. As	0.1459	0.1461
5	0.050 As	0.1286	0.1288
6	0.030 Sb	0.1221	0.1221
7	0.050 Sb	0.1378	0.1379
8	0.030 Bi	0.1279	0.1281
9	0.050 Bi	0.1353	0.1356

TEST No. 2

Each of the following was added: 0.25 g. Fe, 0.05 g. Al_2O_3, and 0.05 g. CaO.

No.	Sb	As	Bi	Cu Taken	Cu Found
1	0 g.	0 g.	0 g.	0.1432 g.	0.1432 g.
2	0	0	0	0.1415	0.1413
3	0.01	0.01	0.01	0.1302	0.1301
4	0.02	0.02	0.02	0.1310	0.1313
5	0.01	0.01	0.01	0.1322	0.1322

TEST No. 3

In each case 0.2 g. Fe was present.

No.	MO_3	Se	Pb	Cu Taken	Cu Found
1	0 g.	0 g.	0 g.	0.1094 g.	0.1095 g.
2	0	0	0	0.0966	0.0965
3	0.04	0	0	0.0906	0.0914
4	0.02	0	0.03	0.0957	0.0958
5	0.04	0	0.10	0.0923	0.0923
6	.	0.01	0	0.0861	0.0863
7	....	0.02	0	0.0940	0.0943

The next tests were made on pure ores, which were assayed by the regular acid method and also by the new method. Other portions also were weighed out, to which impurities were added, and these also assayed by the new method:

PERCENTAGE OF COPPER FOUND BY TWO METHODS

Cu in Ore No. 1, Acid Method	Cu in Ore No. 1, New Method	Cu in Ore No. 1 + 10 mg. Each of Bi, As, and Sb, New Method
22.20	22.20	22.21
22.19	22.19	22.21
....	22.18	22.19
Ore No. 2, Acid Method	**Ore No. 2, New Method**	**Ore No. 2 + 10 mg. Each of Bi, As, and Sb. New Method**
5.66	5.65	5.64
5.66	5.64	5.66
5.64	5.64	5.64

When determining copper on impure ores containing from 5 to 10 per cent of copper, I have frequently assayed the same pulp six times, using 2 g. portions, and found that the difference between the highest and

lowest result of the six was only 0.01 to 0.02 per cent. These same samples could not be assayed satisfactorily by the regular acid method, because the deposited copper was very dark, and the results were from 0.15 to 0.30 per cent too high.

Early Days in North Arkansas Zinc District

Zinc Carbonate First Taken for Silver Ore and Smelter Erected on Morning Star Property In 1882

By TOM SHIRAS

Written for *Engineering and Mining Journal*

WITHIN a stone's throw of each other, on the Morning Star property at Rush, Ark., are two plants that aptly illustrate the progress of development in the north Arkansas field during the last thirty-eight years. The first is a small crude stone smelter, built on the same plan as a lime kiln, with which a group of early-day prospectors tried to extract supposed silver values from zinc carbonate ore. The second is a modern 200-ton zinc concentrator which has milled thousands of tons of carbonate ore.

The stone smelter marks the first attempt ever made in the field to construct a plant that would actually yield a marketable product. At that time zinc carbonate had no value in the field, owing to the fact that the nearest railroad was seventy-five miles away. It is a common story in the district that the men who constructed the smelter thought the zinc carbonate was silver ore. John Wolfer, one of the oldest prospectors in the Buffalo River country, who located the property, denied that this was true, however, in an interview given just before he died, eight years ago. He had been a member of the group that was working the property as a claim when the smelter was erected in 1882.

MODERN 200-TON CONCENTRATOR HANDLING ZINC CARBONATE ORE AT RUSH, IN NORTHERN ARKANSAS

Wolfer stated that they had their ore assayed, and that the returns showed that along with the zinc it carried $8 per ton in silver. As the zinc had no value then, he said, they built the smelter in an attempt to save the silver, which could be easily transported in bullion form. They were woefully disappointed, however, for there was no silver in the ore.

In making this test the furnace was charged with charcoal and ore, and a sand mold made at the bottom for the silver to run into. Then the owners stood back and waited expectantly. After a short time they noticed beautiful rainbows playing in the air over the blast. This was the zinc going off in fumes. No silver flowed from the bottom. They were so discouraged that they offered to trade the claim, furnace and all, to Carter Gutherie, a prospector, for a can of cove oysters, but he turned them down cold.

OLD STONE SMELTER AT RUSH, ARK., BUILT TO TREAT SILVER ORE FOR WHICH ZINC ORES OF DISTRICT ARE SAID TO HAVE BEEN MISTAKEN

Later Captain George Chase, of Fayetteville, Ark., developed a large body of carbonate on the property, which is still being mined. The majority of stock in the company has been acquired by Pittsburgh interests.

Old John Wolfer, the original locator, died poverty stricken within a few miles of Rush, at a time when the mine was making big money for its owners.

The New Geology

In connection with recent earthquakes in Mexico a darky preacher down in Texas is said to have evolved a remarkable theory, which seems to fit in very well with certain existing circumstances, according to the *C. W. Savery Market Letter*. He promulgates his theory of the earthquakes as follows:

"We has received anudder warnin' not to go pe'ticatin' into de ways ob Providence. De earf, my breddren, revolutes on its axels, as we do now all know, and we all know dar mus' be sumefin to grease dem axels and it takes a right sma't ob grease to do it. So de good Lord done put de 'troleum inside de earf to keep de axels greased. Den byme bye 'long come all dese hyah oil companies, punchin' holes down into the bearin's and de oil all come squirten' out. Fust thing we know dar's a hot box, and de earf squeaks and jolts and rumbles and dat's de earfquake, and if dey don't quit pretty soon dere won't be no moah grease left and the earf will stick tight on its axels and won't go round no moah!"

Mining Engineers of Note

William Wallace Mein

THE first settlements in the vicinity of Nevada City and Grass Valley, Cal., were made in 1848, and were trading posts. Placer mining became active, and resulted in the beginnings of a mining community. In 1850, gold was discovered in quartz veins near Oroville, and speedily thereafter in the immediate neighborhood of these two rapidly growing towns. In 1853, quartz mining interests, after their initial campaign, became prostrated, and it was not until 1864 that the returning miners from the Washoe district of Nevada caused an active resumption in gold-quartz mining. The gold mining industry took on its swaddling clothes in this region. The first sluice was used in 1850, hydraulic mining was discovered in 1853, and the first quartz mill was put in operation on "cemented gravel" in 1857. From that time on the stamp mill was developed steadily. The auriferous sulphides presented a difficulty which was overcome by the introduction of the Plattner chlorination process. In 1873 a survey for a narrow-gage railroad was made of the territory lying between Nevada City and Grass Valley. It was in this mining atmosphere that William Wallace Mein was born about the time that the railroad between the two mining villages began to be constructed. His father, Thomas Mein, achieved a high reputation as an engineer and manager among a group of engineers who found ample opportunity for their capabilities in the gold mines of California. Thomas Mein was general manager of the Alaska-Treadwell mine, of the Robinson Gold Mining Co., Johannesburg, South Africa, and consulting engineer for the Alaska Treadwell group of mines, the Oneida, Mariposa Grant, and many others. Mr. Mein, Sr., was associated with Hamilton Smith, H. C. Perkins and Hennen Jennings and was identified with the London Exploration interests and Wernher Beit & Co. He was a prisoner with many other mining men in the Jameson raid in Johannesburg.

WILLIAM WALLACE MEIN

William Mein is a modest man and only his immediate associates and friends know of his technical and executive ability. In the beginning he was not averse to starting at the bottom, as he took a "mucking" job in Alaska and then worked on shift in the chlorination plant of the Robinson Mine, South Africa. Subsequently he returned to California and entered the University of California, from which institution he was graduated from the mining department. A year later he became manager of the Durban Roodeport Deep, at Johannesburg, South Africa, and after three years in this position accepted a similar post at the Robinson Gold Mine, where he remained for three years. He then became consulting engineer for the Robinson, New Modderfontein, City Deep, Ferreira, Village Deep, and other large mines in the South African gold field. During his managerial administration he never lost sight of "Treadwell Costs," and succeeded in reducing operating costs to such a figure as to command general attention. This is the more noteworthy when the number of able engineers in that field at the time are considered. Jennings, Hammond, Webb, Honnold, Yeatman, Hellman, Seymour, and Behr need only to be mentioned to show that real ability and character were quite essential in the running with such team mates. South Africa at that time was the greatest technical experience school in mining in the world.

California supplied many engineers with their initial impetus in gold mining. Those who went to South Africa found a bigger problem. There was greater extent and more uniformity to the gold deposits. There was opportunity to consolidate smaller mines into larger units, with resultant economy in operation. In the midst of much of this activity Mr. Mein played his part well and when he returned to the United States in 1910 he was qualified indeed to take up his professional practice as a mining engineer. He at once became identified with California mining interests, and in 1912 became consulting engineer for the Dome Mines, in Canada. The International Nickel Co. and the Canadian Mining & Exploration Co., during its period of greatest activity, received the benefit of Mr. Mein's technical knowledge.

Mr. Mein has traveled extensively in Alaska, Canada, South Africa, Central America, and the United States.

BY THE WAY

Safety First

A kick of the Widow Leary's cow upset the lamp that started the Chicago fire, and again it was the kick of a cow that recently exploded a box of dynamite on a ranch at San Ramon, Cal., where the powder was used for blasting stumps. The primary cause of the accident was one Tahw, a Hindoo employee, who struck the cow that kicked the box, which blew up, thereby cutting short the nursery rhyme. Tahw was thrown about 200 ft. and badly injured. The rancher suffered in similar manner and several buildings and five animals were destroyed. Here is meat enough for a sermon a yard long on "Safety First." There is nothing new in the use of dynamite for blasting stumps, breaking up log jams and similar purposes. There is also nothing new in the saying that "familiarity breeds contempt."

At Nelson

Talking about kicks, it is noted that the committee in charge of the Third International Mining Convention, which has been in session the past week at Nelson, B. C., has advertised very prominently that

There's a Kick in every Smile—at Nelson!
There's Dew in the mountains Still!

Under the circumstances the attendance at the convention has probably been excellent.

Purse Strings and Shoe Strings

The man who holds the purse strings in a mining enterprise may be and often is a manufacturer of shoe strings or other commodities. This is one of the things often not at once apparent to the young engineer, but which he speedily comes to recognize. To him who would become prominent as a mining magnate we suggest that first he accumulate a fortune in some other line, such as editorial work, for example, and then enter the mining game from the top. Such is our intention. There is always room at the top, as one finds when he gets there. The latest to enter by way of the top is Mack Sennett, of movie fame, who, with associates, has recently acquired a group of quartz claims not far from Grass Valley, California. The scenery there is not displeasing, and perhaps Mack is looking simply for a realistic background for some thrilling scenarios.

The Higher the Fewer

"Thee mustn't think, m'son," said Cap'n Dick, "that this 'ere Jan Trembath wuz a fool. Any'ow no more so than some o' these young h'engineers o've been to college an' then try to learn old chaps like I 'ow to dig tha h'ore. With h'out boastin,' m'son, mos' o' this 'ere minin' I naws I didn't learn un, it jus' grawed, an', dam-me, didn't come from any bloody book either. Well, any'ow, Jan, 'e figgered to put a bit by for to take a trip back long way sometime, so to begin savin' 'e built 'imself a log 'ouse an' started batchin'. Made 'imself a chair or two h'out o' some boards, an' a table, an' all tha res' o' tha fixin's. Then 'e 'ad a stove set h'up baout four feet from that floor—sort o' foundation it were. One day h'in come two o' these 'ere young h'engineers to get theyselves warmed h'up a bit, an' w'en they saw tha stove, set h'up on tha foundation, they started h'arguing as to w'y Jan 'ad putten there. One chap, 'e sez it wuz to get tha 'eat near tha roof w'ere tha col' wuz, an' tha h'other called tha firs' a bloody fool cause tha 'eat would go h'up any'ow. An' they were snappin' away at h'each h'other jus' like a couple o' fishwomen or some o' these 'ere Polish women w'en one thraws a h'ol tin can h'over tha fence h'in tha h'other's yard—thee naws 'ow it gaws. One o' they chaps talked 'is 'ead off baout tha laws o' thermodam somethin,' an' w'y 'eat makes things 'ot, an' tha h'other told all 'e nawed baout British thermal h'units. Then in comes Jan, an' they h'asked 'im. An' Jan sez, 'I put tha stove h'up cause tha pipe wern't long enough if I putten daown.' So, you see m'son, Jan didn't 'ave to 'ave no schoolin' to naw that."

Blister Copper

"A British syndicate proposes to set up a £10,000,000 copper refinery at Newton Abbot, in Devonshire, on a site where the requisite electric energy can be generated from the lignite deposits at Bovey Tracy," says a contemporary: "There is at present no electrolytic refinery in Great Britain, 90 per cent of the copper used in British industries being imported from the United States. It is hoped that the new refinery will produce 100,000 tons of copper annually, using as far as possible British copper in blister form—an English process of copper-smelting which raises blisters on the white metal after calcination."

Nobody Has Nominated the Kaiser

Most Americans will vote this fall, with mental reservations and by the process of elimination. As a little helper in the process of elimination, we note that Governor Cox declared at Cincinnati in October, 1916:

"Two of the leading sponsors for Justice Hughes are Elihu Root, of New York, and Theodore Roosevelt, of Oyster Bay. In his first speeches Mr. Root declared that the President should have intervened when the Germans went into Belgium. Theodore Roosevelt said this Government shou'd have seized every ship in American harbors. Both have criticized the President for not doing the things which would have embroiled us in a war with Germany.

"The Germans are getting their eyes opened, and about one more speech from Teddy and the German-Americans will join in a triumphal victory for Woodrow Wilson in November."

In the same month, Governor Cox's newspaper, the *News*, said:

"Every indication now is that, with tens of thousands of these splendid people [Germans] still sympathizing with the fatherland, still believing in the righteousness of the German cause, still hopeful that Germany will win, there is every evidence that they will vote for President Wilson for re-election as the best means of aiding Germany, as well as because the re-election of President Wilson will be an aid to the United States."

We are entirely non-political, and reflect the opinions of each subscriber. All of our German and pro-German friends who are on our subscription list will perhaps be enlightened as to how to vote by the above; and those of the opposite persuasion may, if they wish, charitably realize that Cox was after the German vote, and didn't mean it. He says so himself. Certainly, he cannot catch the American vote this year with the same bait.

CONSULTATION

Radium Resources

"The mineralogical scheme I have used for the determination of minerals is not satisfactory for carnotite ore. Is there any regular method of detecting this ore? What is its chemical composition? Do you think the resources of radium-bearing ores will increase throughout the world? Any other information that you may give me about this fascinating mineral that will enable me to become more familiar with its uses will be greatly appreciated."

Carnotite is difficult to classify in any mineralogic scheme for the determination of minerals, hence it is frequently omitted in tables systematically composed for that purpose. Its chief distinguishing feature is its canary yellow color and its usually pulverulent form in minute scales; although often it is compact and wax-like. The greatest carnotite fields in the United States lie in Montrose, Mesa, and San Miguel Counties, Col.; and in Moab and La Sal Counties, Utah.

The three metals, radium, uranium, and vanadium, are found closely associated in carnotite ore, which has the chemical composition as generally given, $K_2O.2UO_3.V_2O_5.3H_2O$ (the radium content, although most important, is too infinitesimal to appear in the formula).

The market value of carnotite therefore will depend not only upon the radium contained in the ore, but also upon the value of the vanadium and uranium constituents. Considering the probable future of radium first, the world will have to turn more and more to the United States as the chief source of this element. The Austrian deposits are almost entirely depleted and the pitchblende deposits of Cornwall have not given any great promise of important development. Outside of the small known deposits in Australia and Portugal, a rare radium-bearing mineral occurs in Russian Turkestan and is called a hydrous-calcium-uranium vanadate, which may prove to be an important foreign resource.

The vanadium content of carnotite is of growing importance as the increasing use of that metal in alloy steel manufacture bids fair to create a steady demand for vanadium-bearing ores—witness the monopoly which one large steel company has obtained over the most important vanadium-bearing area in the world in an endeavor to procure an adequate supply of this important metal for steel manufacture. It is strange to consider vanadium as a byproduct in the extraction of radium from carnotite ore when the quantity of radium in the ore is so small, yet such it really is, being separated as oxide or iron vanadate and reduced in the electric furnace to ferrovanadium.

Enormous concentration of carnotite is required to produce a perceptible amount of radium. Authorities have estimated that about one million pounds of ore will yield only a grain of radium. The effort expended in producing a relatively small amount of the metal is stupendous. First the ore has to be concentrated by either wet or dry methods, which give no exceptional difficulties, the ore merely requiring crushing and agitation with water to separate the finely ground carnotite from the associated silica particles. The metallurgical treatment of the concentrates is the laborious part of the procedure, considering the large amount of material that must be handled. This part of the process may take place in the laboratory. There are several methods of extracting the radium, more or less complex. Experimentation is continually progressing in an attempt to perfect the extraction of radium from its ores. A discussion of any of these methods would be too involved to be detailed here. Briefly, there are acid and alkaline leaching methods and fusion methods. Alkaline leaching employs hot sodium carbonate to eliminate the vanadium and uranium, while the acid leach uses hydrochloric or nitric acid to extract the radium, vanadium, and uranium from ores free from sulphates. In the fusion methods sodium carbonate has been used as a flux, followed by a sulphuric acid leach.

The future of radium-bearing ores in general appears particularly bright, due to the limited world resources and the great demand for both radium, on account of its remarkable properties, and its associated metal, vanadium. Unlike many other ores the market is stable, as it is not subject to the great fluctuation characterizing the trading in the more common and easily obtained minerals.

Getting a Market for Arsenic Ore.

In our issue of July 3, we advised that we did not know of any market for arsenic ore. We have, however, a letter from our Western Editor, who advises that there is an inquiry at his office for an arsenic supply. Miners of arsenic ore in the Far West who wish to market their product should address George J. Young, Western Editor, *Engineering and Mining Journal*, Rialto Building, San Francisco, Cal., or communicate with the companies mentioned below.

We also have several other communications, one of which, from the U. S. Smelting, Refining & Mining Co., says in part: "I note in the July 3 issue of *Engineering and Mining Journal*, page 23, a letter regarding a market for arsenical ores. Our company has recently begun the manufacture of insecticides at our Midvale, Utah, plant, and we need more arsenic. Could you let me have the address of this party?" (Signed) F. B. Weeks, 900 Newhouse Bldg., Salt Lake City.

A statement from L. G. Eakins of the American Smelting and Refining Co., 120 Broadway, New York City, has also been received, who states, "It so happens, owing to peculiar conditions, that our company might be in a position to handle ore such as is described, depending of course upon its location and other important conditions."

The American Metal Co., of 61 Broadway, New York City, is also in the market for this material and states through Edward K. Judd, "If the deposit appears to be of suitable character and conveniently located, we might be interested in looking further into the matter."

Interested arsenic ore producers would do well to get in touch with the above means of disposal for their product, as indications point to an unusual demand for suitable material.

THE PETROLEUM INDUSTRY

Prospecting for Oil at Fallon, Nev.

Tertiary Lake Beds in Vicinity of Stillwater Range Scene of Wildcat Drilling—Scanty Evidences Of Oil—Lake Beds Occur in Many Localities in Western Nevada—Few Indications of Oil Discovered

SAN FRANCISCO CORRESPONDENCE

FALLON, NEV., is the center for a number of companies which are prospecting for oil in Tertiary formations occurring at and close to the southwestern end of the Stillwater range east and southeast of Fallon. Present operations are distinctly of a wildcat nature, as no conclusive indications of the presence of oil in commercial quantities have yet been discovered. It is claimed that oil has been found in two wells, one being put down by the Fallon Oil & Gas Co. and the other on the George B. Williams ranch, by the Churchill County Oil & Gas Co. Over fifty-six companies have been formed or are in process of formation. Local business men, both in Fallon, Reno, and other Nevada localities, are principally interested, although a few from San Francisco have gone into the gamble. Apparently no important oil companies are interested in a direct way. A representative of the *Engineering and Mining Journal* visited the locality. Conditions at the rigs visited are as follows:

Silver State Consolidated Oil Co.—Portable well rig; down 90 ft., with a 12½-in. casing. Claim an "oil shale," and a carbonaceous clay streak at 65 ft. Expect to drill 1,000 ft.

Fallon Oil & Gas Co.—Portable rotary well rig; down 660 ft. Have cemented well and expect to resume drilling soon. Claim to have struck oil. No existing evidence at surface.

Weaver Oil Co.—Wooden derrick, portable rig; 300 ft. in depth. Still in wash.

Lahonton Oil Syndicate—Portable rig, wooden derrick,

SILVER STATE CONSOLIDATED CO.'S RIG

WELL OF LAHONTON OIL SYNDICATE

350 ft. deep, 340 ft. 12½-in. casing. Claim to have struck first water, a 20 ft. water sand containing salt water. Still in surface wash.

Diamond Oil Co., southeast of Lahonton Oil Syndicate—Building derrick.

El Petrolia Development Co., Stillwater—Preparing to work. Small wooden building constructed.

Big Four Oil & Gas Co.—Building a wooden derrick.

Fallon Pioneer Oil Co.—Wooden derrick, portable rig; down 95 to 100 ft.

Wheeler Oil Syndicate—Wooden derrick, portable rig, down 360 ft.; cased 300 ft. Have struck a flow of hot water.

Churchill County Oil & Gas Co.—Portable rig; 12½-in. casing. Claim to have struck oil seepage.

Of the operations listed, all excepting the last two are close to the edge of the Stillwater range, they being out on the flat well away from the range. The Lahonton Oil Syndicate's well is on a small divide in a north-south valley between the Stillwater range and an outlying low range of hills. To the north the valley extends to Stillwater and to the south toward the depression formed by Four Mile and Eight Mile flats. The list of companies reported as drilling, or preparing to drill, or on the properties of which derricks have been erected, taken from a local compilation, is given in the table.

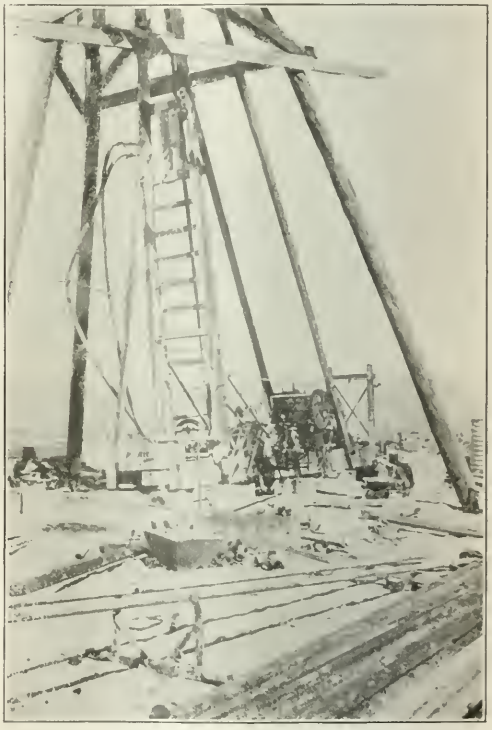
COMPANIES REPORTED AS PREPARING TO DRILL OR ON THE GROUND, AND WHICH HAVE ERECTED DERRICKS

	Township	Range
Fallon Oil & Gas Co.	18 N	31 E
Fallon Pioneer Oil & Gas Co.	19 N	32 E
Churchill County Oil & Gas Co.	19 N	29 E
Big Four Oil & Gas Co.	19 N	29 E
Diamond Oil Co.	18 N	31 E
Lahonton Oil Syndicate	18 N	31 E
Silver State Consolidated Oil Co.	18 N	31 E
Weaver Oil Co.	18 N	31 E
Wheeler Oil Syndicate	18 N	31 E
Carson Sink Oil Co.	17 N	28 E
Indian Lands Petroleum Co.	19 N	30 E
Paramount Oil & Gas Co.	18 N	31 E
Astra Development Co.	19 N	31 E
Ranier Oil Co.	20 N	32 E

Offices for the sale of stock in the various companies are plentiful, and the simple machinery for separating the money from the many to provide the wherewithal for financing the various companies appears to be working in the usual fashion, although one stock seller was heard to remark: "It's just a little bit dull, a little bit dull." Some of the promotion literature is decidedly misleading and contains the usual balderdash, such as "Read the report of an expert"; "Others have made millions—you can too"; "This is your big opportunity"; "See the point?" Nevertheless, there is discernible some degree of sincerity, and not all of the companies are merely selling stock. A fair proportion are legitimately spending money conclusively to test the oil possibilities of the locality.

In the *Nevada State Journal* of April 18 there appear three reports, one by E. P. Osgood, another by Lawrence W. Crehore, and the third by A. E. Wiley, all of which review the general possibilities of oil discovery in the Fallon district. There is a fourth article in the same paper by A. J. Moore. All of these reports are optimistic in tone, and there is much that savors of promotion in them. In the *Nevada Mining Press* of April 10, Charles F. Spilman has an article on "Oil Structure and Petroleum Gas Attract Operators to Fallon." In the same issue are two short articles, one by A. E. Wiley and another by Orlando D. Barton, both giving a crude idea of various geological features. Other articles of a news nature by A. J. Moore have appeared in the *Salt Lake Mining Review* of May 15 and May 30. A. L. Robinson is quoted in promotion circulars. By and large, the impression is created, at least in the minds of the unwary, that there are many favorable oil indications in the Fallon district.

To test opinion, six thoroughly qualified geologists, all of whom are taken as authorities in oil geology, were interviewed, and the question of whether geological conditions favored the occurrence of oil in western Nevada or not was put to them. Two geologists were not familiar with the field, and could give no positive opinion. Four were familiar with the field, and expressed doubt that oil would be found in commercial quantity. One of the four said that he had found some oil indications, one indication being the odor of oil at a water well in the district and the other a chloroform



ROTARY RIG, FALLON OIL & GAS CO.

test at a locality a considerable distance removed from the district.

The important question is not the incidental occurrence of oil, but its occurrence in commercial quantity. It is not improbable that some oil will be found in the Fallon district and in other localities where Tertiary lake beds are found.

Lake beds tentatively placed at different horizons in the Tertiary, the Pliocene, Miocene, Oligocene or Eocene, are in evidence at many points in western Nevada. The Truckee beds, west of Reno, the sedimentaries near Fallon, the area east of Mina, the Esmeralda formation, in the Silver Peak area, and west of this area; the Siebert formations at Tonopah and Goldfield, the Furnace Creek area, and an area in the Mohave Desert,

in California, are important localities of Tertiary lake sediments. The correlation of these occurrences has not been thoroughly demonstrated. The most extended résumé is given by F. L. Ransome in Professional Paper 66, p. 95, in his review of the work of King, Hague, Lindgren, Turner, Spurr, Ball, Gilbert, Fairbanks, and Campbell. Ransome says:

There is in western Nevada extending from the 40th parallel down to about the 35th parallel, a chain of remnants of Tertiary lacustral deposits. These deposits are of great volume, estimates of total thickness in the various places where beds are well represented ranging from a minimum of at least 600 ft. (183 meters) at Tonopah to 14,800 ft. (4,511 meters) at Silver Peak. The materials vary from place to place, but are preponderantly volcanic. They include true tuffs, largely rhyolitic, and detrital rocks of a wide range of coarseness derived from all the prelacustrine rocks and probably also from volcanic masses piled up and eroded during the lake period. Diatomaceous beds appear to be rather characteristic of the deposits north of the Death Valley region, while in and south of Death Valley descriptions indicate a greater abundance of clays, with associated beds containing gypsum and borax. Lignitiferous beds, apparently in all cases in the basal part of the deposits, occur from Truckee River southward to the Mohave Desert. The beds are everywhere folded and faulted, and in many places sheets of basalt have flowed over their eroded edges. It is clear that since the period of lacustrine deposition, the region has undergone such deformation and erosion as to entirely remodel the topography; lake beds, for example, now forming the summit of Montezuma Peak, west of Goldfield.

Indications which favor the possible occurrence of oil in these formations are: the presence of diatomaceous beds, "oil shales" (not bearing oils but from which oil may possibly be obtained by distillation), combustible gas (whether marsh gas or derived from petroleum, not being clearly definable in all cases), and a few isolated tests of sedimentaries, which tests appear to show oil. In addition, oil has been reported in a few localities. A well put down in 1907-08, southwest of Reno, in the Truckee beds, reached a depth of 1,890 ft., and in the log (U. S. Geological Survey, Bulletin 381, p. 475), a blue shale showing a little oil was reported at a depth of 1,270 ft.; at 1,545 streaks of coal, and at 1,710 ft. blue shale and a little sand, with water and a little oil. No gas was struck in this well. The log of the Timberlake well, put down by the U. S. Geological Survey, includes indication of oil. To these may be added whatever oil occurrences have been encountered in the Fallon district, although these are susceptible of further proof.

The occurrence of thin lignitic beds at several horizons in the Truckee beds, in the Esmeralda and at other places, may or may not have significance. Robert Anderson, in Bulletin 380, U. S. Geological Survey, describes an occurrence of asphaltite in Eureka County, fifteen miles south of Palisade, in the Pinon range. The asphaltite exists as a filling in fractures within steeply dipping Carboniferous strata. Mr. Anderson says: "There is little doubt that strata in this region at one time contained considerable petroleum. Owing to disturbed conditions of the beds . . . it is likely that almost all, if not quite all, of such oil has escaped or become altered in the derived form of asphalt. Strata of probable Paleozoic age elsewhere in this portion of Nevada are reported to be petroliferous, and it is not impossible that careful study might reveal areas in which conditions are more favorable than in the one here discussed." This occurrence is not of importance with respect to the Fallon area, but is mentioned as having a bearing on the subject of oil possibilities in the Great Basin region.

On the other hand, the fact that the sedimentaries belong to a fresh-water series, and not to readily defined marine strata, may be taken as unfavorable. The occurrence of the diatomaceous beds at upper instead of lower horizons is looked upon by some geologists as unfavorable. The fact that the diatomaceous beds are in many instances intercalated with beds of volcanic ash, and that there exists in the diatomaceous beds often a large proportion of contemporaneous ash and glass, is considered unfavorable. The paucity of organic life and the prevailing volcanism accompanying or preceding sedimentation are other unfavorable factors. Faulting is conspicuous in the occurrences of these lake beds. Despite many exposures of tilted strata, there have been surprisingly few discoveries of seepages and other well-known forms of surface indications of the presence of petroleum.

DERRICK USED WITH ROTARY RIG

On the whole, the unfavorable overbalance the favorable factors, but it is worth while to prove or to disprove conclusively the commercial oil possibilities of the Tertiary lake beds. In the present activity at Fallon there is an excellent opportunity for co-operative work. Little will be gained by indefinitely multiplying companies or in farming the public for money which may be uselessly spent. Let the companies which have started

wells push a sufficient number to a depth to prove the presence or absence of oil in commercial quantity. Let them prorate the expense for this work in an equitable way. They will best serve their own and conserve their stockholders' money by this procedure. If they are successful—and everyone wishes for their success—they will have the satisfaction of knowing that they have extended greatly the productive oil areas of the country.

Comodoro Rivadavia Field, Argentina

State Has Practically a Monopoly on All Oil Produced—Oil Discoveries in Other Sections

THE petroleum trade of Argentina, according to *Commerce Reports*, is controlled by three distributing agencies: La Comisiôn Explotadora del Petróleo de Comodoro Rivadavia, whose headquarters are at Buenos Aires; the Anglo Mexican Petroleum Co., with headquarters at Buenos Aires, and the West India Oil Co., whose main storage tanks are at Campana.

In addition to the output of the state-owned wells, small amounts of petroleum are produced by private companies in the Comodoro Rivadavia field, which is situated about 850 miles south of Buenos Aires, in the vicinity of the Patagonian port of the same name.

In 1907, when oil was discovered, a decree was issued forbidding private exploitation within a certain radius of Comodoro Rivadavia, and exploration was begun by the General Board of Mines, Geology, and Hydrology of the Argentine government. Development proceeded slowly, however, and by the end of 1910 only seven wells had been sunk, four of which were not producing. By June, 1918, the number of wells actually producing had increased to forty, in addition to which number fifteen had been abandoned or were temporarily closed for repairs, and twenty-one were being bored. The operations of the several private companies in the Comodoro Rivadavia field are still largely experimental. Extracts from recent reports of these companies show that practically all the oil which they produce is shipped north to the consuming markets in government tankers and sold by the government distributing agency, thus enabling the government virtually to maintain a monopoly on all of the oil produced in the country.

The Comodoro Rivadavia oil is heavier than the better grades of oil produced in the United States and has heretofore been used almost entirely as fuel, although the statement has been made that it will distill readily. It has an asphalt base and a specific gravity ranging from 0.922 to 0.940, according to the U. S. Geological Survey, and on distillation yields 1.5 to 3.5 per cent of naphtha and gasoline, 15 to 19 per cent of illuminating oils, and 77 to 85 per cent of lubricants, fuel, and coke.

Oil has been discovered in three sections of Argentina besides the Comodoro Rivadavia field. One of these deposits, known as the Salta Jujuy field, is in the Provinces of Salta and Jujuy near the Bolivian border, and is entirely inaccessible at present except over the long, single-track government railway from Tucuman north to the Bolivian border. Another of these deposits, known as the Cacheuta field, is a few miles southwest of Mendoza, near the Chilean border. The third is the Neuquen field, where the government is planning to undertake some exploration work during the present year. This last is considered the most promising of the three fields.

Wells Drilled Near San Diego, Cal.

A number of wells that were carried to depths of more than a thousand feet have been drilled around San Diego, according to the U. S. Geological Survey. One of the first of these wells was the Chula Vista oil well, which reached a depth of 1,812 ft. without striking oil. A few years ago a deep well was put down on the south side of Otay Valley by the Otay Oil Co. About the same time the Lo Tengo Oil Co. sank a well 3,400 ft. deep on the south side of Otay Mesa. Both these wells afforded showings of oil and gas. The Tia Juana well, which was lately taken over by the Community Oil Co., went 1,405 ft. without encountering oil except a questionable show.

Two wells were put down by the San Elijo Oil Co. at Sorrento. The first well was sunk 1,599 ft., the second 1,303 ft. Oil and gas are reported to have been noted in both wells. The Puterbaugh well, at Morena, is reported to have gone 1,200 ft. without affording encouraging results. The Clark well, about five miles northeast of Encinitas, in Sec. 26-12-4, penetrated Eocene strata for 2,125 ft. without showing any satisfactory indications of oil.

A well recently abandoned was the Balboa, in Mission Valley, which was drilled to a depth of 5,625 ft. This well disclosed the interesting fact that sedimentary beds more than a mile thick underlie this part of San Diego County. The greater part of these beds belongs to the Cretaceous system, but whether they lie approximately flat, as do the overlying Eocene beds, has not been determined. Possibly they are somewhat folded, so that the distance drilled is more than the actual thickness of the beds.

Mexican Pipe Lines Nearing Completion

The Mexican Gulf Co.'s 10-in. pipe line from the lower Tepetate fields to its terminal at Prieto, a distance of sixty-five miles, is nine-tenths completed, according to the July issue of *Oil Trade Journal*. The line parallels its 8-in. line, which covers the same distance. In addition, the company has completed two 8-in. lines from Tepetate to Los Naranjos, giving a continuous run from the Prieto terminal to Los Naranjos. There is also being built a 10-in. line from Tepetate to Tolteca and an 8-in. line from Los Naranjos to Lot 146, Amatlan district. Four temporary pumping stations will soon be finished.

With the construction of the pumping station at Prieto the company will have a loading facility of 7,500 bbl. an hour. By July, according to an official, deliveries in Tampico should be at the rate of 2,000,000 bbl. of oil a month, for which there will be facilities for exporting.

The Huasteca Petroleum Co.'s new 10-in. pipe line from Tampico to Cerro Azul, a distance of sixty-five miles, is expected to be completed by Aug. 1. Twenty-five miles have already been laid and the pipe has been distributed along the way for about sixteen miles in addition.

NEWS FROM THE OIL FIELDS

Storms Damage Properties in Burkburnett Field

Texas Company Building Houses for Employees—Other Activities from Texas Districts

From Our Special Correspondent

Lightning struck a big oil tank of the Texas Pipe Line Co. in the Burkburnett field recently, igniting the contents. The loss was complete. Two bad storms also blew down many derricks. In spite of this, however, the production increased 5,000 bbl.

At Port Arthur, the Texas Co. has begun to solve the housing problem of its employees. It has purchased 100 residence lots in one of the better sections of the city, and has started to build twenty houses for office employees. More will be added later. In another section of the town the first unit of forty-two houses for Mexican workmen has been completed. These are three or four-room houses, with modern conveniences. This Mexican settlement will cover three city blocks, and will contain community centers as well as the dwelling houses.

A new well being drilled by the Republic Production Co. in the Breckenridge field, Stephens County, recently blew the tools out of the well and damaged the casing. Gas at the rate of 10,000,000 cu.ft. daily went to waste, and the initial flow of oil was over 2,000 bbl. daily, it was reported. The casing is so badly damaged that it is doubtful if the hole can be cleaned. Just north of Breckenridge, the Humble Oil & Refining Co. has brought in a well on the Dickey tract, flowing by heads. As the sand has barely been penetrated, it is believed the well would make a much larger production if drilled deeper, but the pipe-line facilities are not sufficiently large to handle any more oil at present. The No. 3 well of the Oklahoma Petroleum Co., on the Walker-Caldwell land, three miles east of Breckenridge, has made a head of oil. The well will be drilled deeper.

Deep drilling on the southern Gulf Coast section is being done by the Kleeberg County Oil & Gas Co. in its No. 2 Ross well, now below 3,600 ft. It is also reported that the No. 1 Champion well of the Grande & Gulf Oil Co., twenty miles north of Brownsville, Cameron County, will be sunk to a depth of 7,000 ft. if oil is not found before that depth is reached. The well is now 2,000 ft. deep.

In Brazoria County several new wildcat wells are being sunk east and northeast of Angleton. Gas in water wells in this section was discovered several years ago. In this same county, at Stratton Ridge, the Freeport Sulphur Co., Humble Oil & Refining Co., Texas Co, and others still continue to drill wildcat wells. West Columbia, in this county, still continues to make the largest oil production of the coastal domes.

At Goose Creek, Harris County, the daily production during the week ended July 10 increased to 17,000 bbl., compared with about 15,000 bbl. during the preceding week.

Natural Gas Production Figures

From Our Washington Correspondent

The U. S. Geological Survey has just reported the 1918 production and consumption figures for natural gas. These figures show that a little over 720 billion cu.ft. was produced and marketed that year. The value of this production at 21¼c. per M. is a little over $153,000,000. As usual, West Virginia, Oklahoma, Pennsylvania, and Ohio lead in the production, ranking in the order named. Pennsylvania, Ohio, West Virginia, and Oklahoma is the order of consumption, showing, as usual, the large export of gas from West Virginia to Pennsylvania and Ohio, and the considerable exports from Oklahoma to Kansas and adjacent territory.

There is a wide range in the average price at which natural gas is sold by the producer in various parts of the country. The figure for Wyoming is 3.59c. per M.; in New York 67.05c., and Michigan 89.08c.

There is a decided tendency toward an increase in the percentage of gas sold for domestic users and a corresponding decrease in the percentage used industrially. This is in line with the recommendations of the Conservation Commission which has recently been studying the subject, the natural result of the gradual increase in the price at which gas is sold tending to make its use industrially less advantageous than formerly. This report shows that the 7,100 producers supplied 2,500,000 domestic consumers and 16,500 industrial consumers. The average price paid by the former group is 31.35c. per M. and the latter 15.23c. The total volume of gas used industrially is, however, still considerably greater than that consumed in domestic equipment, amounting to about 60 per cent of the total. Of this manufacturing takes slightly more than the production of industrial power.

Although about 30 per cent of the wells drilled in 1918 were dry the total number of wells productive at the end of the year had increased by about 1,000 over the number productive at the beginning of the year. The total productive Dec. 31, 1918, was 40,369.

The discovery of oil in Southern and Southwestern Alaska has been reported, and it is stated that 35,000 acres has been filed upon by prospectors.

Operators Leaving Lee County, Ky.

Activities Transferred to Other Oil Sections of the State—Eastern Districts Expect Development

From Our Special Correspondent

A movement of oil operators from the Lee County fields to Johnson, Magoffin, Morgan, and others of the more eastern counties of Kentucky is beginning, according to oil men returning from that district. They report that the frenzy of development there is over, and almost every train carries away one or two drilling rigs to Paintsville, county seat of Johnson County, and other points in that region. The wells in these eastern counties are the deepest in the state, none finishing short of 1,500 ft., and the production is from a "second sand."

Two important transactions have taken place in the eastern territory. A tract of 500 acres, with two producing wells, averaging 30 bbl. each, was sold for $350,000. Another tract of 90 acres, with one producing well, good for 50 bbl., sold for $90,000. The latter is considered an exceptionally high price. Both tracts are in Johnson County. The purchaser is not known, but is understood to be one of the larger oil companies. Considerable development is anticipated in consequence.

In Warren County, M. Roulen, of Paris, France, has drilled in a large producing well on the Kirby farm. He has put up three 250-bbl. tanks and two 100-bbl. tanks for the output, and is running two machines which are drilling Nos. 2 and 3 A modern pumping house has been installed.

No. 5 on the Wainscott lease in Allen County is reported completed at 321 ft., 80 ft. under the shale. It is rated at 200 bbl. flush production.

Gas Shortage Predicted in Oklahoma

From Our Special Correspondent

Warning has been sounded by the Oklahoma Gas & Electric Co., of Oklahoma City, Okla., to the public to make preparations for a fuel supply during the "gasless" months next winter or there will be greater suffering than in 1919. Gas companies throughout the state have launched propaganda campaigns to this effect, but so far to little avail.

The Frantz Corporation is preparing to sink a test well about nine miles northeast of Boulder, Col. The company's geologists anticipate that oil will be found at a depth of 2,500 to 3,000 ft. Leases on several sections of land have been secured by the company, and drilling equipment is being assembled.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

PENNSYLVANIA

Copper Process Co. Loses Bond Suit

Judgment of Lower Court Sustained—Parties Accused of Fraud and Connivance by Bonding Company

Judgment against the Copper Process Co. in its five actions against the Chicago Bonding and Insurance Co., rendered in the U. S. District Court for the Eastern District of Pennsylvania, has been affirmed in the Court of Appeals, Third Circuit. The actions were on five bonds of the defendant company, each for $52,400, given the copper company to assure performance by the Bird Coal & Iron Co. of five contracts for the sale and delivery of pig iron.

The record in the case is voluminous. Each contract, as set out by the Copper company, provides for the purchase by it and the sale by the Iron company of 4,000 tons of Talladega pig iron of a given analysis during a given month at the price of $13.10 per ton delivered f.o.b. Talladega, Ala. The defendant pleaded two defenses, and introduced evidence tending to show (1) that its indemnity bonds did not cover contracts for purchase monthly of 4,000 tons of pig iron at $13.10, but for the purchase monthly of 2,000 tons at $26.20, and that the contracts covering 4,000 tons at $13.10 had been substituted; (2) that it was induced to enter into the bonds by fraud of the Iron company with the knowledge and connivance of the Copper company.

That it was induced to enter into its undertakings by fraud and gross misrepresentations of the Iron company was not seriously disputed by the Copper company, whose position was that it was not a party to the fraud and was ignorant of it.

The substance of defendant's testimony was that the Copper company was not at any time concerned in any business other than its transactions with the Iron company; and that the Iron company had as its one asset an interest in an option or arrangement with Ladenburg, Thalman & Co., of New York, for the operation of a blast furnace at Talladega, Ala., which had long been out of use. When the Iron company was practically without funds or tangible assets, it entered into the five contracts at $13.10 a ton, a price in the Birmingham district, little, if any, above the cost of production. With these contracts made, the two companies entered into another contract, called the "Underlying Agreement," reciting the five contracts and providing for an advance or payment by the Copper company to the Iron company of $75,000, with numerous other details. The curious feature of this agreement was that it contained no provision for the return or repayment to the Copper company of the money so advanced.

To induce the bonding company to enter into the bonds, an officer of the Iron company supplied defendant with certified copies of what purported to be its pig-iron contracts with the Copper company, but not for 4,000 tons a month at the suspiciously low price of $13.10 a ton, as actually called for by the contracts, but 2,000 tons a month at $26.20 a ton, or about market price. Defendant's agent was shown what purported to be an engineer's report of the property, and an inventory and a financial statement of the Iron company. He was informed that the Iron company had $75,000 to its credit, verified by letter from the depository bank, which was represented as money from the sale of stock; that it owned 2,511.5 acres of ore land; and possessed total assets of $1,360,650.

When the transactions were reported to its home office within a few weeks, it immediately made disclaimer, this being about May 1. The Iron company breached its first contract in June; in fact, it delivered no iron under any of the five contracts. There was evidence that the two companies were controlled by the same officers, that the president of the Copper company assumed control of the funds of the Iron company on its failure to perform its sales contracts; stopped payment on checks at will; controlled its directorate by his nominees; and in July and August caused it to vote for his protection a bond issue of $500,000 and notes to the amount of $750,000.

The questions of fact were presented to the jury, which found against the Copper company, upholding contentions of the defendant, and judgment was rendered accordingly, and this was affirmed on appeal.

KENTUCKY

Virginia Iron Loses Suit To Quiet Title to Mineral Lands

The decree for A. S. Webb and G. B. Hoppin, defendants in the suit brought against them by the Virginia Iron, Coal & Coke Co. to quiet title to the minerals underlying certain parcels of land in Perry County, Ky., has been affirmed by the United States Circuit Court of Appeals for the Sixth Circuit. This court held that a grantee of mineral lands was charged with constructive notice of the rights of other persons then in possession of and living on the land and claiming under deeds without mineral reservations, which were recorded, to the extent of the boundaries in such deeds.

ARIZONA

Judgment Against Calumet & Arizona Reversed

Facts Held to Establish Contributory Negligence of Deceased Employee of the Company

On its appeal to the Supreme Court of Arizona, the Calumet & Arizona Mining Co. has secured from that court a reversal of the judgment rendered against it for death of its former employee, Jesse Gardner, in its smelter at Douglas, Ariz. The case has been remanded to the trial court, with directions to that court to dismiss the action.

In its opinion, the court lays down the measure of damages for death of an adult son, where death is caused by negligence of the employer, as being the reasonable expectation of the parent of pecuniary benefit from the son had the son lived. Where the workman, experienced and skilled in handling electric switches in controlling machinery for pouring copper and skimming the slag, is killed when he reached for a switch safety handle without looking, and grasped a live blade, the court held the company entitled to a verdict, on the ground that deceased was guilty of contributory negligence, for which, under the conditions, the company properly could not be held responsible.

CALIFORNIA

Calaveras Copper Co. Must Pay Compensation

Andy Jordan Held by California Supreme Court To Be Acting Within Scope of His Employment

The Supreme Court of California has denied a hearing to the Calaveras Copper Co. in its petition to reverse the award of compensation made to Andy Jordan, an employee, under the Workmen's Compensation Act, thus making the award for the injuries sustained by Jordan final.

Jordan was employed by the copper company as a truck driver about its property at Copperopolis, Cal., and at the date of the injury had been instructed to do some hauling for one of the company officials. In order to haul a bigger load, Jordan concluded to put additional sideboards on the truck, and to secure the materials he went to the company's saw mill and started a ripsaw. Here he was injured by the ripsaw. The company contended that Jordan was injured while acting outside of his scope of employment and thereby not entitled to compensation, but the court held that his injury resulted from causes incident to his employment.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Joint Conference Committee of F. A. E. S. Clears Up Some Points

Object, Name, Representation, Finances and Machinery Are Discussed in Some Detail

OBJECT OF FEDERATION

The object of The Federated American Engineering Societies as declared in its Constitution, and as has been repeatedly stated,

> "Shall be to further the public welfare wherever technical knowledge and engineering experience are involved and to consider and act upon matters of common concern to the engineering and allied technical professions."

Notwithstanding this, the statement is repeatedly made that the organization does not deal with the interests of the individual engineer and of the allied technologists. The purpose of the organization is that of service first to the nation, state and community, and second, to the profession, which obviously must include the interests of the individual. While it is true that it does not deal with the interests of the engineer and technologist as does a labor union for its member, nevertheless its work will do more ultimately to advance the interests of the individual than a labor union could possibly do, because the advancement of the profession through a greater recognition by the public of the engineer and allied technologist, and the greatly increased solidarity and higher standards of these professions, must unquestionably work for their ultimate good.

NOT A NEW ORGANIZATION

The Joint Conference Committee, among others, has referred to The Federated American Engineering Societies as a "new" organization. This is not strictly correct. While the name is new, the organization will be a successor to the existing Engineering Council, whose work will be amplified and carried on on a much more extended plan as to scope and membership.

HOW AND WHY THE NAME WAS SELECTED

There has been considerable comment on the name of the new organization. Probably no detail caused the Committee on Constitution and By-Laws of the Organizing Conference more serious thought than the question of a suitable name. The purpose was to secure a short title that could readily be used, and many suggested names were rejected for good and sufficient reasons. The Committee decided that the name of the organization should be indicative of its character, based on the fundamental resolution of the Organizing Conference, that it should consist of societies and not of individual members. The words "Association," "Confederation," "Federation," and others were suggested and considered and all were rejected and finally as a compromise the word "Federated" was unanimously agreed to. In view of the fact that other countries are looking with interest on this movement with the probability that there will be similar organizations formed in those countries, it was felt desirable that some distinctive name should be given the organization in this country, and so the word "American" was inserted. Objection to this was made on the ground that this country is the "United States of America" but the answer was that the soldiers of this country fought in Europe as "The American Expeditionary Forces" and have been internationally so recognized. It was thought undesirable to use so long a name as Engineering and Allied Technical Societies, especially in view of the fact that engineering as defined in the preamble of the Constitution is an all-inclusive word, and it was, therefore, decided to use only the word "Engineering" in the title. Hence the name "The Federated American Engineering Societies."

It is probable however, that when the organization begins to function it will be referred to rarely as The Federated American Engineering Societies but will be called the American Engineering Council which is the executive body of the organization.

BASIS OF REPRESENTATION

There seems to be difficulty in understanding what the basis of representation should be where a state organization exists and where there are also strong local organizations and affiliations. The Constitution provides that a state council or organization, representative of the engineers and allied technologists in the state, can be represented on the American Engineering Council on the basis of all the engineers and allied technologists in the state. If, however, there exists a strong local organization or affiliation which elects to have its own representative or representatives on the Council, then the state council or organization is entitled to representation on the basis of all the engineers and allied technologists in the state, less the engineers and technologists that are to be represented through their local organization or affiliation. This will not prevent the local organization or affiliation from participating in the work of the state council or organization in the consideration of matters affecting the state only.

NO PROVISION FOR DUES

The Joint Conference Committee has received several letters inquiring as to the provisions for dues. The Constitution and By-Laws provide for funds contributed by the Member-Societies for the support of The Federated American Engineering Societies. Inasmuch as it would be unreasonable for a small local society to pay as large a contribution as a national society, the Constitution provides that the contribution shall be on the basis of the number of members in the organization at the rate of $1.50 per member for national societies and $1 per member for local, state and regional organizations or affiliations. The individual, therefore, does not directly pay any dues but the Member-Society of which he is a member contributes to the support of The Federated American Engineering Societies on a per capita basis of its membership. It, therefore, follows that any one who is a member of several organizations which hold membership in The Federated American Engineering Societies will be counted in the total membership of each society as a basis of its contribution.

ORGANIZATION NOT CUMBERSOME

It has also been stated that "the machinery proposed is somewhat elaborate and appears to be cumbersome and expensive." The Joint Conference Committee can see no basis for this statement. The By-Laws provide that

> "Any Society or organization of the engineering or allied technical professions whose chief object is the advancement of the knowledge and practice of engineering or the application of allied sciences and which is not organized for commercial purposes, is eligible for membership."

The Federated American Engineering Societies will function through the American Engineering Council, which will meet either annually, or biannually, as it will determine. This American Engineering Council will consist of representatives from the Member-Societies on the basis of one representative for from 100 to 1,000 members and an additional representative for each additional 1,000 members or major fraction thereof. From this body of representatives will be formed an Executive Board of thirty, consisting of six officers and twenty-four other members selected in part from the national societies and the remainder from the local, state or regional organizations or affiliations. The plan reported by the Committee on Constitution and By-Laws provided that the representation on the Executive Board

should be based on the ratio of the total number of members in the national societies to the total number of members in the local, state and regional organizations or affiliations. The Organizing Conference however changed this to the ratio of the number of representatives from the national societies to the number of representatives from the local, state and regional organizations or affiliations, on the American Engineering Council. This Executive Board will meet monthly or as often as may be found to be necessary to properly transact the business of The American Engineering Council. There will be an executive officer who will also be the secretary of these bodies and who will be entrusted with carrying out their instructions.

As a matter of fact, the American Engineering Council thus created is less cumbersome or unworkable than the present Engineering Council; furthermore it has the distinct advantage of being more democratic and broader in its scope and membership.

ORGANIZATION CONSERVATIVELY FINANCED

As to the statement that the organization is expensive, it is pointed out that on the basis of the present membership of Engineering Council the income from the contributions provided in the Constitution of The Federated American Engineering Societies would be about $75,000. At no time in the history of its existence has the budget of Engineering Council exceeded $50,000. Provision is made, however, that

> "The Executive Board shall, whenever practicable, provide for the whole or a part of the expense of members or of representatives attending its own meetings and those of the Council."

On the basis of past experience, it is estimated that if the expenses of all the representatives on American Engineering Council and of the members of its Executive Board were paid to each meeting of these bodies, there would be involved an annual expense of about $25,000. The purpose of these expenditures was to secure a full attendance of the representatives of The American Engineering Council and of the Executive Board, especially during the earlier years of the organization. As will be noted in the excerpt from the Constitution the expenses of representatives of the Council and members of the Executive Board will be provided from such funds as may be available. If, in the judgment of the Executive Board, this money should be required for more urgent work, the expenses of the representatives and members would not be provided for. It seems to the Joint Conference Committee that it would be highly desirable to have sufficient funds to pay the expenses of this representative body of men who contribute their time for the good of the engineering and allied technical professions. The payment of these expenses is the only part of the organization that can be said to be expensive.

ORGANIZATION DEMOCRATIC

It has also been stated that the form of organization that has been set up is "autocratic, not democratic."

If a democratic organization is taken to mean one in which its constituents have a voice in its affairs, then the Federated American Engineering Societies is truly a democratic organization. Member-Societies of this organization are represented on the American Engineering Council, which has full power to control and to direct the activities of the American Engineering Council and of its Executive Board and can determine whether it is necessary for the former to meet annually, biannually, or tri-annually, or how frequently the latter shall meet.

THE OPPORTUNITY

The Joint Conference Committee is unqualifiedly of the opinion that an opportunity has been created for bringing about a solidarity of the engineering and allied technical professions that has never heretofore been available and that the success of the movement will depend on the whole-hearted support of each American engineer and of each technologist, who, if determined that this movement shall succeed, will obviously not bother with the details or the form of organization, in his effort to secure the end desired.

The First Citizen of America

The Manchester Guardian (England) said recently, referring to the Presidential nominations in the United States: "It is impossible for European observers of the American scene to refrain from speculating upon the profoundly significant difference that would have been made in the outlook had either of the two great parties bestowed the Presidential nomination upon the one great American citizen, apart from President Wilson, whose name is familiar to the whole world. There are millions of America's well wishers in Europe today who will ask with keen interest and deep concern: 'What is to be the decision of that great body of instructed, earnest American opinion, of which Herbert Hoover was the chosen leader?' "

Mining Engineers at the Conventions

Probably there were a number of mining men in attendance at the great Presidential nominating conventions; so far three have come to the knowledge of the *Engineering and Mining Journal*. Among the delegates to the Republican Convention at Chicago were O. C. Davidson, general superintendent of the Oliver Iron Mining Co., from the Twelfth Michigan District, and John C. Greenway, general manager of the Calumet & Arizona Mining Co., of Arizona. Among the delegates to the Democratic Convention is C. H. Benedict, of Lake Linden, Mich., mill metallurgist of Calumet & Hecla Mining Co.

Madagascar's Graphite Industry Growing Since 1914

Madagascar's graphite deposits are very numerous and are marked by lines of outcrop running eastward to the center of the island pretty much throughout its length, from Cape Amber on the north to Fort Dauphin in the south.

Madagascar graphite is much sought after for metallurgical crucibles because of the following properties: It has a very high carbon content; its flakey texture gives the crucible a woodlike structure, yet increases its strength and prevents cracking; the iron and silica contents are very low. In fact this graphite should prove a desirable substitute for the best Ceylon graphite, according to *Écho des Mines et de la Métallurgie*, Paris.

During the period between the beginning of rational exploitation of the Madagascar deposits in 1905 and the year 1913, the exploiters sought to perfect concentrating machinery, but the consumers of graphite were not familiar with the Madagascar article and it proved very difficult to bring them to appreciate its true value. Therefore progress had been slow; but the great demand and consumption induced by the war made it possible to perfect the mining and preparative methods and made the product better known. In 1917 35,000 tons (metric) were produced on the island and 26,000 tons were exported; in 1918 the exports fell to 16,000 tons by reason of the halt in transportation means during August and the complete cutting off of the American market. Otherwise the 1918 production would have amounted easily to 50,000 tons.

A study of the Madagascar graphite deposits and industry was contributed by Mr. Lavila to the *Bulletin Économique de Madagascar et Dependences, 1919*, giving in considerable detail the exploitation, treatment, and mechanical concentration by dry and by wet methods, by electrostatic separators, and by oil flotation.

Breakfast by French Engineers

The officers of the Féderation des Ingénieures gave a breakfast on June 19 at Langer's to their colleagues and friends in the French Parliament and to the directors of the great schools of civil enginering, says a report in *L'Écho des Mines et de la Métallurgie*. During the dessert M. Paul Petit, one of the presidents, set forth the origin, the purposes, and the aspirations of the Féderation, which now embraces more than 10,000 engineers. The dean of the Senate, by seniority, M. Denis, replied by praising the advantages of the organization; and M. Bochet, director of the École Centrale, congratulated the country on the lively interest shown by the great engineering associations in the moulding of their young colleagues and in the part they are summoned to take in the economy of the industrial and social future of France.

Technical Papers

Use of Oil Fuel.—The July number of *Industrial Management* (120 W. 32 St., New York, 35c.) contains an article entitled "The Efficient Burning of Fuel Oil, a Summary of Good Practice." Many engineers are shifting from coal to oil burning. Too often the fireman thinks that all that is necessary is to turn on the oil valve and admit enough air to prevent heavy smoke. This article points out some of the things which must be watched to secure maximum economy. The oil should be filtered through about 40 mesh and heated to about 125 deg. F. for steam- or air-type burners, and to 150 deg. for mechanical burners. Air for combustion should be regulated by the damper or blower and the ash-pit doors left wide open. The oil pressure depends on the type of burner: about 30 to 50 lb. for steam-jet burners and 100 to 150 lb. for mechanical pressure burners. Several types of burners are described; rotary burners are coming more and more into use; 200 to 350 lb. of oil per burner hour are commonly used in stationary practice. A well-constructed furnace and proper care of burners are essential to the best work.

Helium—The Mines Branch of the Department of Mines, Canada (Dr. Eugene Haanel, Director, Ottawa), has issued a "Report on Some Sources of Helium in the British Empire," by J. C. McLennan and associates. The report covers investigations made of the helium content of various natural gas supplies in Canada, where, it is stated, the largest sources of supply in the empire are available. Experiments on a semi-commercial scale were made, followed by the working out of the technical details in connection with large-scale production and purification of helium. It is estimated that the gas can be produced at less than 25c. per cu.ft. at normal pressure and temperature. The natural gases of Ontario, Alberta, and British Columbia were examined.

Safety Lamps—Although written primarily for use in the trade-extension classes organized in coal-mining communities, "Safety Lamps," (Bulletin No. 42, Trade and Industrial Series No. 12, issued by the Federal Board for Vocational Education), will be found suggestive for discussion purposes and instruction in the metal-mining field. The principles of safety lamps, construction, and requirements are detailed, with descriptions of the various types.

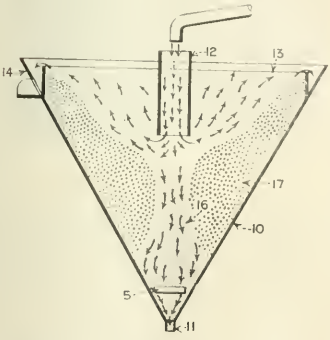
Mine Safety Standards—Bulletin No. 9 of the Colorado Bureau of Mines includes a number of rules dealing with the above-named subject. Although the standards contain nothing new, and in general follow the rulings outlined by most operating mining companies, it is commendable that the state has placed its sanction on the work that is being done in accident prevention. Many of the standards are applicable to quarries, mills, and smelters as well as to mines.

Talc and Soapstone—A list of some 79 uses for these materials is contained in a 9-page pamphlet of the U. S. Bureau of Mines *Reports of Investigations* series, for May.

Recent Patents

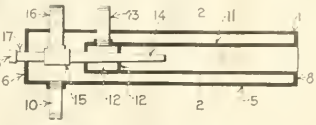
1,339,682. Settling-Basin Separating Device. Charles Allen, El Paso, Tex. Filed July 3, 1917.

A method of preventing irregularity in the discharge of solid particles through the outlet orifice of a dewatering settler adapted to accumulate a substantial bulk of settled material which consists in filling the space centrally above the orifice and below the level of the settled material in a manner to leave an attenuated passage for the settling solids extending from and above the discharge orifice for an appreciable distance.



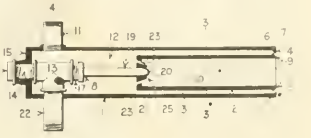
1,339,580. Combustion-Gas and Crude-Oil Burner. Benjamin F. Runyan, Houston, Tex. Filed Sept. 6, 1919.

A burner comprising a pressure fluid casing open at one end, a combustion casing open at one end, having a plurality of atomizing apertures, said combustion casing being disposed within the fluid pressure casing and connected at its open end to the fluid pressure casing, the remainder of the combustion casing being spaced from the inner walls and end of the pressure fluid casing, a pressure fluid inlet member communicating with the pressure fluid casing adjacent its closed end, an oil inlet member extending through the pressure fluid casing diametrically opposite the pressure fluid inlet, a nozzle carried by said oil inlet member, said nozzle extending through the end of the combustion casing, a perforated plate surrounding the nozzle within the combustion chamber adjacent the closed end thereof, said plate co-operating with said closed end to form a gas chamber, and a gas inlet extending through said pressure fluid casing and into the gas chamber.



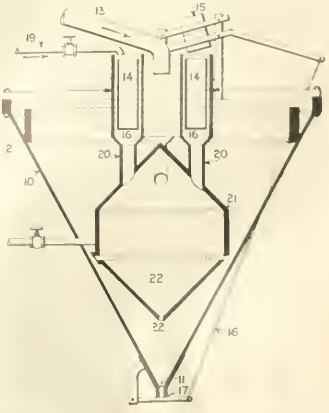
1,339,579. Crude-Oil Burner. Benjamin F. Runyan, Houston, Tex., assignor of one-half to Joseph O'Donnell Decuir, Houston, Tex. Filed June 25, 1919.

In a crude-oil burner, the combination with a casing having steam and oil chambers and provided with a mixing chamber, of means adjacent the opposite ends of the mixing chamber for spraying the oil and the combined oil and steam at angles toward each other, whereby the sprays may impinge at a point tangentially to the oil spray.



1,339,681. Slime-Pulp Thickener. Charles Allen, El Paso, Tex. Original application filed June 9, 1917. Divided and this application filed Oct. 5, 1918.

In a thickener for slime pulp, a settling tank having a controllable orifice for the discharge of thickened material, a fluid column in hydrostatic balance with the thickening material and adapted to contain fluid of fixed density whereby variations in the density of the thickening material will cause a change in the elevation of the fluid in said column, means actuated by the rise and fall of the height of the fluid in said column to control the sizes of the discharge orifice, and a cone-shaped baffle member at the bottom of the fluid chamber overlying the discharge orifice for the purpose mentioned.



MEN YOU SHOULD KNOW ABOUT

Sidney Paige has gone to South Dakota to continue his study of the Homestake orebody.

Lewis A. Levensaler, mining engineer, has opened offices at Suite No. 902, Hoge Building, Seattle, Wash.

C. M. Weld, mining engineer of New York City, is in West Virginia for a fortnight on professional business.

Philip S. Smith, administrative geologist of the U. S. Geological Survey, arrived at Fairbanks, Alas., July 14.

W. J. West, general superintendent for the Oliver Iron Mining Co., in the Virginia district, is recovering from an operation at Pocono Manor, Pa.

Donald M. Liddell, chemical engineer and metallurgist, 66 Broadway, New York City, who was in Joplin, Mo., recently, has returned to New York.

Henry M. Parks, director of the Oregon Bureau of Mines, who has been in New York recently on professional business, has returned to Corvallis, Oregon.

Bulkeley Wells, general manager, was at Pandora, Col., when the Smuggler-Union flotation mill was burned. He lost his own house and its contents in that fire.

F. W. Farnsworth, of Cincinnati, Ohio, president of the Chippewa Iron Mining Co., has completed an inspection of the company's Vermilion Range property.

Donald D. Smythe, of Bisbee, Ariz., geologist on the staff of the Phelps Dodge Corporation, recently examined mining properties near Ajo and Gunsight, Ariz.

William A. Clark, president, and **Chas. W. Clark**, general manager, were recent visitors to the United Verde Copper Co.'s mines at Jerome, and the smelter at Clarkdale, Ariz.

Karl Baumgarten, mining engineer of San Diego, Cal., examiner of U. S. War Minerals Relief Commission, has returned to Washington, D. C., from a month's trip to Oregon and California.

Hoyt S. Gale, who has been in South American for several months engaged in potash and nitrate investigations, is en route to the United States. Mr. Gale is expected to arrive in New York, July 28.

Charles D. Kaeding, vice president and general manager of the Candelaria Mines Co., of Reno, Nev., and consulting engineer of the Rochester Nevada Silver Mines Co., of Rochester, Nev., was in Reno, Nev., on July 5.

Harvey B. Small, mining engineer, who has returned from Colombia, South America, has left New York to examine mining properties in Tennessee, and will go thence to California to look after personal mining interests.

George L. Kaeding, in charge of operations at the Cortez Consolidated mine, was brought to Reno July 3 suffering from an attack of ptomaine poisoning. He quickly responded to treatment and will soon be out.

Sam C. Soupcoff, engineer with the American Smelting & Refining Co., was in Reno, Nev., July 4 on his return from a professional trip to the Yerington district. He has returned to his headquarters at Salt Lake City, Utah.

D. B. Scott, general manager of the American Silver Corporation, Mogollon, N. M., has resigned and left for California. Mr. Scott was also general manager for the Socorro Mining & Milling Co. before it was acquired by American Silver Corp.

G. F. LAUGHLIN

G. F. Laughlin, who was assigned as chief of the Mineral Resources division of the U. S. Geological Survey some months ago, though just now free to assume those duties, has been with that bureau since 1906, and has had a wide experience with both metals and nonmetals. He is better known as a specialist in building materials. He was formerly engaged entirely on the metallic resources of the country, and has been in charge of both the sections of the division he now heads.

Dr. Laughlin was born in Hyde Park, Mass., in 1880 and after graduation from Boston Latin in 1898 he studied sciences at Massachusetts Institute of Technology, receiving his Sc.B. from her in 1903. Later he earned a Ph.D. from Yale University. From 1906 to 1912, while instructor in economic geology at Yale, he devoted his summers to work for the Federal and the Connecticut geological surveys. During this time he studied the clays and clay industries of the state and assisted in preparing an educational series of the rocks of the state. He has done metalliferous work in the zinc-bearing sections of Leadville, Col., and Eureka, Nev., in Oregon and other western states.

During the war Dr. Laughlin prepared, from information at hand in Washington, a very satisfactory map classifying the road metals of France, which was early in the hands of the American Expeditionary Force.

W. P. Snyder and **C. D. Dyer**, president and vice-president respectively of the Shenango Furnace Co., have completed a visit to the company's Minnesota mines, making the trip on the steamer "W. P. Snyder Jr.," flagship of the Shenango fleet.

Lieut. Col. William Kelly, U. S. Engineer Corps, has been appointed by the President to serve with the Federal Power Commission as Engineer Officer. Much of Col. Kelly's experience in the Engineer Corps has been in California, where he has been brought in contact with water power problems.

E. R. Shorey, professor of mining and metallurgy, University of Wisconsin, is studying the mines and mills of the Black Hills, S. D. Prof. Shorey is accompanied by a number of mining students of the university, and before they return the class will visit mines in Montana, Idaho, and Arizona.

R. T. Walker, manager of U. S. Smelting & Refining Co.'s ore-purchasing department at Salt Lake City, has been promoted to their exploration department, and **M. Wallace Wooley** becomes office manager of the ore-purchasing department. **J. C. Brumblay**, the company's representative in Nevada and California for some years, will do ore-buying in the field.

W. Pellew-Harvey, of Pellew-Harvey & Co., London, England, is in Victoria, B. C., and will spend some months in a general survey of the mining development and possibilities of the province. Mr. Pellew-Harvey practiced engineering in the Canadian West twenty years ago and later moved to London. He is said to be in America on behalf of a syndicate of British capitalists.

P. G. Beckett, general manager for the Phelps Dodge Corporation, has announced discontinuance of the position of manager of the industrial relations division of that company, following the resignation of **T. H. O'Brien**. Mr. O'Brien, who has become general manager for the Inspiration Consolidated Copper Co.'s properties at Miami, Ariz., had been connected with the Phelps Dodge interests for twenty years, including ten years as manager of the corporation's coal mines at Dawson, N. M.

OBITUARY

Adolphe Carnot, chemist and mineralogist, died in France recently at the age of eighty-two. Carnot was honorary director of Ecole Nationale Supérieure des Mines, a retired Inspector General of Mines, and a Member of the Institut de France. He was a prominent French analytical chemist and author of "Traité d'Analyse des Substances Minérales."

THE MINING NEWS

LEADING EVENTS

Arizona Copper Companies Seek Lower Assessments

Reduction of Over $25,000,000 Asked in 1920 Valuation—Total for Forty-three Producers $389,000,000

The present condition of the copper market, together with the fact that many small mines have ceased to operate altogether and the additional fact that all properties are operating at from 35 to 60 per cent of normal capacity is given as the reason for a reduction of more than $25,000,000 asked in the valuation of mines in Arizona for 1920. The Arizona State Tax Commission has just announced its assessment on the operating mines for 1920 as $389,029,918.57 as against $414,236,-636.90 for 1919. This valuation represents the forty-three producing mines in the state but does not include the smelters, or non-producing properties.

In dealing with the surplus stocks of copper on hand the commission has assessed such stock at 18.60c. per lb, which is subject to change depending upon what is actually obtained for this metal when sold.

The highest valuation was placed on the Copper Queen branch of the Phelps-Dodge Corporation, the valuation being $65,394,204.49, an increase of $1,767,-402.02 over that in 1919. In the case of Inspiration Consolidated the valuation shows a decrease of $8,071,494, the assessed value this year being $65,372,-690. The Calumet & Arizona also shows an increase in valuation, being rated at $42,163,006.94 this year as against $40,432,317.29 in 1919. The United Verde Copper Co. is rated at $40,095,-385.25 for 1920 as against $43,822,275.40 in 1919. The United Verde Extension is assessed for 1920 at $34,561,479. Last year the valuation was $36,972,224.26. The Ray Consolidated is assessed at $39,834,159.15, an increase of $315,490.38 over the valuation of 1919.

Northwest Magnesite Dividends Involved in Suit

By Telegraph

To compel payment of dividends of $500,000 suit was brought at Spokane, Wash., on July 19, by R. S. Talbot, of Spokane, against William H. Crocker, of Crocker National Bank, San Francisco. Talbot was one of the first men to appreciate the commercial importance of Washington magnesite. He alleges in the complaint that Crocker is seeking by unfair means to secure control of the Northwest Magnesite Co., of Chewelah, Wash., which company Talbot promoted by securing financial aid from Crocker, R. N. Bishop, S. F. B. Morse, Wellington Gregg, Bart Thane, and the Sperry Flour Co., all of San Francisco.

WEEKLY RÉSUMÉ

Contempt proceedings against Miami Copper in the Minerals Separation case have been dismissed by the U. S. Court at Wilmington. Minerals Separation has been permitted to make the North American Corporation a party to the suit. The investigation of the Federal Trade Commission into the company's affairs has been resumed, this time in Salt Lake City. The president and two trustees of the Colorado School of Mines have been accused of unethical conduct in a report by a committee of the American Association of University Professors. In Arizona, the Swansea Lease, Inc., has suspended operations. In Utah, stockholders of the Montana-Bingham Consolidated are suing the directors for conspiracy and violation of agreement. In Washington, D. C., the U. S. Geological Survey has decided to expand its work of collecting copper statistics. In Nevada, the Tonopah Divide is reported to be developing a promising strike of good ore. The coal situation is said to be bad in Northern Ontario, and low water there is also causing power shortage.

Montana-Bingham Directors Sued by Stockholders

Conspiracy and Violation of Agreements Charged—Company's Funds Said To Have Been Wasted

Directors of the Montana-Bingham Consolidated Mining Co., of Bingham Canyon, Utah, which has been operating for the last five years the old Fortuna holdings, long owned by the Bambergers, are being sued by a number of stockholders, who are charging conspiracy and violation of agreements. A request for an accounting has been made. Plaintiffs in the suit are: Murray Carleton, J. Benton Leggat, B. E. Calkins, F. L. Melcher, C. R. Mower, and R. W. Grant. The defendants are: The Henry Waterhouse Trust Co., R. W. Shingle, A. N. Campbell, J. A. McCandles, John Watt, J. Jorgenson, C. G. Ballantyne, C. G. Bockus, L. R. Eccles, J. M. Eccles, E. A. Vail, J. B. Mossman, Imer Fett, and L. B. McCornick.

The complaint charges that the group in control has secured its control so as to use the funds for its own benefit in the way of excessive salaries and bonuses; that an inexperienced man had been hired as president and general manager at an exorbitant salary; that $105,000 was paid in five years to C. G. Ballantyne as president and general manager. It is also charged that the directors in return for positions on the directorate had promised that the company would be financed by the sale of 500,000 shares of stock at 50c. a share, and that not more than 265,000 shares had been sold. The property has been worked for five years by the present company, which includes Salt Lake and Honolulu interests.

Miami Copper Not in Contempt in Flotation Case

Minerals Separation May File Bill To Make North American Corporation Party to Suit

The petition of Minerals Separation asking that the Miami Copper Co. be judged in contempt of court and enjoined from further use of the former company's flotation process was ordered dismissed on July 13 by Judge Morris, in the U. S. District Court, at Wilmington, Del. In doing this, the court has sustained the contentions which were made upon the part of the Miami company at the hearing before the court on June 15. (*Engineering and Mining Journal*, June 26, 1920, p. 1426). Judge Morris' order is as follows:

"This cause was last before this court upon an application by the plaintiff for leave to file a supplemental bill. 264 Fed. 528. The plaintiff now charges by petition that the processes employed by the defendant since it stopped using the three processes heretofore adjudged to be infringements are also infringements and prays that the defendant be adjudged guilty of contempt and/or that further injunction be issued specifically enjoining and restraining the defendant from using such processes.

"The defendant by its answer denies that the new methods infringe the patents sued upon and moves that the rule to show cause be vacated and the petition dismissed upon the ground that, due to the character of the new processes, the present procedure is inappropriate for the determination of the questions raised. The plaintiff contends that it appears from the facts alleged that the new methods are the same in principle as those adjudged to infringe and that the defendant has made only a substitution of equivalents resulting in a mere colorable change in the process, while the defendant contends that those facts disclose that it no longer uses the agitation of the patent. Much testimony touching the processes in question has been introduced by the plaintiff before the master upon the accounting now being had. In fact, it is conceded that little testimony of any other nature has so far been presented.

"The present issues do not seem to make necessary a review of the cases upon contempt or those in which the procedure by supplementary injunction has been recognized. Although embarrassed by the fact that I do not possess the full knowledge of the intricate facts of this case that might have been gained had the testimony and argument in the main cause been heard

by the court as now constituted, I am, nevertheless, satisfied that the facts set up by the petition are not of the character required to sustain a judgment of contempt. Nor do I find that the practice of enlarging an injunction or granting a supplementary injunction has been adopted in this circuit. But, be that as it may, in view of the nature of the new processes used by the defendant as charged by the petition, the questions raised thereby, and the decision of the Circuit Court of Appeals in this case, 244 Fed. 752, I am of the opinion that the plaintiff must obtain the relief to which it is entitled, if any, touching the new processes, either through the proceedings now being had before the master and the decree to be entered thereon, or by a new bill and not otherwise. Which of these procedures is the proper one under all the circumstances or whether both must be resorted to, one as to some of the processes and the other as to the remaining processes, need not now be determined.

"An order vacating the rule and dismissing the petition may be submitted."

As to the petition for permission to file a supplemental bill making Minerals Separation North American Corporation party plaintiff to the suit, submitted with the motion setting up the filing of a disclaimer, Judge Morris expresses the opinion that it would be in furtherance of justice to grant leave to file, but without prejudice to the Miami company to renew its objections.

This matter was so very hurriedly argued at the time of the hearing upon the contempt proceedings that the granting of right to further argument appears reasonable. The important bearing of this feature of the case, it is said, seems to be that it has the possibility of so affecting the disclaimer as to the three claims of the patent No. 835,120, which were found invalid by the Supreme Court, that the present infringement suits might all lose their standing before the courts.

Ontario Government To Instruct Prospectors This Winter

Harry Mills, Ontario's Minister of Mines, announces that short winter courses of instruction for prospectors will be opened at several mining centers in Northern Ontario, including Haileybury, Sudbury, Timmins, Swastika and some point at the head of the Great Lakes. It is proposed that the courses last six weeks, including such teaching by competent geologists as will enable the student to judge the economic possibilities of a district by its rock formations, and a general training in sampling and testing the value of ore. The courses, which will begin next winter, will be free to prospectors. Mr. Mills has also decided to open a government assay office at Kirkland Lake, which will make assays at cost.

Swansea Lease, Inc., in Arizona Suspends Operations

Would Also Shut Down Railroad Permanently—Old Planet Copper Mine Affected

The Swansea Lease has suspended operations and the Swansea railroad has applied to the Arizona Corporation Commission for authority to suspend operation. There apears to have been no trouble in finding an ample supply of ore of good grade or in handling it well in the new mill, which, it is claimed, made a better recovery than any other copper concentrator in the Southwest. It is said to have been demonstrated that a new mining method will have to be employed before profit can attend operation at the present price of copper. It was discovered that the shaft had been sunk at the wrong point. It was necessary to handle the ore from three to five times before it was dumped into the mill bin. The ore is a sticky material, needing much shoveling. A new shaft, possibly 1,000 ft. deep, is required, it is stated. This expensive work the leasing company is not prepared to take up.

The shutdown of the railroad has affected also the old Planet copper mine, on which operations had been started with expectation of heavy shipments. The Planet was the first copper mine of northern Arizona and was worked in the early sixties. Its ore was then rich enough for shipment by river steamboat to the Gulf of California and thence by sailing vessels to San Francisco and Wales. It has been badly "gophered" for its rich surface ores, but deeper explorations have found continuation into the sulphide zone of a body of good commercial ore.

HEADFRAME AT NO. 7 SHAFT, SWANSEA LEASE, INC., SWANSEA, ARIZ. THIS COMPANY HAS JUST SHUT DOWN

Many British Columbia Claims Revert to Crown

List of Properties Forfeited for Non-Payment of Taxes Surprisingly Large This Year

Lists of Crown-granted mineral claims which have reverted to the Crown, because of non-payment of taxes and are now subject to lease under the terms of the taxation act have been forwarded to the gold commissioners and mining recorders throughout British Columbia. This publication is of surprising size, containing thirty-odd pages. Every mineral district of British Columbia figures in the tables it contains. As would be expected, the sections best known to miners have contributed to the Crown the greater number of delinquent mineral claims. The Rossland assessment district, for instance, has provided over 800 such properties, all of which, as stated, may be leased after compliance with the statutory formalities, the particulars of which will be furnished on application to the assessor. The Slocan assessment district, also, is well represented, with about 300 such claims advertised for lease. Nelson has about 328; Fort Steele, about 90; Kettle River, 170 odd; and, coming to Vancouver Island, it is found that Nanaimo has some 28 of these, presumably abandoned, claims; Cowichan, 18; Comox, 33; and Alberni, 45.

The Vancouver Chamber of Mines is engaged in assembling an exhibit of British Columbia ores that will be representative of the mineral wealth of the various mineral districts of the province.

Lake Superior Iron-Ore Shipments Increase in June

Shipments of iron ore from the head of Lake Superior during June showed an increase of 1,727,694 tons over May and are now within approximately one-half million tons of equalling the shipments as of July 1, 1919. Coal shipments for the week ending June 19, the first week under the revived pooling arrangement, showed an increase of 43,000 tons over the preceding week but are still only half as great as during a similar period last year. Lake dumpings to July 3 total 2,923,000 net tons, as compared with 8,136,000 tons on July 3, 1919. Below are details of iron ore shipments:

Dock	June, 1919	June, 1920
D. M. & N., Duluth	2,947,651	2,528,446
D. & I. R., Two Harbors	1,136,833	1,448,547
C. & N. W., Ashland	787,351	1,081,659
Soo, Ashland	163,936	218,161
N. P., Superior	66,404	106,604
Soo, Superior	201,047	217,683
G. N., Superior	1,621,397	1,931,963
	6,984,619	7,533,063

Dominion Steel Votes To Enter British Empire Merger

At a special general meeting of the shareholders of the Dominion Steel Corporation held at Halifax, N. S., the proposal to merge the company in the British Empire Steel Corporation was ratified without a dissentient vote. The Nova Scotia Steel & Coal Co. has already accepted the merger. The Canada Steamship Lines has yet to vote on the question.

Roy M. Wolvin, president of the Dominion Steel, made the announcement that the British Empire Steel Corporation had made a gift of $250,000 to Dalhousie University to be used for the purpose of providing more professorships in research work in connection with the natural resources of Nova Scotia.

El Paso Mica Co. Operating Mine in Petaca District, N. M.

The El Paso Mica Co., of El Paso, Tex., is operating a mica mine in Rio Arriba County, Petaca district, New Mexico, and shipping its crude product to a sorting and finishing plant on the outskirts of El Paso. Five carloads have been shipped to the plant already but three carloads of crude mica ready to be shipped have been greatly delayed due to high water in the vicinity of the mine. The result has been to temporarily shut down the finishing plant.

The deposit, which is a pegmatite vein reaching 30 ft. in width, affords a muscovite mica of excellent grade. Three drifts with connections, totaling 965 ft., have been extended into the deposit. The mine is at an elevation of 9,300 ft. At the finishing plant, sheet mica up to a maximum size of 8 x 10 in. is selected, packed in barrels and shipped. The residual mica is shipped in bulk as scrap mica. It sells for approximately $27 per ton. The clear sheet mica is practically all profit as the scrap mica brings in a return sufficient to repay mining and shipping expenses. About 35 girls are employed on finishing work. About three weeks are required to sort a carload of 55,000 lb. The coarse scrap mica is used for the manufacture of roofing material, the fine mica for rubber and the highest grade for making wall paper. At present the Richmond Mica Co. and the U. S. Mica Manufacturing Co. are receiving the output from the producer. There are other occurrences of mica in the district which appears to give considerable promise of increased production.

Farmers Complain of Trail Smelter Smoke

Fifty-two claims have been made by farmers against the Consolidated Mining & Smelting Co. of Canada for damages to crops caused by the fumes from the Trail smelter. The allegations of those who seek compensation from the company are being investigated by Judge J. A. Forin and a party of advisers, some with legal and others with agricultural experience as their qualifications. Before setting out on a tour of the farms said to have been affected Judge Forin and party made an inspection of conditions in an adjacent valley outside the smoke area.

Civil Service Examinations

Those interested in the following examinations should apply at once to the Civil Service Commission, Washington, D. C., for the form indicated, stating the title of the examination desired.

Metallurgist, $10.80 per diem, both sexes. An open competitive examination August 3. A vacancy at Navy Yard, Norfolk, Va., and similar positions, may be filled from results. Not required to report at any place for examination; request Form No. 1312.

Associate physicist qualified in physical metallurgy, $2,000-$2,800; assistant physicist qualified in physical metallurgy, $1,400-$1,800; both sexes in both cases. An open competitive examination on application, until further notice. Vacancies in U. S. Bureau of Standards for duty at Washington or elsewhere, may be filled from results. Not required to report at any place for examination; request Form No. 1312.

Junior mining engineer, $1,500, both sexes. An open competitive examination on August 3. A vacancy in the Bureau of Mines for duty at Seattle, Wash., may be filled from results. Not required to report at any place for examination; request Form No. 2118.

Metallurgical laboratorian, $4.80 per diem, both sexes. An open competitive examination on application, until further notice. Vacancies at the Engineering Experiment Station, U. S. Naval Academy, Annapolis, Md., and elsewhere, may be filled from the results. Not required to report at any place for examination; request Form No. 1312.

Metallurgical chemist, $6.88 a day; assistant metallurgical chemist, $5.12 a day, both sexes. Open competitive examination, Aug. 10, 1920. Vacancies at the U. S. Naval Ordnance Plant, South Charleston, W. Va., and in positions requiring similar qualifications may be filled from the results.

Recent Production Reports

North Butte produced 1,616,822 lb. copper in June compared with 892,118 in May.

Butte & Superior in June produced 8,250,000 lb. zinc in concentrates and 160,000 oz. silver, compared with its output in May of 5,900,000 lb. zinc in concentrates and 103,000 oz. silver.

Granby Cons. M. S. & P. Co.'s output in June was 2,079,000 lb. copper, compared with 2,131,219 lb. in May.

Anaconda produced 12,700,000 lb. copper in June against 9,700,000 in May.

Shattuck Arizona produced in June 198,327 lb. copper, 661,746 lb. lead, 33,702 oz. silver, and 397 oz. gold in June.

Phelps Dodge produced 7,552,000 lb. copper in June against 7,902,000 in May.

Old Dominion's June output was 2,999,000 lb. copper compared with 2,287,400 in May.

Arizona Copper produced 3,000,000 lb. copper in June as in May.

Miami's output in June was 4,400,000 lb. copper; in May 5,054,760.

Utah Copper's June output was 10,000,000 lb. copper compared with 9,904,781 in May.

Chino produced 4,010,069 lb. copper in June compared with 3,930,728 in May.

Ray Con.'s June production was 4,520,000 lb. copper against 4,260,000 in May.

Nevada Con. produced 4,650,000 lb. copper in June against 4,350,000 in May.

Inspiration's output in June was 7,300,000 lb. copper; in May 7,500,000.

Greene Cananea produced 3,750,000 lb. copper in June compared with 4,300,000 in May.

Cerro de Pasco produced 3,944,000 lb. copper in June.

U. V. Extension produced 2,828,020 lb. copper against 3,219,934 in May.

Oriental Consolidated's clean up for June was $80,000 compared with $95,500 in May.

Calumet & Arizona's June production (available for company) was 3,812,000 lb. copper.

New Cornelia produced 3,664,000 lb. copper in June.

Kennecott Copper produced 10,120,000 lb. copper (including Braden's output) in June compared with 9,311,000 in May.

Calumet & Hecla produced 9,022,879 lb. copper in June compared with 8,803,811 in May. Output by subsidiaries in June was as follows: Ahmeek, 1,773,200; Allouez, 333,800; C. & H., 5,097,594; Centennial, 86,000; Isle Royale, 878,508; LaSalle, 0; Osceola, 661,500; Superior, 32,200; and White Pine, 160,077.

Shipments of domestic copper ore, matte, etc., from Alaska to the United States in June were 9,146 gross tons, containing 7,213,820 lb. copper.

Katanga's June production was 4,323,221 lb. copper compared with 3,847,027 in May.

Burma Corporation produced 4,733,120 lb. refined lead in June and 265,620 oz. silver.

Colorado School of Mine Officials Charged with Improper Conduct in Office

Committee of American Association of University Professors Reports After Prolonged Investigation

The president of the Colorado School of Mines, Victor C. Alderson, and two trustees, H. M. Rubey and James T. Smith, are scathingly arraigned in a report that has just been made by a committee appointed by the American Association of University Professors, in which it is charged that Dr. Alderson "repeatedly violated the essential principles of sound educational administration and of professional ethics." In preparing this report, the committee began its work in November, 1918, since which time they have been collecting evidence sustaining charges made against the school administration. The school board was again approached by the committee in 1919, but maintained that it was not responsible for the mistakes of the administration in previous years, although Dr. Alderson was still president, as he had been previously. "The principal charges on which the committee based its investigation," states the report, "were made by former professors of the school and were:

"1. That trustees intervened in matters of student discipline.

"2. That President Parmelee's dismissal was chiefly due to the stand he took in resisting the attempt of trustees to intervene in the question of discipline which arose at the time of the students' strike.

"3. That a number of teachers of professional rank were dismissed, mainly during the administration of President Alderson, without charges, hearing or adequate warning.

"4. That President Alderson discouraged high standards of scholarship and brought pressure to bear upon instructors to cause them to raise the marks of students.

"5. That President Alderson used his power of reappointment to secure support in the faculty of his personal policies."

The committee's report was signed by M. J. Lihby, chairman; Herbert S. Hadley, ex-governor of Missouri; J. M. Coulter, H. O. Hoffman and A. A. Potter.

In the course of the investigation, witnesses were heard who recounted incidents sufficient to show interference by both Messrs. Rubey and Smith, with the authority of the faculty in administering the discipline of the school. The committee found that this intervention was made in such a way as to weaken the authority of the faculty and to encourage disorder and grave breaches of discipline in the institution. In summarizing the result of the investigation, the report asserts "the trustees of the Colorado School of Mines do not seem to realize the impropriety and the evil influence of their interference in the routine affairs and educational problems of the institution," and it warns "that the conditions brought out by the investigation unless remedied without delay will prove most disastrous to the future of the school." The state authorities are urged to appoint trustees who are competent to select and support a president who has proper educational ideals.

Rio Tinto Mines in Spain Cease All Work

The mines in the Rio Tinto region have ceased work completely and hundreds of the striking workmen have decided to migrate to other parts of the country or to go abroad, according to a press dispatch dated July 13. Many families are suffering from hunger. The entire district affected is in distress, owing to lack of articles of prime necessity.

The striking miners have maintained a quiet attitude, and up to the present the Government forces have not been required to intervene in the dispute. The directors of the English company controlling the mines still decline to concede any of the demands made by the workmen. On the other hand, the miners are remaining firm in their attitude.

Minerals Separation Hearing Renewed in Salt Lake City

After conducting its hearing in San Francisco in the course of its investigation into the methods of Minerals Separation, the Federal Trade Commission resumed its inquiry at Salt Lake City on July 13. Thomas Varley, of the local station of the U. S. Bureau of Mines, in testifying, stated that in his belief the effect of the license rates of Minerals Separation was to restrict the production of minerals by oil flotation. V. P. Strange, president and general manager of the Utah Leasing Co., testified as to his experience in the matter of royalty to be paid and the delivery of machinery, when his company undertook the treatment of the 800,000-ton tailings dump of the old Cactus mine near Newhouse, Utah. Delivery of machinery was refused when objection was made to an increase in the royalty beyond the amount agreed upon in negotiation with an official of the company. By means of a replevin bond the company secured its machinery, and for a time operated before a license was secured.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Geological Survey To Expand Its Work on Copper

Capt. Jenison, Succeeding B. S. Butler, Plans Exact Study of World's Production

Capt. H. A. C. Jenison is now in immediate charge of the U. S. Geological Survey's work on copper. He succeeds B. S. Butler, who recently entered private employment. Capt. Jenison is a mining engineer who has had ten years of very active and intimate association with copper mining in the United States, Mexico, Chile and Alaska. It is the intention of the Geological Survey, so far as conditions will permit, to expand its work on copper. In this connection Capt. Jenison has submitted a program which has been approved by Dr. George Otis Smith, the Director of the Survey. This work, of course, will be in addition to that of gathering the material which goes to make up the regular chapters on domestic and foreign production and the preliminary estimates which are made in July and January of each year. In order to make possible a more exact study and analysis of the world copper production and trade figures will be collected on reserves of all important lines in all countries. It is intended to calculate the ratio of reserves to present production and to production over a long period. A calculation will be made of the ratio of consumption to production and reserves over the same period. In connection with the foregoing work, "least squares" and "probability" curves will be developed to show past, present and probable future tendencies of production, consumption and reserves.

With regard to the domestic industry, it is the intention to collect monthly figures of production, stocks and sales from the principal producers from which data approximate figures indicating the condition of the industry can be prepared for publication at least once a quarter. This will allow the determination of when and where peak and minimum load occur and will make it possible to determine reasons of changes of the rate of mining and of transportation. This is expected to make it possible to indicate in advance where, under normal circumstances, prices may change due to probable excess and deficient production. It is intended to maintain

tabulated, confidential sheets for each important mine, smelter and refinery. This is in addition to the sheets for each state. The confidential sheets for each company will show the following: Production and character of ore; percentage recovery of metal from ore; tonnage treated at smelters and refineries; production and cost of refined copper, gold and silver from the mine and the names of the purchasers of the refined metals. Accurate account will be kept of exports and imports of copper ore, matte and metal, showing kinds and quantities, as well as sources and destination. This same plan will be carried out as far as is possible with regard to exports and imports of copper from foreign countries.

A card index and bibliography will be developed to cover exhaustively information pertaining to the geology, technology, reserves and development of copper mines.

Bill for Revising Mining Law Not Yet Approved by Ingalls Committee

The draft of bill providing for certain revisions of the mining code, which is in the hands of the chairmen of the Committees on Mines and Mining of the Senate and of the House, has not been approved by the committee headed by W. R. Ingalls, according to Dr. F. G. Cottrell, Director of the Bureau of Mines. The bureau is co-operating in the effort to present to Congress the draft of a revision-of-laws bill, along with copious notes showing wherein certain changes may be controverted. Dr. Cottrell explains that the draft, which has been prepared, is for submission to the members of Mr. Ingalls' committee and has not been approved by them. They are to go over the draft between now and the opening of the new session of Congress and Dr. Cottrell points out that it is altogether probable that many changes will be made in the document as it now stands.

The draft of the bill was sent to the chairmen of the Committees on Mines and Mining at the same time that it was sent to the members of Mr. Ingalls' committee, so that they might be kept informed as to the work being done. Every effort will be made to present a revised draft to these Congressional committees with the hope that they will find it possible to take up the consideration of the matter soon after the convening of Congress.

War Mineral Awards Average One-third of Claims

Awards have been recommended as follows by the War Minerals Relief Commission during the week ended July 10 (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): H. T. Stiles, manganese, $2,954.90, 79 per cent; Thomas H. Green, manganese, $792.75, 77 per cent; Wells & Pollock, chrome, $993.21, 64 per cent; A. G. Green, chrome, $2,152.38, 47 per cent; Alexander R. Shepherd, tungsten, $1,025.75, 35 per cent; Scherer & Wall, manganese, $768.42, 14 per cent; Neely Bros., Inc., chrome, $23,040.98, 17 per cent; C. H. Palmer, manganese, $489.82, 100 per cent.

Up to July 10 the commission had acted on 904 claims in which $9,909,093.06 was asked by the claimants. The average percentage recommended for payment on all the claims is 33.07 per cent.

Outlook Unpromising in Nevada Districts, Ferguson Reports

Labor conditions and costs are such in the Manhattan and Round Mountain districts of Nevada as to give no particular promise for early resumption of gold mining operations on a large scale. Much of the ground of the larger companies is being turned over for leasing and not operated for company account. This report on conditions is brought back by H. G. Ferguson, of the U. S. Geological Survey, who has been doing geologic work in those camps. Mr. Ferguson also visited the property near Silver Peak, Nev., where a mill is being put up for handling potash alum by the Silver Peak Chemical Co.

NEWS BY MINING DISTRICTS

ARIZONA

Dripping Springs Copper Buys Broken Hills Equipment—Little Treasure Group at Winkelman Sold

Bisbee—The ventilating shaft that is being sunk by the Calumet & Arizona Mining Co., southeast of the Briggs shaft, has reached a depth of 310 ft. This means that an average of more than 8 ft. per day has been made since the work started. The shaft was deepened 54 ft. in six working days recently. The work is being done on contract. When completed the shaft will be about 800 ft. deep.

The company is installing two more boilers which will give the boiler plant an equipment of 15 instead of 13 boilers. The increased flow of water that is expected to be encountered when the Junction shaft is deepened is the reason for increasing the boiler capacity. Plans for sinking the Junction shaft from the 1,800 to the 2,200-ft. level are now underway.

Winkleman—The Dripping Springs Copper Co. has purchased the mining equipment of the Broken Hills Mining Co., at Ray, and moved it to its property near here. This will greatly facilitate development through the long crosscut tunnel. Pending the installation of this equipment a raise is being driven for ventilation. Improvements are being made in the roads to facilitate shipments of ore to the Hayden smelter.

The most important transaction in mining property this year in Pinal County, Ariz., took place on July 10 when the Arizona Silver Consolidated Mining Co. acquired the Little Treasure Group, from N. H. Mellor. The property consists of nine claims, situated in the Saddle Mountain mining district about five miles east of Winkleman. It has never been worked extensively but has produced some very high-grade silver ore.

The new company is headed by John Hartnett, Jr., of Washington, D. C., who has been auditor to the General Staff of the War Department. Dr. Hartnett is president. Captain Walter E. Purvis is secretary-treasurer, to be in charge of the eastern offices. C. T. Carpenter, of Phoenix, will be secretary in the Arizona office. E. T. Herrmann is general manager and G. G. Wald, of Phoenix, is consulting engineer. The company has begun construction of a camp and will improve the roads leading from the main highway at once. It plans to start development of the Little Treasure vein system on August 1 along the lines laid out in the original report on the property made by Arthur L. Flagg, consulting engineer.

ARKANSAS

Good Demand for Batesville Manganese Ore Reported

Batesville—There is renewed activity in the manganese industry in the Batesville district. The demand is good for ore at a price on which operators can make a profit. High-grade ore is most in demand but some as low as 30 per cent is moving.

The National Manganese Co., which owns property near Anderson, is preparing to construct a dam across Lafferty Creek, which will create a large reservoir of water to be used for ore washing. It is intended to erect a large washing plant and install hydraulic mining machinery at once. A tram will also be built from Anderson to Penters Bluff, the shipping point, four miles away.

Joe Magness and associates, who have a lease on the Manganese Cave property at Penters Bluff, have completed a switch and built chutes to it from the adit on the mountain side. Ore is thus

dumped directly into the car. From one to two cars a week is being produced.

Tom Shell has a large crew of miners at work on his property near Cushman and is making a good production.

Case and Wilson are opening up a fine body of high-grade ore on their property at Penters Bluff.

E. C. McComb, of the Independence Mining Co., has one steam shovel and the washing plant in operation at the Polk-Southard Mine near Cushman and will start operating a small washer at Penters Bluff soon.

CALIFORNIA

Idaho-Maryland Gets Golden Gate Stamp Mill—Rising Sun's New Mill Running—North Star Abandons Champion

Portola—The Engels and Walker companies are shipping large tonnages of copper concentrates from their flotation plants. New development has added extensively to the reserves of both properties. At the Engels group recent work has opened up rich deposits and the grade of ore is said to exceed any ever discovered previously in the district.

All other mines in the Plumas copper belt are doing extensive development work. Practically every company reports development of profitable ore, with new work materially extending the dimensions of the proven ore belt.

The Gruss company has just acquired two claims lying to the east of its former holdings. The new acquisition is considered important.

Nelson Creek—An unexpected cloudburst wrecked the equipment of the company employing a diving method at Nelson Point. Several sluices and other devices recently set in place were washed away.

Benton—Several shipments of rich silver ore have been made by companies and lessees in the Benton district in Inyo County. Many new interests are seeking to acquire holdings in the camp.

Grass Valley—The Idaho-Maryland has acquired the ten-stamp mill formerly in commission at the Golden Gate group.

The Mayflower Mining Co. at Canada Hill has purchased the mine plant and headframe of the Golden Gate, which will be moved to the Lily property.

The Empire Mines Co. has 80 stamps dropping on high-grade ore taken from the Empire and Pennsylvania. The mine force has been increased and the development of new territory below the 4,500-ft. level is proceeding satisfactorily.

Nevada City—The North Star company has announced that all work has been abandoned on the Champion group at Nevada City. The Champion was bought several years ago by the company but proved a losing venture despite every endeavor to develop commercial ore at greater depth.

Work at the Alcalde, Boundary and other local properties is progressing, and the several managements are quite pleased with the showings. The North Star's Central mill is running steadily.

Colfax—The Rising Sun company has completed installation of the ten stamp mill and the plant is now in commission. The ore being taken from the mine is of high grade. The shaft is now down to the 900-ft. level. No development of consequence has been done below the 400-level, but $2,000,000 has already been taken from the mine.

COLORADO

Smuggler Union Preparing To Rebuild Flotation Plant—Drilling Contest at Idaho Springs

Idaho Springs—The Fourth of July celebration included an old fashioned miner's drilling contest, in which the double-hand event was won by W. H. Keelor and Frank Cramer, who drilled a hole 20⅛ in. in ten minutes, in hard Silver Plume granite. The single-hand contest was won by Tony Zancanelli who drilled a hole 15 in. in ten minutes in Silver Plume granite.

Telluride—The Smuggler-Union Mining Co. continues milling operations as well as possible without its flotation plant, which was recently destroyed by fire. Arrangements are being made to rebuild the plant. As much material as possible will be purchased in Colorado. About 100 workmen and several teams are engaged in clearing away the fire rubbish, preparatory to laying foundations for the new buildings. The new office building is under construction. The new mill buildings will be of steel and concrete.

Boulder—The Nil Desperandum Mining Co. has been reorganized, with a capital of $500,000, divided into 500,000 shares of a par value of $1. The company plans to list its stock on the New York Curb. Considerable new development work is under consideration.

The Boulder County Mines Co. has installed flotation equipment in its mill and is planning to resume development work in its lower tunnel.

The Caribou mine has resumed active operations. The 1040-ft. shaft has been repaired, and ten sets of lessees are mining ore between the surface and the 840-ft. level. Some of the ore is high grade, and a recent shipment averaged 397 oz. silver per ton. A block of ground on the 10th level will be developed on company account. J. G. Clark is manager.

The Telegraph mine is being equipped with a 25-ton mill. The plant is rapidly nearing completion and will probably be in operation this month. The equipment includes crushing rolls, a ball mill, electrolytic amalgamating tanks and flotations cells. The management plans to treat the fines and slimes separately in Ogden amalgamating tanks. The pulp from these tanks will be passed to the flotation cells.

Gypsum Valley — The Cummings Chemical Co. is increasing its operations in Gypsum Valley, San Miguel County, Col. Carnotite ore is being shipped via Placerville to the Rare Ore Sampler at Montrose, and thence to Eastern buyers. O. B. Willmarth is manager.

The Carbonero mine is being operated by Ruutilla & Brown, who are shipping high-grade silver-lead ore, some of the product going to Midvale, Utah, and some to the Pueblo smelter.

The San Bernardo mine is being developed and equipped by the Valley View Leasing & Mining Co. Most of the machinery for the new mill is on the ground and the plant is rapidly nearly completion. Underground development continues with promising results.

Cassells—Operations are being resumed for the summer at the mine and mill of the Whale Mines Leasing & Reduction Co. A. C. Dart is superintendent.

IDAHO

Coeur d'Alene Syndicate Drops Option on Black Bear—Big Creek Company Offering 50-cent Bonus

Mullan — Arrangements are being made to resume operations on the American-Commander about Aug. 15, by which time it is expected that a compressor will be in position and all other equipment necessary. A good showing of lead-silver ore was exposed many years ago and a crosscut has been run 3,000 ft., but without finding the ore. A few months ago the West Hunter company, joining the American-Commander on the south, started a crosscut south from the American-Commander tunnel and at a distance of about 150 ft. cut a strong vein and a shoot of good ore about 8 in. wide on the west side of the crosscut and 18 in. on the east side, indicating an important orebody lying to the east. It is now planned to drift east on this ore.

Kellogg—T. S. Welch, of Butte, has secured an option on all outstanding stock of the Blue Star Mining & Milling Co. and is preparing to begin work by Aug. 1. A shaft has been sunk 500 ft. A crosscut at 300 ft. and a drift have disclosed some promising lead-silver ore, particularly in a winze 40 ft. deep, in which a small stringer of ore has widened to about 2 ft. A crosscut has also been started from the bottom of the shaft and has about 150 ft. to go to reach the vein. The extension of this crosscut will be the first work undertaken by Mr. Welch and if results are satisfactory the shaft will be sunk 300 ft. further. The property is favorably located, being only about 1,000 ft. from the railroad.

Gem—After many years of idleness another effort is to be made to find a commercial orebody on the Bell. A lease and bond has been taken on the property by Axel Swan, who, after a careful examination, believes he can solve the problem by driving a crosscut about 100 ft. from No. 2 tunnel. The

property is owned by the Bell Mining Co., control of which is held by the estates of Finch and Campbell. The surface showing is one of the best in the district and indicates a large orebody, which Mr. Swan will now make another attempt to find.

Wallace — The option held by the Cœur d'Alene Syndicate on the control of the Black Bear Mines Co. has been surrendered. The first payment on the option was due June 30. A few weeks prior to that date a request was made for an extension, and this being refused the option was given up. The syndicate has an option on control of the Flynn Group Mining Co., adjoining the Black Bear, and has an easement which gives it the right to use the Black Bear tunnel as a means of entering the Flynn ground. This right is not affected by giving up the Black Bear option and the development of the Flynn is proceeding as usual.

The Big Creek Mining Co., which normally employs about 25 men under ground, in order to overcome the difficulty in holding employees, is offering a bonus of 50c. per day to all men who remain on the job 30 days, the bonus to continue as long as they remain. This makes a daily wage of $6.25. The larger companies experience much difficulty in holding men and some of them pay a bonus in special cases. At the Morning mine the contract system prevails, the men making from $7 to $11 per day.

MINNESOTA

Mesabi Range

Steel Corporation Gets Polk & Jackson Interest in Walker Iron Mine

Coleraine—The Polk and Jackson mining companies, subsidiary to the Great Northern Iron Ore Properties, have turned over their one-half interest in the Walker iron mine to the U. S. Steel Corporation receiving in exchange therefrom the one-half interest of the corporation in the Hill mine. Several other smaller properties are involved in the exchange, bringing the total estimated tonnage up to 90,000,000 tons.

One shovel is stripping and one shovel mining ore at the Mahnomen mine, Ironton.

The stockpile of 4,500 tons at the Algoma mine, a former property of the Onahman Iron Co., has been shipped.

Buildings and equipment at the Ferro mine near Trommald have been advertised for sale at sheriff's sale July 10, sale having been postponed from June 19. Sale is advertised by the Gorham-Garbett Co. of Minneapolis, fee owners of the property, who hold mortgage against the property for unpaid royalties in the sum of $14,000. Property is completely equipped and developed. It was operated during 1917 and 1918 by the Onahman Iron Co., an Omaha concern which also operated the Algoma mine and which lately went bankrupt. During 1918 it shipped monthly about 4,000 tons of manganiferous ore to the Algoma Steel Co. The property has been idle since the fall of 1918, at which time work was started to sink the shaft an additional 140 ft. from the 145-ft. level to develop the ore lenses at depth. The ore is a hard, silicious, low phosphorus and moisture, manganiferous iron ore, and will average over 20 per cent natural manganese, with 18 to 20 per cent silica. The reserve tonnage is not large.

The Mangan No. 1 stockpile near Ironton, amounting to 7,000 tons has been shipped by Clement K. Quinn & Co. The property has been idle since the winter of 1918-1919.

The Maroco mine of the Marquette Ore Co. at Trommald, an E. N. Breitung enterprise, is sinking an inclined shaft to the 200-ft. level, for drainage of the orebody preparatory to stripping and open pit mining. Shaft is now at 150 ft. and good progress is being made. The sand sucker and other hydraulic stripping equipment has been set up on the property for over a month, but orders have not been given to go ahead. Property contains several million tons of ore, about one-half of which is washable. Contract has been let for the erection of a one-half unit washing plant for which Allis-Chalmers Co. are furnishing the machinery, and the timbers for the structure are on the ground.

MISSOURI

New Zinc Oxide Plant Damaged by Fire —Butte-Kansas Mill Ready Soon

Waco—The Acme mine and mill have been turned over to lessees. The management has two drill rigs outlining new orebodies.

The new Butte-Kansas mill, replacing one that caved into the mine, should be ready about August 7.

Joplin—The baghouse at the newly completed plant of the Metals Extraction Corporation was burned on July 9. The walls are intact. Reconstruction is to begin at once and should be completed by August 15.

MONTANA

Davis Daly Mining High Grade on Butte & Ramsdell Ground

Butte—Ore production from North Butte's Granite Mountain and Speculator properties is being increased slightly and a larger output is looked for in July. The showing on the lower levels of the Edith May vein continues favorable.

The recent ore shoot disclosed on the 500-ft. level of Tuolumne Copper's Main Range mine continues steady at about 40 oz. of silver per ton with up to 2 per cent and more of copper. Resumption of sinking of the winze from the 1,200-ft. level, where there appeared to be a good ore, is planned by the company.

The development drift on the vein near the station on the 2,700-ft. level of the Colorado mine continues in ore. A body of ore more than 400 ft. long and about 8 ft. wide has been opened, all being of a commercial grade.

Sinking of the Plutus shaft is under way with the object of opening on the 400-ft. level an orebody found near the surface of the Norwich claim adjoining.

Further underground development has been temporarily suspended by the Butte Metals company.

Mining of the high-grade ore from a fissure striking through the Butte & Ramsdell property on the 2,500-ft. level of the Ramsdell claim has been begun by the Davis-Daly company under a profit-sharing arrangement with the Butte & Ramsdell. The latter has approximately 250 ft. on the strike of a vein showing about 6 ft. of 20 per cent copper ore.

Marysville—Operations at the Piegan-Gloster mine are expected to be suspended soon. Operation of this property last year cost the Barnes-King approximately $88,000. The Shannon mine is showing up well. The new orebody opened on the 500-ft. level having a width of 6 ft., the ore running $14 per ton. Barnes-King invested $17,000 in an oil well venture thus far without success. This well is located in the northern part of Montana, in the Winifred field and drilling has been interrupted by considerable casing trouble.

Elkhorn—Drifting by Boston & Montana on the 300-ft. level of the Blue Jay vein is still in ore and has been exposed. This drift is being driven away from the big fault. Housing of the new mill is under way, the foundation having been completed about three weeks ago.

NEVADA

Promising Ore Reported on 375 Level of Tonopah Divide—New Vein Cut in Combination Mine at Goldfield

Tonopah—The final June clean-up of the Tonopah Belmont was 87,846 oz., valued at $96,630. Development and stoping are being done on fifteen veins of this property. The principal tonnage is being mined from the Rhyolite veins, and the Belmont, Rescue and South veins. There is more ore in sight than a year ago and development possibilities are good.

In the Tonopah Extension the work of sinking the Victor shaft from the 1,760 to the 1,880-ft. point is progressing. There is considerable water to handle but surface equipment and pumping facilities are capable of handling it. Reports indicate that developments on the Murray vein on the 1,760 level continue good and great hopes are entertained for the next level. Sinking of the McCane shaft to the 1,540 level of the Victor workings will soon be started, and connection made with them.

The last shipment for June from the West End was 50,830 oz., with a value of $55,900. Development is satisfactory with no changes of importance.

The latest bullion shipment from the Tonopah Mining Co. mill at Millers was valued at $40,000. Development for the last week totaled 163 ft. with no changes. Conditions are reported good in the Silver Top and Mizpah shaft workings.

The Rescue Eula is making regular shipments of ore. Development work on the Rescue vein is producing good results and some tonnage is being blocked out.

Divide—Very favorable reports are being circulated regarding developments in the Tonopah Divide mine on the 375 level. A drift started on a small stringer of ore on this level now shows a full face of ore of good grade, with only one wall in sight. The drift is now in about 50 ft. and all material is reported to have averaged $40 per ton for the last week. This is welcome news to stockholders and if the showing continues good will undoubtedly renew interest in the whole Divide district.

Goldfield—A new vein, in the footwall of the Combination vein, is reported to have been discovered on the 480 level of the Combination mine. The drift is in milling ore. The Goldfield Development is operating 20 stamps and expects to increase production soon. When complete the mill will have a capacity of 2,000 tons per day.

The Goldfield Deep Mines Co. expects to start sinking its projected 3,000-ft. shaft on July 16. The hoisting plant of the Goldfield Merger will be used and is now being moved to the site of the new shaft. A special meeting of the Atlanta, C. O. D., Goldfield Merger, Blue Bull, Goldfield Combination, and Milltown companies will be held in Goldfield on July 16 to ratify the combination.

Hilltop—Roy J. King, formerly with the Tonopah Belmont Development Co. but now consulting engineer for the note holders of the Kimberley Consolidated, is doing development work on the latter company's property at Hilltop, in Lander County.

Taylor—The 100-ton cyanide mill of the Wyoming Mining & Milling Co. at the old camp of Taylor, White Pine County, is running steadily and is said to be making a high extraction. There is about 30,000 tons of ore on the dumps, which was expected to go 12 oz. in silver to the ton, but the average so far is said to be nearer 17 oz. The water for the mill is piped five miles from Connors Canyon springs.

Golconda—The compressor at the Adelaide mine near Golconda has been bought by the Cortez Consolidated and will soon be installed. This will facilitate work in extending the Arctic tunnel which is being driven to get under the orebody from which the big production was made in the early days.

Cherry Creek—John Carlson, Herman Brest and Joe Carpen are sacking ore running well in gold and silver from a strike they recently made at the mouth of Silver canyon, four miles from Cherry Creek. The shaft is down 16 ft.

Hamilton — Ed. Wilson recently shipped a carload of ore sampling $125 per ton from the Great Valley mine at Hamilton, the shipment going to the smelter by way of Ely.

Osceola—Clyde Tilford and brother, who are placer mining at the old camp of Osceola, recently found some good-sized nuggets.

Gold Circle—William J. Cleary and associates, who recently closed a deal for the Esmeralda mine, have secured options on the Bamberger and Coalition mines in the northern end of the district.

So much water came from the last holes drilled in the crosscut on the 315-ft. level of the Queen mine that it was decided to plug them and await the installation of a pump before shooting and opening up the vein.

Virginia City—The south drift from the main crosscut on the 150-ft. level of the Comstock Phoenix is being advanced in ore that is said to average $30 per ton.

NEW MEXICO

Porterfield Bros. at Silver City Shipping Large Tonnage of Manganese Ore

Lordsburg—At the 85 mine the C. & A. company is down 815 ft. Work is being pushed by 21 men working in three shifts.

The Octo main shaft has reached the 300-ft. level and a station, 10 x 20 ft., will be cut. A sump, 10 x 10 x 20 ft., will also be put in. A drift to the east will be run and the shaft carried to the 400-ft. level at once.

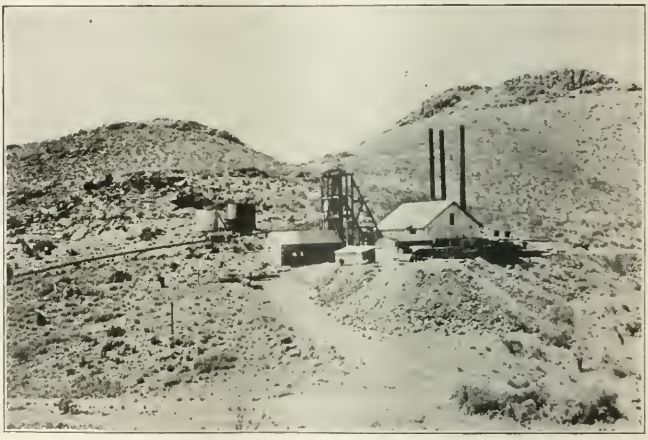
Silver City—During June Porterfield Bros. shipped from the Amory Stevens properties on Boston Hill a large tonnage of manganiferous iron ore, although they were without cars for eleven days because of the washout on the Santa Fe line near San Marcial. The Santa Fe will build a new ore-loading platform to accommodate this business.

Hachita—The Little Hatchet Mining Co. has established a camp 12 miles southwest of Hachita and will sink two shafts upon some promising copper deposits recently opened up. Head frames and hoists are being installed and a compressor will be purchased.

UTAH

North Standard Stockholders Seek To Change Control, Charging Irregularity in Administration

Park City—The Park-Utah has followed a vein of shipping ore for 450 ft. and has 150 tons ready for shipment as soon as arrangements have been completed for taking it out through the 1,500 level of the Ontario, through which the Park-Utah is working.



SURFACE PLANT OF OCTO COPPER MINE, LORDSBURG, N. M. SHAFT IS 300 FT. DEEP. LEE'S PEAK IN BACKGROUND

The Keystone, which is resuming work after the settlement of litigation with the Silver King Coalition, shipped a car of ore the week ended July 9. The Naildriver shipped two cars the same week. The Ontario is short about 50 men and more could be used at all of the mines.

Eureka—The Grand Central at Mammoth is receiving its water from wells near Diamond instead of Eureka. The water runs down from Diamond to Mammoth by gravity, and is then pumped to the mine. Regular shipments are being made of ore coming from between the 540 and 2,100-ft. levels.

At the North Standard the shaft is down 600 ft. An effort is being made to effect a change in the control of the property on the part of some of the stockholders, who accuse the present management of irregular methods of administration. The officers of the company have prepared a financial statement, and have called a meeting for

August 2. The opposition has called a meeting for July 17.

Marysvale—A four-mile paved road is proposed from Marysvale to Alunite to be built by means of county funds and contributions from the mining companies chiefly interested, in this case the Mineral Products and the Deer Trail. It is proposed that the county finance three miles of the road and the companies one mile.

WASHINGTON

Northwest Magnesite Co. Plans New Six-Mile Tramway to Keystone Deposit

Chewelah—The Northwest Magnesite Co. is planning the erection of a six-mile aerial tramway to connect the Keystone magnesite deposit with the present tram between the Finch deposit and the company's large calcining plant at Chewelah. Up to the present practically the entire production of the company has come from the Finch deposit, which has been worked intensively and the other holdings kept in reserve. The Keystone deposit is well developed and fully as large as the Finch deposit and it is evidently the plan of the company now to extend operations to the Keystone quarry.

The American Refractories Co. is employing a crew of 60 men at the Double Eagle magnesite deposit, which it now operates under lease and bond. It is burning the magnesite in shaft kilns located on the property and the finished material is shipped by auto trucks to the railroad at Valley, 13 miles distant.

CANADA

British Columbia

Trail—Ore shipments received at the Consolidated M. & S. Co.'s smelter during the week ended July 7 were as follows:

Mine Location	Gross Tons
Bluebell, Riondel	138
Crescent, Greenwood	2
Emerald, Salmo	47
Electric Point, Boundary, Wash.	135
Florence, Princess Creek	35
Josie, Rossland	172
Monarch, Field	31
Mandy, Le Pas, Man.	1006
North Star, Kimberley	216
Sally, Beaverdell	42
Company mines	7213
Total	9035

Victoria — The British Columbia department of mines has sent two reconnaissance parties into the Unuk River country, north of the better-known section of the Portland Canal district, this summer. They were organized by George Clothier, resident engineer at Prince Rupert, B. C., and will work along lines laid down by him. One of Mr. Clothier's parties on reaching the Unuk River will work in a southeasterly direction, eventually meeting the other explorers, who will go in by the Salmon River, over the divide to the Naas slope and northwesterly along the line of contact.

Word received recently by mail from Dawson, Y. T., appears to confirm the recent report of a new silver strike in the Mayo district. The latest discoveries are on the slope of Mount Hinton, opposite Keno Hill. They are about five miles from Keno Hill, where the first excitement occurred, the waters of Lightning Creek separating the two. When the news reached Mayo there was a stampede and the ground has been thoroughly staked. As to the Keno Hill properties it is stated that one company has found a rich new silver deposit near where they have been working.

A pioneer prospector writing to a prominent resident says: "I've been up Keno prospecting. I located three claims and hope to prospect for the remainder of the summer. I got in on the new stampede. It is located near the head of Lightning Creek and shows gold and galena. Everyone is away stampeding. Middlecoff Hydraulics are about closed and the men are staking. They are opening up the biggest thing yet on Keno Hill, taking the ore out of the mud, five feet wide and had it stripped over 200 ft. in length two days ago. It runs 1,000 to 2,000 oz. to the ton, and they take it down to the frost about one foot deep and there must be a big lead under. The worst drawback at present is too many stakers and too few prospectors."

Ontario

Coal Situation Worrying Operators—Lower Water Causes Power Shortage

Colbalt—The coal situation is causing serious concern to operators in Northern Ontario. The majority of the mines have contracts for coal at prices considerably below what coal is now selling at, but, so far this season, very little coal has arrived and there is a good deal of uncertainty as to whether or not this contract coal ever will arrive. Local dealers are quoting up to $18 per ton, f.o b. the cars in Cobalt, and state they cannot get much, even at that price. As it will be necessary to start the boilers for heating purposes in about three months, the necessity for some assurance of coal supply is evident.

The exceptionally low water this season is having its effect on the power company in Cobalt, and has resulted in a drop in the pressure of the air supplied. Ordinarily air is supplied at 100 lb. pressure, but recently it has dropped as low as 50 lb. To complicate the situation further the power company has had several breakdowns lately. The Kirkland Lake camp is also suffering from a shortage of power, which is supplied by the same company that furnishes power to Cobalt. The Wright-Hargraves is forced to use steam power for underground work, and the Teck-Hughes is operating at about two-thirds capacity.

Premier Drury of Ontario, speaking recently, stated that the investigation of the Department of Lands and Forests had shown the timber industry to be rotten to the core. As soon as the inquiry is finished, the mines will be investigated to see if the public has been defrauded there.

The Bailey Silver Mines, of Cobalt, will build a railway spur to the property to permit the shipment of low-grade ore to the mill. A considerable quantity has been developed, and, in addition some high-grade is being mined.

The Colonial, idle for several years, has been re-opened. The property is equipped with a small mill, but it is doubtful if this will be operated.

The Right-of-Way mine is shipping 50 tons of mill rock a day to the Northern Customs concentrator.

South Lorraine—The Keeley mine has developed a shoot of high-grade milling ore at a depth of 300 ft. The 80-ton mill is rapidly nearing completion.

Gowganda—The Bonsall property in Gowganda, now owned by Sir Clifton Sifton and George Glendenning, is being operated.

The Trethewey property in Gowganda is making another shipment of high-grade ore. Conditions at the property are very satisfactory.

Porcupine — The McIntyre fiscal year ended June 30 and, although the annual report is not ready, it is understood that production will be about $2,250,000 and net profits about $1,000,000.

Diamond drilling on the Porcupine Crown has shown ore at 1,100 ft. This is either a new vein or the faulted portion of the old vein.

The New Imperial Mines Limited is to be opened up. A permanent liquidator will be appointed July 26.

Manitoba

The Pas—The Board of Trade of The Pas, Manitoba, are planning a special trip to mining districts of northern Manitoba on Sept. 1. The party will start from Winnipeg and will probably arrive at The Pas Sept. 2, leaving there on "S. S. Nipawin" on Sept. 3 for Sturgeon Landing. From there the party will proceed by canoe and Evinrude motors to the Flin Flon and Mandy properties.

An invitation is being issued to every member of the Manitoba provincial government and it has been intimated that most of the members of the House will avail themselves of this opportunity to become familiar with the need of this mining district and particularly as the government will be called upon to vote for a new railway from The Pas to Flin Flon at the first session of the new parliament. The proposed new railway will pass through the Elbow Lake section, also through the Cranberry Lake, Copper Lake, Athapapouskow Lake, Schist Lake and Flin Flon Lake districts.

Recent discoveries in the Elbow Lake section have caused considerable interest being taken in the district and prospectors and mining men have concentrated there.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Silver and Sterling Exchange

July	Sterling Exchange	Silver			July	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
15	387½	99½	92½	53⅜	19	384	99½	88⅜	52
16	388	99½	90½	52½	20	382	99½	89½	52¾
17	387	99½	89⅜	52	21	383	99½	94	55¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Daily Prices of Metals in New York

July	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St L.	St. L.
15	18.55@18.75	45.75	49.50@50	8.20@8.35	8.20@8.35	7.75@7 85
16	18.50@18.75	46.25	49.75@50.25	8.25@8.30	8 25@8.30	7.75@7.85
17	18.50@18.70	46.25	49.75@50.25	8.30	8.30	7.70@7 80
19	18.50@18.70	46.00	49@50	8.30	8.30	7.70@7.80
20	18.50@18.70	45.50	49.25@49.75	8.35@8.65	8.35@8.65	7.70@7.80
21	18.50@18.70	45.00	48.75@49.25	8.50	8.50	7.70@7.80

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for prompt and nearby deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3 M	Spot	3 M	Spot	3 M
	Spot	3 M							
15	90⅛	92⅛	106	265⅝	271½	34	35½	41	42½
16	90	92½	106	267¾	272¾	33½	35	40¾	42¼
17	..	....	...	....	....	....	....	....	....
19	90¼	92⅝	106	268½	273	34¼	35¾	41½	43⅛
20	91⅛	93⅜	109	268½	272	34⅜	35½	41¾	43⅛
21	90⅜	93⅛	109	262½	267½	34⅜	36	41	42⅜

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Metal Markets

New York, July 21, 1920

No change of importance has taken place in the copper, tin, or zinc markets in the last week. Lead is the only active metal. Labor conditions in New England seem better, and if the Connecticut and Rhode Island wire and brass mills resume normal operation, sales of copper and zinc may pick up. Manufacturing interests in many cases are holding off to see if railroad employees will strike for wages higher than those just announced by the Railroad Labor Board.

Copper

The incipient buying movement proved of meager proportions, and the market during the last week has been dull. The large producers continue to hold for 19c., delivered, for September and October metal, and several million pounds have been sold at this figure. Smaller producers and outsiders are accepting down to 18¾c, delivered, and small lots of spot metal can be obtained at 18½c., delivered. The London price for electrolytic has advanced owing to low sterling exchange. It is now more nearly comparable to New York.

Lead

None of the large producers has a pound of lead for July or August delivery, and the scarcity of prompt metal has extended to deliveries in September. Sensing this, consumers and dealers became somewhat alarmed, and many inquiries developed at the end of last week, with several sales for September and October delivery at advancing prices. Production, both abroad and at home, is below normal, but demand continues good. With these conditions, and with the London price firm, the A. S. & R. advanced its New York contract quotation to 8½c. this morning. This augurs well for the future, and the price should increase rather than decrease during the next few months.

Spot metal sold late last week for 8.70c., St. Louis. Most of the inquiries for near-by positions are from dealers and speculators.

Conditions are very bad in Mexico again, labor strikes, dynamiting of railroads, fever epidemics, shortage of ships, and general disturbances attending the latest revolution. As a result, Mexican lead is not being received here, and about 1,200 tons has been engaged from England during the last week to make up the deficiency which will exist on contracts already made, based on the usual Mexican production.

Zinc

No change in conditions can be detected. The market has been quiet, and London seems to be pretty well liquidated. Production in Missouri continues below normal. The zinc situation is discussed on page 191.

Tin

Little business has been done, and dealers have given up guessing the market. They feel, however, that consumers will have to come in soon. The prevailing unstable condition of silver and sterling exchange has considerable effect on the price of tin. Sales of electrolytic picked up slightly, at a discount of 1⅜@2c. per lb. under Straits.

Straits tin for future delivery: July 15th, 49.50@50c.; 16th, 50@50.25c.; 17th, 49.75@50c.; 19th, 49.50@49.75c.; 20th, 49.25@49.50c.; 21st, 48.75@49.25c.

Arrivals of tin, in long tons: July 14th, Hongkong, 10; Straits, 150; 15th, Hongkong, 10; Batavia, 200; Liverpool, 65; London, 25; 16th, Straits, 100; 19th, Liverpool, 50.

Silver

The domestic demand continues limited. The general undertone, however, for the silver market has improved, and with the U. S. Government buying all

our domestic production under the Pittman Act, and with the Mexican government now buying approximately 1,000,000 oz. per month of the Mexican product for Mexican mintage, the offerings of silver are more limited.

The New York quotation for foreign silver has been depressed this last week, owing to the lower quotation from London as well as to the sharp decline in sterling exchange.

Mexican Dollars—July 15th, 69½c.; 16th, 68⅜c.; 17th, 67⅞c.; 19th, 67¼c.; 20th, 67⅞c.; 21st, 71c.

Gold

Gold in London on July 15th, 106s. 6d.; 16th, 106s. 6d.; 19th, 107s.; 20th, 107s. 9d.; 21st, 107s. 3d.

Foreign Exchange

Increased European exports during the current month, particularly of wheat, have brought an unusual number of foreign bills on to the market, which has consequently depreciated exchange rates.

Pursuant to a new custom which has been introduced, we will hereafter quote francs and lire, as well as other foreign money, in cents to the unit. On Tuesday francs were 8.19c.; lire, 5.79c.; marks, 2.54c.; and New York funds in Montreal, 13⅛ per cent premium. South American exchanges broke violently. Yesterday Argentine exchange was 90.4c., compared with 107.9c. a week ago, and Brazilian, 22.0c., compared with 23.5c last week.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7⅞c. W. C. C. brand, 9c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $2.50 to $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum** Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$80 per oz.

Platinum—Market weak at $80@$85 per oz.

Quicksilver — Market weaker; $90@$92 per 75-lb. flask. San Francisco wires $85. Firm.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $1.75@$2 per lb.

[1]**Thallium** Metal—Ingot, 99 per cent pure, $18@$20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 77@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Other ports show gain in shipments.

Manganese Ore—75@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 60@85c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite, 52 per cent TiO_2, 2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6.50@$7.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 10c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., July 17—Zinc blende, per ton, high, $51.40; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $42.98; calamine, $34.46; all zinc ores, $42.94.

Lead, high, $98.50; basis 80 per cent lead, $90@$92.50; average settling price, all grades of lead, $96.33 per ton.

Shipments for the week: Blende, 8,682; calamine, 150; lead, 1,454 tons. Value, all ores the week, $521,450.

Blende was freely negotiated today on $47.50 basis, with several buyers holding back until noon on $45 basis offerings. Lead ore was advanced $2.50 per ton today.

By not operating night shifts the production is lessened to the demand, and with no ore for sale on $45 basis buyers compromised the demand of sellers for $50 basis, and the sellers let it go.

Platteville, Wis., July 17—Blende, basis 60 per cent zinc, $51 to $52 base for high grade. Lead ore, basis 80 per cent lead, $90 per ton. Shipments for the week: Blende, 1,229; calamine, none; lead, 130; sulphur ore, 110 tons. Shipments for the year: Blende, 38,909; calamine, 2,240; lead, 3,494; sulphur ore, 1,098 tons. Shipped during the week to separating plants, 2,016 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $1,800@$2,500; No. 2, $1,100@$1,500; spinning fibres, $400@$700; magnesia and compressed sheet fibres, $300@$400; shingle stock, $100@$150; paper stock, $60@$80; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $10@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 7c. per lb.; light, 4½@5c.; heavy, 4@5c.; English, extra light, 7@7½c.; light, 5½@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10 f.o.b. Maine; ground, $22@$30, car lots, f.o.b. Baltimore; ground, $22@$30, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Kentucky and Illinois mines; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Good demand for lubricating grades at 20c. upward, in less than car lots. Stove polish grades (25 to 30 per cent carbon), 1c., in car lots. Facing grades (45 to 50 per cent carbon), strong at 2@2½c. per lb. Mexican, amorphous, $45 @$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c.

Gypsum—Raw crushed rock, $3.50@ $4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $50@$60, Chester, Pa. (Magnesite brick — See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $42 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $20 in less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, $9.50@$14 per ton; roofing grades, $8.50@$9; rubber grades, $9@$15, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, carload lots, $12 per ton; less than carload, $15, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $10@$20 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, $225, freight allowed; Spiegeleisen, 18 to 22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $78@$85; 75 per cent, $150 @$160.

Ferrotungsten—70 to 80 per cent W, 85c.@$1 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$8.25 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 22½c.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. in quantity, mill lots.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$85@$90 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $45@$53 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $40. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$90@$100 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110 @$120.

Silica Brick—Nine in. and 9-in. sizes, per 1,000, $51@$55, Birmingham, Ala.; $50@$55, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, July 20, 1920

Transportation affecting the shipment of pig iron and steel products has continued to grow worse, in general, although there may have been some improvement in spots. The worst conditions were in the latter part of April. In May and perhaps the first week or two of June there was improvement, conditions growing worse since then. Largely at the instance of the steel mills and blast furnaces, the Interstate Commerce Commission has defined a coal car, for interpretation of Service Order No. 7, giving car priority to coal mines, as excluding flat-bottom gondolas under 36 in. high, inside measurement, and this will help the iron and steel industry somewhat, as some roads were calling coal cars any gondolas over 30 in.

Pig Iron—Sales of several thousand tons each of bessemer and basic have been made, for early shipment, at $46, Valley, or $1 advance, foundry remaining quotable at $45, Valley, with $1.40 freight to Pittsburgh. Late deliveries do not interest buyers at any price. The question before the market is whether a buying movement or a selling movement will come first.

Steel—Mills show more readiness to sell semi-finished steel, presumably on account of their accumulations. Billets are still quotable at $60@$65, but are easier at that range. Sheet bars can be had at $70, against $75 formerly quoted.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$18.50.

The Unsatisfactory Zinc Situation

Metal Has Recovered Slightly From Recent Drop, Production Generally Being Maintained — Foreign Business Decreasing, According to Recent Figures — Belgium Making Rapid Recuperative Progress — Future Outlook Not Very Bright

THE middle of June witnessed the lowest zinc quotation of the year, 7.30c. per lb., St. Louis. Quotations since then have gradually risen, and a month later a price of 7.85c. had been reached—a gain of over half a cent in the interval. Nevertheless, the price of zinc is far from satisfactory, and is generally below the cost of production for all but the most-favored operators. It is not likely that the serious problem presented by this condition can be met by shutting down operations, although the zinc mines in the Middle West could close with less trouble than larger Western mines.

Production Increased

Curiously enough, the low price of zinc has had little detrimental effect on production. Instead of a decreased output, as might be expected, production in the Joplin, Mo., district has actually increased. Shipments of zinc concentrates were 64,150 tons greater for the first half of 1920 than for the corresponding period in 1919, demonstrating that the productive power of the district was not diminished by any difficulty with labor or the high cost of supplies.

One of the main reasons given for maintaining production in the face of adverse conditions is the peculiar short-time leasing system in vogue in the Middle Western zinc and lead mining districts, whereby short-term leases on mineral-bearing Indian land necessitate quick development and ore extraction before the expiration of the lease. Naturally, an operator will not feel himself justified in abandoning operations which have entailed considerable expense in development, especially when no assurance is given that the lease will be renewed. Hence extraction occurs in feverish haste before the lease expires.

Those companies with large developed ore reserves which face the possibility of losing their land in the next two or three years will necessarily make every effort to secure the greatest possible return in the shortest possible time. Owing to this condition, any reduction in output except by arbitrary and concerted action by all the operators is not to be expected. Recently, voluntary action on the part of the Joplin operators resulted in a fortnight's respite from the recent heavy production. It is noticeable that, concurrently with this step on the part of the producers, the price of zinc stiffened, advancing slightly, but not sufficiently to warrant much optimism.

Another reason that production has been maintained or increased is the large demand for zinc in paint manufacture, in lithopone, and in the manufacture of zinc oxide for the rubber-tire industry.

At the same time that production has been increasing—with occasional relapses—there is little indication that domestic consumption of the metal itself is being accelerated, owing, no doubt, to the still serious railroad and coal troubles, which have also been such a detriment to prosperity in the copper and lead industries.

Foreign Business Diminishing

Export business has fallen off. For the month of April the exports of zinc amounted to 32,982,956 lb. and imports to 7,011,322 lb., leaving a net balance for the month of 25,971,634 lb., but in May the favorable balance dropped appreciably, as exports were only 19,610,210 lb., the imports being 4,046,418 lb., giving a net favorable balance of 15,565,791 lb. For the four months, February, March, April and May the favorable balance of exports has been gradually dwindling. Although this situation cannot be viewed with satisfaction, it must be accepted as a logical tendency, as the United States in normal times is accustomed to take care of its own production of zinc, consumption and production nearly equaling each other, the foreign demand being met mainly through foreign resources.

MOVEMENTS OF ZINC TO AND FROM THE UNITED STATES
(In Pounds)

Exports		
To	April	May
United Kingdom	18,373,026	13,896,975
France	11,159,962	2,548,674
Japan	168,059	511,617
Canada	68,052	92,686
Italy		850,757
Argentina		361,273
Belgium		470,400
Others	131,732	877,828
Totals (pigs, slabs)	29,900,771	19,610,210
Rolled zinc	3,082,185	
Imports		
From	April	May
Mexico	4,510,839	2,653,621
Canada	34,935	124,707
Chile		1,264,299
Others	2,447,280	
Totals (from ores)	6,993,054	4,042,627
Miscellaneous	18,268	3,791

It is worth noting that the lower price of zinc in London is not conducive to betterment in the falling export business, as European requirements can be more cheaply filled in London. Fortunately for the zinc producer, his business is not so dependent upon foreign orders as is that of the copper producer.

The following table, compiled from figures of the U. S. Geological Survey, indicates what the apparent consumption of zinc has been in the United States, compared with the production and the total available supplies for the last nine years:

U. S. ZINC PRODUCTION AND CONSUMPTION
(In Tons)

	United States Production Primary Zinc	Apparent United States Consumption	Total Available Zinc
1910-1913 (Average)	310,298	290,413	327,255
1914	353,049	299,983	394,588
1915	489,519	364,855	510,518
1916	668,343	459,317	683,280
1917	669,573	413,643	687,428
1918	517,927	423,792	571,683
1919	465,743	323,964	507,054

The extraordinary conditions arising out of the war created an unusually large demand for United States zinc; hence the big discrepancy between consumption and production during the war years. The fact that some sources of zinc are still unavailable to Europe—notably Australian zinc—would be a boon for America were it not for the temporarily satiated European requirements and the stagnation in the market there. Some dispatches indicate that this condition will prevail for the next six months, which presents not a very bright prospect for the zinc business.

Belgian and Australian Labor Compared

The attitude of labor in the world's zinc industry is strikingly contrasted by conditions in Australia and those in Belgium. The little European nation is exhibiting remarkable recuperative powers, and no small measure of the credit for this turn of affairs is due to the willingness of labor to co-operate eagerly and assume its share of responsibility in placing the Belgian zinc industry upon its feet again. The Australian situation is a sorry spectacle by comparison. The Broken Hill strike, which has caused millions of dollars' loss to capital and labor, seems no nearer settlement. Lately a round-table conference has been in session to help adjust matters, and the opinion is gaining that nationalization of the mines or operation by labor would not result in the benefits fancied. Last year Belgium is estimated to have produced 18,000 tons of zinc, and during the first four months of this year to have produced the metal at the rate of 80,000 tons per annum. This is a rapid advance considering that the pre-war produc-

tion was about 200,000 tons yearly. Increased Belgian output will have a tendency to offset the declining British production.

With the low price of zinc, the English smelters are having their troubles, and there is talk of governmental assistance to help them out of their difficulties. No satisfactory solution to the labor problem has been found, and the large smelter at Avonmouth, in which the government is interested, and which is expected to handle Australian concentrates formerly sent to Germany and Belgium, is neither operating nor exhibits any likelihood of being operated for some time. Germany is finding herself able to export an appreciable tonnage of zinc and has lifted the export ban to enable the traffic to proceed.

From Norway comes the news that the new electrolytic zinc refinery at Glamfjord which has been under construction will soon begin to operate. This will be the first refinery of its kind in Norway. In Tasmania the electrolytic zinc refinery at Risdon is considering increasing the output of electrolytic zinc from 100 tons to 140 tons per week. It is significant that electrolytic zinc and some special brands have been maintaining a higher price differential than is normal. Prime Western brands are not in their customary favor.

The Future of Zinc

What the future of zinc will be is difficult to prophesy. An optimistic view would be that the metal bottomed in June, and that it is in for betterment, but there are so many vicissitudes to the market, and so many adverse factors which must be overcome against the general economic trend to lower prices, that substantial improvement would appear to be a slow process.

The price of lead is still higher than that of zinc, and whether the return to a normal ratio will progress through a lowering of the lead price or an advance in zinc cannot be foretold. The London market bids fair to remain below the United States market for several months, and this condition alone would tend to prevent material improvement in the quotations. There is the question, of course, as to whether the London price will try to reach the United States quotation, or vice versa. In the meantime, commendable and successful attempts are being made in the United States to educate the people to new uses for zinc, and so to create a wider domestic consumption.

Copper Production in Norway

The copper deposits of Norway are similar to those of Spain, and are chiefly massive cupriferous pyrite. Their value lies not only in the copper content of the mineral but also in the iron, nickel, and sulphur contained. The latter element is frequently of more importance than the copper, owing to its application in the manufacture of sulphuric acid.

Recent figures on the copper production of Norway are not easy to obtain. Consul General Marion Letcher, at Christiania, reports that the raw copper produced in Norway from non-pyritic ores and from nickel-copper ores in 1916 and 1917 was as follows:

Smelter	1916, Pounds	1917, Pounds
Christiansand Nickel Refinery	1,221,382	758,755
Roros Copper Refinery	531,314	901,690
Sulitjelma Works	1,333,102	2,092,090
A/S Birtavarre Grüber	473,531	238,015

The production of copper ore in 1916 is given as 19,398 short tons, and in 1917, as 43,318 tons.

The production of copper pyrites for the years 1916 and 1917 was 325,571 and 362,323 short tons, respectively.

Norwegian Potash Manufacture

A local Norwegian paper calls attention to the fact that the Dalen portland cement factory expects soon to begin the manufacture of potash. This factory is situated at Dalen, near Brevik, in Norway. It was established in 1916, and is capitalized at 3,200,000 crowns ($857,600).

Movements of Metals and Ores

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for May, 1919, and the figures for May, 1920, as finally revised, are as follows:

IMPORTS MAY, 1919, AND MAY, 1920

(In pounds, unless otherwise stated)

	May, 1919	May, 1920
Antimony ore, contents	58,880	26,625
Antimony matte, regulus or metal	526,400	2,296,000
Copper:		
Ore, contents	3,159,699	5,449,040
Concentrates, contents	1,870,957	4,720,868
Matte, regulus, etc., contents	2,915,904	437,463
Imported from (in part):		
Canada	2,342,065	2,277,313
Mexico	4,537,982	2,778,787
Cuba	793,632	1,453,742
Chile	None	1,469,999
Peru	94,781	539,129
Unrefined, black, blister, etc	15,997,164	23,920,357
Refined, in bars, plates, etc	853,436	18,580,986
Old, etc., for remanufacture	14,995	665,121
Composition metal, copper chief value	None	87,076
Lead:		
Ore, contents	2,565,390	5,623,742
Bullion, contents	6,683,731	3,258,425
Imported from (in part):		
Canada	801,786	202,880
Mexico	6,940,331	8,413,133
Chile	1,507,004	91,336
Pigs, bars and old	5,440	3,170,707
Manganese ore, long tons	19,644	56,586
Imported from (in part):		
Cuba, long tons	195	118
Brazil, long tons	12,212	30,100
British India, long tons	None	14,300
Tungsten ore, long tons	285	96
Pyrites, long tons	33,263	25,329
Imported from:		
Spain, long tons	29,951	17,629
Canada, long tons	420	7,700
Tin ore, long tons	2	3,120
Tin bars, blocks, pigs, etc	449,064	9,102,341
Imported from (in part):		
Straits Settlements	224,870	4,286,663
Dutch East Indies	None	187,043
United Kingdom	224,000	3,065,287
Australia	None	236,241
Hongkong	None	973,011
Zinc:		
Ore, contents	584,619	4,042,627
Imported from:		
Canada	77,000	124,707
Mexico	507,619	2,653,621
Blocks or pigs, and old	66,898	None

EXPORTS OF COPPER, LEAD AND ZINC

(In pounds)

	May, 1919	May, 1920
Copper:		
Ore, contents	161,500	None
Concentrates, contents	None	None
Unrefined, black, blister, etc	None	111,880
Refined, in ingots, bars, etc	18,686,929	72,107,577
Exported to (in part):		
France	None	17,803,625
Italy	1,368,267	81,364
United Kingdom	10,053,311	14,810,044
Canada	1,854,518	3,877,894
Japan	1,120,000	9,184,000
Germany	None	7,055,336
Sweden	1,456,112	6,458,806
Switzerland	1,925,482	336,087
Composition metal, copper chief value	20,900	61,524
Old and scrap	45,583	13,698
Pipes and tubes	433,908	364,719
Plates and sheets	856,089	4,883,671
Wire, except insulated	3,971,415	5,248,746
Lead:		
Pigs, bars, etc.:		
Produced from domestic ore	370,883	364,086
Produced from foreign ore	1,905,041	4,785,752
Exported to (in part):		
Canada	369,651	62,674
United Kingdom	1,568,146	1,021,144
Argentina	11,212	448,000
Brazil	133,907	593,363
China	4,402	None
Japan	None	2,464,000
Netherlands	None	291,200
France	None	None
Zinc:		
Dross	182,703	675,593
Spelter:		
Produced from domestic ore	10,804,672	14,868,768
Produced from foreign ore	176,000	2,134,383
Exported to (in part):		
France	1,394,800	2,483,939
Italy	756,758	336,000
United Kingdom	6,288,240	13,460,960
Canada	233,437	None
In sheets, strips, etc	1,335,924	2,607,059

Great Fall in Metal Prices in Germany

From Our Vienna Correspondent.

Dated June 24, 1920.

The trade crisis in metals has become still more acute in Germany. As a result of their high value and the quantity imported for industrial purposes, metals are at present the most important subjects in the list of German imports. The copper consumption has fallen to about one-half of that needed in the pre-war period, as the result of labor difficulties, lack of fuel coal and the prevailing trade crisis, but as a result of the increase in prices its value has increased almost fourfold. The value of the present copper import of Germany may be safely placed at tenfold that of the pre-war importation. The general fall in prices will bring about further weakening in metal prices, and only the most necessary needs will be covered.

The effect of exchange naturally is most noticeable in the drop of the Berlin quotations as they fell from their maximum of 4,700 marks per metric ton in February to 1,609 marks at the end of May, that is, a drop of almost 65 per cent. Since then they have recovered to the level of 1918 marks.

In zinc, German trade is quiet; only small quantities exchange hands. Since the maximum of March it fell 68 per cent, or from 1,675 marks to 525-550 per hundred kilos, and has since risen to about 600 marks.

Tin prices have been subject to great variations. The domestic price for Germany, at 5,100 and 5,200 marks, still stands considerably above the London par, and at the end of January tin had reached a level of 16,000 marks per hundred kilos, indicating a decrease of 71 per cent.

German prices of lead have generally stood below the international market price since January and particularly below the New York quotations. From the maximum price of 1,800 marks, which was reached at the end of February, it dropped to 500 marks in June, a fall of 80 per cent.

The world's market price for silver has been higher than the German domestic price. The German quotation for aluminum has been more than counterbalanced by the fall in exchange rates, so that in Germany it has fallen by one-half since February. The Eisenwirtschaftsbund, in consideration of a cheapening in comparison with foreign ores and as a result of the rise in the value of the mark, have reduced prices per ton (1,000 kg.) as follows: Hematite by 200 marks, down to 2,150 marks; steel of low copper content, by 200 marks, to 2,140 marks; foundry pig iron No. 2, by 50 marks, to 1,740 marks; foundry pig iron No. 3, by 50 marks, to 1,739 marks; ferromanganese, 50 per cent, by 570 marks; ferrosilicon, 10 per cent, by 200 marks; tempered pig iron, by 182 marks.

The general market situation and particularly the reduction in prices of other products also has resulted in an oversupply.

Spain's Metal Production

The latest authoritative figures available regarding the metal production of Spain are those for the year 1918, published by the "Chambre Syndicale Francaise des Mines Metalliques." A table summarizing the production in metric tons follows:

Metal	1916	1917	1918
Iron and steel	322,931	470,242	303,206
Copper	32,880	38,526	45,104
Zinc	8,523	10,155	15,900
Lead	147,407	172,909	169,709
Mercury	795	827	567
Silver (kilograms)	110,521	114,312	98,988

A comparative table of exports of metals from Spain follows:

	1917	1918
Iron and steel	32,848	29
Copper	30,660	20,492
Zinc		3,828
Mercury	650	705
Lead, pig	133,460	127,120
Argentiferous lead	21,219	16,110
Silver (kilograms)	62,408	47,951
Gold (kilograms)	11	55

With but two exceptions, the exports materially decreased during the last war year.

COMPANY REPORTS

Oroville Dredging Co., Ltd.

Gold; Colombia

The annual report of the Oroville Dredging Co., Ltd., a British corporation, for the fiscal year ending Sept. 30, 1919, states that the American Oroville Co.—the original operating company—having gone into liquidation, and dredging in the properties having ceased through exhaustion of the gravel reserves, the receipts from the liquidation of the company, amounting to £36,181 14s. 6d., are written off the valuation of the 686,531 shares of $5 each, reducing it to £650,349 5s. 6d.

There are held in the Nechi Mines (Colombia), Ltd., 125,993 ordinary shares of 10s. each and in the Pato Mines (Colombia), Ltd., 73,918⅝ shares of £1 each, fully paid. During the year under review dividends were received from the company's holdings in Nechi Mines (Colombia), Ltd., amounting to £59,846 13s. 6d., and in Pato Mines (Colombia), Ltd., £11,087 15s. 6d. Including other fees, and after debiting all charges in London, the balance to credit of profit and loss account for the year is £69,653 14s. 8d. Four quarterly dividends of 6d per share were paid during the year, and totaled £68,653 16s. 0d. A balance of £25,367 7s. 5d. remained to the credit of profit and loss account on Sept. 30, 1919.

During the year, 1,379,331 cu.yd. were dredged by the Pato company, compared with 1,345,215 for the previous year, the gross value of the gold recovered being $489,953 (average 35.5c. per cu.yd.), with an average depth of gravel dredged of 31.4 ft., against $266,062 (average 20c. per cu.yd.), for the previous year, with an average depth of 33.2 ft. The field cost for the year was 8.77c. per cu.yd., compared with 11.16c. for the previous year. The yield was 27.3 per cent greater than the prospecting estimate for the area dredged.

The London accounts of the Pato company show a profit of £29,723 19s. 3d. after providing for £26,206 1s. 10d. depreciation. The credit to profit and loss at Sept. 30, 1919, amounted to £195,475 1s. 5d.

There were dredged in the Nechi company's property 1,042,464 cu.yd. for the last nine months of the fiscal year, the gross value of the gold recovered being $450,763, averaging 43c. per cu.yd., with an average depth of gravel dredged of 46.3 ft. The field cost was 7.75c. per cu.yd. The London accounts of the Nechi company show a net profit for the year of £61,994 19s. 8d.

Chile Copper Co.

Copper; Chile

The thirteenth quarterly report of the Chile Copper Co. covering operations for the first quarter of 1920, indicates a production of 25,390,987 lb. of copper, compared with 22,916,710 lb. during the fourth quarter of 1919. There was sold 32,704,110 lb. of copper during the first quarter of 1920, or almost twice as much as in the previous quarter (16,466,812 lb.).

The financial outcome of the Chile Copper Co. and the Chile Exploration Co. combined (earnings being based upon copper actually sold and delivered) shows the following comparison:

	Quarter [illegible]	Quarter [illegible]
Net profit on copper delivered after deducting depreciation	$1,84[illegible]	$500,[illegible]27
Miscellaneous income	58,[illegible]0	423,[illegible]7 07
Interest on cash [illegible] bank balances of Chile Copper Co	147,7[illegible]2	[illegible] 444 56
Total	$2,036,09[illegible]88	$223,200,[illegible]
Amortized [illegible] year 6 per cent convertible bonds	$3,[illegible]0	$[illegible]0
Accrued bond [illegible] Chile Copper Co	788,490 35	785,858 00
Expenses of [illegible] Co	1,555 22	701 20
Balance undistributed profits, both companies	$1,243,036 31	$ 590,916 38

Old Loss.

MINING STOCKS

Week Ended July 17, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	.	.	*75	
Ahmeek	Boston	.	.	60	June '20, Q .50
Alaska-B.C.	N. Y. Curb	1	⅞	.	
Allouez	Boston	.	.	28½	Mar. '19, . 1.00
Amerenda	N. Y.	57½	54½	55¼	Feb. '20, Q 1.00
Ariz. Com'l	Boston	11¼	10	10	Oct. '18, .50
Big Ledge	N. Y. Curb	⅞	¾	.	
Bingham Mines	Boston	9½	9	9	Sept. '19, Q .25
Calumet & Ariz.	Boston	59½	57½	57½	June '20, Q 1.00
Calumet & Hecla	Boston	315	310	310	June '20, Q 5.00
Can. Copper	N. Y. Curb	1/16	1/16	1/16	
Centennial	Boston	.	.	11¼	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	44½	42⅝	43	June '20, Q 1.00
Chief Consol	Boston Curb	4	3⅞	3⅞	Feb. '20, Q .10
Chile Cop	N. Y.	15⅞	14⅛	14⅞	
Chino	N. Y.	31	29½	29¼	June '20, Q .37½
Columbus Rexall	Salt Lake	48½	*46	*46	
Con. Ariz	N. Y. Curb	.	.	1/16	Dec. '18, Q .05
Con. Copper M	N. Y. Curb	.	.	2⅞	
Copper Range	Boston	38⅜	37⅛	38	June '20, Q .50
Crystal Cop. (new)	Boston Curb	*38	*29	*30	
Davis-Daly	Boston	9	8⅞	8⅛	Mar. '20, Q .25
East Butte	Boston	12½	12¼	12¼	Dec. '19, A .50
First Nat'l	Boston Curb	*99	*90	*93	Feb. '19, SA .15
Franklin	Boston	1⅞	*65	*70	
Gadsden Copper	N. Y. Curb	.	.	*71	
Granby Consol	N. Y.	38	37½	38	May '19, Q 1.25
Greene-Can	N. Y.	31	30	30	Feb. '19, Q 1.50
Hancock	Boston	4½	4	4	
Houghton	Boston Curb	.	.	*60	
Howe Sound	N. Y. Curb	3¼	3⅛	3¼	July '20, Q .05
Inspiration Con	N. Y.	52	49⅛	49⅝	July '20, Q 1.00
Iron Cap	Boston Curb	.	.	9	Feb. '19, M .25
Isle Royale	Boston	30	30	30	Sept. '19, SA .50
Kennecott	N. Y.	26⅛	25	25½	June '20, Q .50
Keweenaw	Boston	1⅞	1⅞	1⅞	
Lake Copper	Boston	3⅜	3⅛	3⅛	
La Salle	Boston	2⅞	2⅝	2⅞	
Magma Chief	N. Y. Curb	.	.	*21	
Magma Copper	N. Y. Curb	30	30	30	Jan. '19, Q .50
Majestic	Boston Curb	.	.	*18	
Mason Valley	N. Y. Curb	.	.	2⅛	
Mass. Con	Boston	3⅜	3⅜	3⅛	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	5⅝	5	5	
Miami	N. Y.	21⅝	20½	20½	May '20, Q .50
Michigan	Boston	4⅞	4½	4⅝	
Mohawk	Boston	62	61	62	Feb. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	6	5½	5½	
Nevada Con	N. Y.	13	12⅛	12⅛	June '20, Q .25
New Arcadian	Boston	.	.	2⅜	
New Baltic	Boston Curb	.	.	3	
New Cornelia	Boston	17	16½	17	May '20, .25
Nixon Nev	N. Y. Curb	.	.	*9	
North Butte	Boston	17⅛	16½	16½	Oct. '18, Q .25
North Lake	Boston	*70	*60	*60	
Ohio Copper	N. Y. Curb	.	.	1⅜	
Ojibway	Boston	1⅞	1⅞	1⅞	
Old Dominion	Boston	26	24½	24½	Dec. '18, Q 1.00
Osceola	Boston	41	38½	38⅝	June '20, Q .50
Phelps Dodge	Open Mar.	†195	†180	.	July '20, Q 2.50
Quincy	Boston	51	49	49½	Mar. '20, Q 1.00
Ray Con	N. Y.	16¼	16⅛	16⅛	June '20, Q .25
Ray Hercules	Boston Curb	.	.	*75	
St. Mary's M. L.	Boston	42	42	42	June '20, K 2.00
Seneca	Boston	13⅜	13	13⅜	
Shannon	Boston	1⅝	1⅛	1⅛	Nov. '17, Q .25
Shattuck Ariz	N. Y.	9	9	9	Jan. '20, Q .25
South Lake	Boston	2⅜	2⅜	2⅜	
South Utah	Boston	.	.	*14	
Superior	Boston	.	.	5	Apr. '17, 1.00
Superior & Boston	Boston	3⅜	3⅛	3⅛	
Tenn. C. & C	N. Y.	10	9⅝	9⅞	May '18, I 1.00
Tuolumne	Boston	*60	*58	*60	May '13, .10
United Verde Ex	Boston Curb	32	31	31⅛	June '20, Q 1.50
Utah Con	Boston	6⅝	6⅛	6⅝	Sept. '18, .25
Utah Copper	N. Y.	68⅛	66⅛	67	June '20, Q 1.50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17, .30
Victoria	Boston	2⅛	2	2⅛	
Winona	Boston	*60	*50	*50	
Wolverine	Boston	15⅛	15	15	Jan. '20, Q .50
LEAD					
Hecla	N. Y. Curb	4⅛	3⅝	4	June '20, QX .20
St. Joseph Lead	N. Y.	15⅞	15⅛	15⅝	June '20, QX .50
Stewart	Boston Curb	.	.	*16	Dec. '15, .05
Utah Apex	Boston	1⅜	1⅛	1⅛	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	15⅞	14	14	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	49	49	49	May '20, Q 1.50
Butte C. & Z.	N. Y.	9⅛	8⅛	9	July, '18, I .50
Butte & Superior	N. Y.	23	22⅛	23	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	13⅛	10⅛	11⅛	June '20, Q .50
New Jersey Z.	N. Y. Curb	197	192	194⅓	May '20, SA 4.00
Success	N. Y. Curb	*5	*4	*4	July '16, .03
Yellow Pine	Los Angeles	.	.	1.02	June '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	
Alaska Juneau	N. Y.	2	1⅞	2	
Carson Hill	N. Y. Curb	28	25	25½	
Cresson Consol. G.	N. Y. Curb	.	.	1⅛	June '20, Q .10
Dome Ex	Toronto	*24	24½	*24½	
Dome Mines	N. Y.	9⅞	9½	9½	July '20, Q .25
Golden Cycle	Colo. Sprgs	‡	.	*73	May '20, Q .02
Goldfield Con	N. Y. Curb	*11	*9	*10	Dec. '19, .05
Hedley	Boston	.	.	4½	June '19, .10
Hollinger Con	Toronto	5.75	5.65	5.75	June '20, BM .05
Homestake	N. Y.	.	.	55	Sept. '19, .50
Kirkland Lake	Toronto	*49	*48½	*48½	
Lake Shore	Toronto	1.18	1.17	1.17	Oct. '19, Q .02½
McIntyre-Porcupine	Toronto	1.85	1.83	1.83	May '20, K .05
Porcupine Crown	Toronto	*29	*28½	*29	July '17, .03
Portland	Colo. Sprgs.	‡	.	*60	July '20, Q .01½
Reorgan. Booth	N. Y. Curb	*6	*5	*5½	May '19, .05
Silver Pick	N. Y. Curb	*6	*5	*5½	
Teck Hughes	Toronto	*101	*101	*101	
Tom Reed	Los Angeles	1.10	1.00	1.00	Dec. '19, .02
United Eastern	N. Y. Curb	2⅛	2	2⅛	Apr. '20, Q .21
Vindicator Consol	Colo. Sprgs.	‡	.	*18	Jan. '20, Q .01
West Dome	Toronto	*6½	*6½	*6½	
White Caps Min	N. Y. Curb	*11	*9½	*10½	
Yukon Gold	Boston Curb	.	.	1	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*18	*12	*14	Apr '20, M .03
Beaver Con	Toronto	*45⅛	*43	*44½	May '20, K .03
Coniagas	Toronto	.	†2.50	.	May '20, Q .25
Crown Reserve	Toronto	*22	*20	*22	Jan. '17, .05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept. '19, 1.00
La Rose	Toronto	*38	*38	*38	Apr. '16, .02
McKinley-Dar	N. Y. Curb	*50	*50	*50	July '20, Q .03
Mining Corp.	Toronto	1.95	1.95	1.95	June '20, Q .12½
Nipissing	N. Y. Curb	8⅞	8½	8½	July '20, Q .25
Ontario Silver	N. Y.	6½	6½	6½	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	1/16	⅛	⅛	Jan. '12, .10
Peterson Lake	Toronto	*13½	*12½	*13	Jan. '17, .01½
Sil. King Ariz	N. Y. Curb	*38	*32	*32	
Temiskaming	Toronto	*38½	*36½	*36½	Jan. '20, K .04
Trethewey	Toronto	*31	*29½	*30	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2	*1	*1½	
Barnes-King	Butte ‡	.	.	1.28	Nov. '19, Q .05
Bost. & Mont	Boston	*64	*62	*63	
Cashboy	N. Y. Curb	*6½	*5½	*6	
El Salvador	N. Y. Curb	1⅛	1⅛	1⅛	
Jim Butler	N. Y. Curb	*14	*12½	*14	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*6	*5	*6	June '16, .05
Louisiana Con	N. Y. Curb	⅛	⅛	⅛	
MacNamara M.	N. Y. Curb	1/16	⅛	⅛	May '10, .02½
N.Y. Hond. Rosar	Open Mar.	†14	†12½	.	July '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	1⅛	1⅛	
Tonopah Ex	N. Y. Curb	1⅛	1⅛	1⅛	July '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '19, SA .15
West End Con	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*24	*22	*22	July, '20, M .01
Consol. M. & S	Montreal	26	25	25⅛	July '20, Q .62½
Daly-West	Boston	4⅛	4⅛	4⅛	July '20, Q .25
Eagle & Blue Bell	Boston Curb	.	.	2⅛	Apr '20, Q .10
Electric Point	Spokane	32	30	30	May '20, SA .03
Fed. M. & S	N. Y.	.	.	13¼	Jan '09, 1.50
Fed. M. & S. pf	N. Y.	.	.	36	June, '20, Q 1.75
Florence Silver	Spokane	.	.	*45	Apr '19, .01½
Iron Blossom	N. Y. Curb	.	.	⅛	Apr. '20, Q .02½
Judge M. & S.	Salt Lake ‡	.	.	4.00	July '20, Q 12½
Marsh Mines	N. Y. Curb	.	.	*12	
Prince Consol	N. Y. Curb	1/16	⅛	⅛	Nov. '17, .02½
Rambler-Cariboo	Spokane	*10	*10	*10	Feb. '19, .01
Rex Con	N. Y. Curb	*7	*6	*7	
South Hecla	Salt Lake ‡	.	.	*94	Sept. '19, K 0.15
Stand. S. L.	N. Y. Curb	⅛	⅛	⅛	Oct. '17, .05
Tamarack-Custer	Spokane	2.50	2.40	2.42	Dec. '19, K .03
Tintic Standard	Salt Lake	3.45	3.30	3.37½	June '20, Q 0.10
Wilbert	N. Y. Curb	*4½	*4	*4	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	18⅛	17⅛	17⅛	Mar. '19, .50
Internat'l Nick.pf	N. Y.	81	80⅛	81	May '20, Q 1.50
QUICKSILVER					
New Idria	Boston	.	.	5	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb	.	.	*10	
VANADIUM					
Vanadium Corp.	N. Y.	89½	82½	85	July '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	88	86	88	July '20, Q 1.50
Asbestos Corp. pf.	Montreal	96¼	95¾	96¼	July '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	62⅛	58⅛	58⅜	June '20, Q 1.00
Am. S. & R. pf.	N. Y.	91½	90½	90½	June '20, Q 1.75
Am. Sm. pf. A	N. Y.	74	74	74	July '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	59½	57	57	July '20, Q 1.50
U. S. S. R. & M. pf.	Boston	44⅛	43½	44	July '20, Q 87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually BM, bimonthly K, Irregular. I, Initial. X, includes extra

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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Volume 110 New York, July 31, 1920 *Number* 5

Human Engineering in Mining

WE DO NOT KNOW who invented the term "Human Engineering," but it was a happy phrase, and has been used a good deal during the last year. It is, indeed, the same as welfare work, and all welfare work is human engineering, but the latter phrase puts the science on the square man-to-man basis where it really belongs.

It pays the employer to look after the working conditions of the employee; it pays the mining company to study and improve underground conditions. Bad ventilation, for example, is expensive: men often cannot work a full shift, and can do only half the usual work, if the air is bad. Properly heated and equipped changehouses and shower baths are as much the business of the good mine manager as taking care of his powder and other supplies.

Proceeding further, progressive companies find that it is not enough to take care of the miner or millman when he is working, if he is not well situated during the sixteen hours of the day that he is not on the job. He must live in sanitary conditions, have a contented mind, eat well and sleep well, and have healthful recreation; otherwise his wage is likely to turn out a poor investment to the company. Eternally unsatisfied and restless, he wanders from job to job, seeking contentment—a tramp miner.

It is, therefore, the soundest of business principles for employers to consider their employees' welfare, not only as regards wage but also as to the far more important living conditions for which the employee gives up his wage. Unless there are perquisites of good surroundings, the wage in itself is generally insufficient pay, no matter how high it runs in dollars. Miners on the Mother Lode in California usually work for a less wage than other precious-metal miners, because they can have a permanent pleasant home and garden, and education and social standing for their children; and miners on the desert and in the mountain tops must be paid higher, so that they can save and move on, if the homing instinct cannot be properly satisfied.

No corporation whose stock is held wisely has the right to do anything with its funds that is not strictly good business, and helping toward profits, unless (which is unlikely) by a special vote of the stockholders. A mine or a corporation is a business enterprise; the charity, if there is to be any, is the affair of the stockholders after dividends are disbursed. Therefore, miners owe no servile gratitude to mining companies for any and all money expended for their welfare: it is a business proposition, and no thanks are in order on either side; but each side (employee and employer) owes the other the respect of man for man—the respect that one square, able man, doing his share of the common job and a little more for good measure, owes the other. It makes toward a sound partnership, in which each side helps himself and the other.

Americans are by theory and by nature independent; and are apt to style extensive projects for the common welfare, in which the individual has small part, as paternalism, and therefore weakening. This is a false conception as applied to work like that which has been done by the Steel Corporation, the Homestake Mine, the Chile Copper Co., the Ajo company in Arizona, and the Wallaroo & Moonta in Australia—it is not paternalism, but robust common sense and healthy self-interest. And in no other way can these steps toward good living be accomplished than by large capital expended for the well-being of all.

In cities without water works and sewerage, the individual cannot help himself, no matter how able: the city treasury, or, as often, some adventuring outside corporation, must supply the funds to bring him the larger comforts and safeguards. In towns given up entirely to mining, such as those clustering around some of the colossal mines which the economic development of the times has brought into being, there is no force strong enough to put in public works but the mining companies themselves. Part of their job, and their responsibility—for the conservation of the humanity which has drifted under their strong influence is part of their duty to the commonwealth—is to do what should be done, in the way of houses, sanitation, streets, parks, schools, churches, education, and amusement. If they do not do it, nobody will; and both they and the employees will be so much the worse off.

True everywhere, this is especially true of countries less advanced than the United States, where American or British enterprises are pioneering. Their economic penetration can be made the most effective human uplift that can be devised. A recent writer advocated the United States sending an army of teachers into Mexico to solve the Mexican problem. It has been the special genius of American political administration of less fortunate countries to advance the native development and prosperity in a way that no other country has attained. American and British mining companies have not always done what they could or should do in this respect. It is true, for example, that they have not done much in Mexico; and they should look into this at once, and follow their own advanced example, as set forth in developments like those described in this issue. Nor have the great companies in the United States always accomplished enough in this regard. A mining engineer from Australia told us recently that he found conditions especially unsatisfactory in Bingham Canyon. We have not seen Bingham Canyon, and we cite this with hesitation. If we are wrong, we want to be corrected. But there are many properties that we have seen where improvement is in order.

The Reputation of the Colorado School of Mines

THE administration of the Colorado School of Mines, at Golden, has, it appears, been under investigation since November, 1918, by the American Association of University Professors, through the Committee of Academic Freedom; and after rigid investigation and deliberation that committee has made public its report. The committee's report is signed by M. J. Libby, chairman; Herbert S. Hadley, ex-Governor of Missouri; J. M. Coulter, H. O. Hofman, and A. A. Porter. Those who are not familiar with academic circles will at least recognize the name of ex-Governor Hadley, who was put forward as a Progressive candidate for president at the Republican Convention of 1912, and, who, if Roosevelt (as was hoped) had indorsed him instead of bolting the party, would doubtless have been elected President of the United States.

The report of the committee is as blunt and unvarnished as could be desired. There is, at least, no doubt as to the verdict. It is frankly condemnatory of the School of Mines administration, particularly of the president, Victor C. Alderson, and the controlling element of the board of trustees.

The committee charges that President Alderson lowered the standards of scholarship "by compelling members of the faculty to change grades of students, especially those with influential relatives," and that in this and other ways he "repeatedly violated the essential principles of sound educational administration and of professional ethics."

The principal charges on which the committee's investigation was undertaken were made by former professors of the school; and the committee now sustains their charges. Various former professors swore that "Alderson arbitrarily raised the grades of some men," and that he "dominated and coerced individual members of the faculty as a whole in the matter of grades." One professor testified that "President Alderson insisted on seeing all quiz papers before they were returned to the students, but after they were marked by instructors, and Alderson warned him to change a student's grade to a passing grade or he (the professor) would get into trouble." An alumnus of the school swore that "many students at the school during Alderson's administration were allowed to pass, after having failed in their studies, because they were either athletes or relatives of influential men of Colorado."

The first charge of the ex-professors of the School of Mines was that "trustees intervened in matters of school discipline," and in finding this true, the committee of the American Association of University Professors observes: "The trustees of the Colorado School of Mines do not seem to realize the impropriety and the evil influence of their interference in the routine affairs and educational problems of the institution."

The American Association of University Professors is a nation-wide institution, and, we believe, a final and trustworthy court in such matters.

Such a report, however, does not come as a surprise or a shock to us. We have to advise the excellent people of Colorado that the conduct of their School of Mines has for years been a by-word wherever it was discussed. It has been for years a matter of common talk and consent that in Colorado politics dominated the administration at Golden; that students could and did dictate to the professors, and that the latter could not enforce discipline, except in so far as they truckled to cheap political influences. We must apprise the people of Colorado that no mining school in the country has for years borne so dubious a reputation in this respect, as being the playground for politicians, as has that at Golden. This must mean a good deal, for we have no doubt that much of this evil exists in other state mining schools; but at least nowhere else have we had it so repeatedly thrust on our attention that it reeks to heaven.

Colorado is a great state. It is a great mining state. Like California, it is the mother of miners. It has one of the most advantageous locations on earth for a mining school, and its school should rank among the highest. It does not. One needs more than air and scenery and mines and great miners and notable engineers and husky students and devoted professors for a great school. A high academic standard of ethics and of scholarship is the indispensable thing, far greater than all else; and, according to all common report, understanding, and evidence, these essentials Golden has not had.

What we say is explicit, because we should like the mining people of Colorado to clean house. They cannot afford such continuous evil rumors. To play politics in an institution of learning is to play Hell: keep them apart—the two are as essentially separate as night and day.

The Opportunity of the Reno Experiment Station

THE Rare and Precious Metals Station of the Bureau of Mines, which has been driven away from Golden by the authorities of the Colorado School of Mines, and which is to be re-established at Reno, has outlined an elaborate program of work. A résumé of the problems regarded as being in need of immediate study was given in our columns two weeks ago. If only a small percentage of the dreams and hopes of the directors come true, the mining industry will benefit greatly. The work outlined is along metallurgical rather than mining lines, as is natural, for that field offers more opportunities for research.

An investigation into the cyanide process with a view to reducing the losses is announced. With continued high prices of silver assured for some years, this is a matter of considerable importance. The old chloridizing roasting process preceding cyaniding may offer possibilities under present conditions. Or the Western Precipitation Co's. volatilization process may be attractive if not too expensive.

There is room for much experimenting. It is to be hoped that private investigators will make known what they have done either through the columns of the technical press or by direct consultation with the Bureau, so that work will not be needlessly duplicated. Experiment-station activities are of the most benefit to the industry when co-operation exists in the fullest degree.

Another important problem is that of extracting the copper and silver from the many low-grade oxidized ores in the country. Few high-grade deposits are left; the U. V. X. is one. At many properties, not only has the cream been skimmed off, but the cow has stepped in the milk-pail. Considerable work has been done by some of the large companies such as the New Cornelia, Chino, Miami, Anaconda, and Utah Copper, but the results are not in general available to the smaller operator. To be

sure, operations of this kind are pre-eminently large-scale problems, but the Bureau can do much in bringing the latest facts concerning leaching before the mining public, so that all interested may have a better understanding of what is and what is not possible. The cheap production of sponge iron for precipitation may well be studied.

One of the twenty remaining lines of investigation is to be a study of the methods used in crushing ores and a comparison of results secured by different machines. This would give exceedingly interesting data. Many excellent crushing and grinding machines are on the market, claims for which are most conflicting. Then the new types of rod mills which have been devised by F. E. Marcy and David Cole should be given immediate attention. Under what circumstances are they better than ball mills? Practically every reduction plant, no matter how small, has a fine-grinding mill, and will be thankful for guidance.

As we mentioned last week, the Bureau of Mines experiment stations have not always been unqualified successes. We hope at a later date to be able to say some nice things about this latest installation. We hope that the new Reno station will eclipse for efficiency the reputation of the city's divorce mill.

The Company Store and the Co-operative Store

THE central store in a mining camp in its various phases has been both the worst and the best of institutions. The company store in its old-fashioned form was often a means of exploitation, if it did not so originate. In some cases miners who did not trade at the company store would be discharged, a clear evidence of the profiteering nature of the undertaking; especially since the only reason that a miner could have had for trading elsewhere was that he could thus do better. In some mines, especially those in remote places, where a central store was clearly advisable, the profits from the company store were used to cover up sloppiness in the mine management. It was of less importance how much was paid out for operating expenses, if all, minus the wholesale cost of a certain amount of food and clothing, came back to the company's coffers. It so came about, therefore, that the company store acquired in many places a dubious reputation; and for that reason many companies declined to venture into such an institution, which was sure to be suspected even though properly conducted.

The lack of a central store, however, has proved in many places as bad as the rapacious company establishment. For the one big concern, which may or may not be profiteering, comes a horde of little ones, with high operating costs, and all profiteering to the best of their ability, according to the general principle of retail trade. Especially in these days of high cost of everything, the high overhead expenses of such little stores have contributed to bringing prices so high, not only in mining camps, but elsewhere, that they have become well-nigh intolerable; and the general trend of advanced thought has been toward larger central stores, with a less percentage of overhead, and a less margin of profit. Even before this, many if not most of the company's stores, established by necessity, for the convenience of miners, in remote camps, had completely reacted from the money-making idea; and the store had been managed like any other department of the mine, and required only to pay its actual cost of maintenance, as, for example, at the Eden mine in Nicaragua. The margin of retail profit in such cases was fixed so as just to cover the cost of administration, say at 10 per cent, while the outside retailer's profits would have been 20 or 30. In this form the central store becomes an unmixed economic blessing. As an example of the change of the feeling against the central store is the recent action of the striking miners at Tonopah. Becoming convinced that the Tonopah companies could not afford to pay the increased wages which they felt they needed, to cover the high living costs, they agreed to a central store operated by the companies, in order to reduce to a minimum the retailer's profits.

But how shall miners know how to distinguish between the company store which is established, like the hospital, as part of the necessary plant, and the grafting store? The company must not only avoid profiteering in goods essential to plain living, but the suspicion of profiteering. And the development of the company store in the direction of a co-operative store has solved this difficulty. A margin of profit is fixed more than sufficient to cover running expenses and the net balance is repaid to purchasers at the end of the year. This is the solution at Ajo, where in addition a committee of workmen inspects the functioning of the store and helps advise concerning it. The institution then becomes ideal. In many cases, in foreign countries, the character of the population may be such that this co-operative plan, which presupposes intelligence of the native American type in the purchasing class, would not work out satisfactorily: and the stores must be run as they are at Chuquicamata, with an endeavor to break even. According to the article by Mr. Guggenheim in this issue, so far they have lost money. Therefore, the co-operative plan is the more accurate, where it is feasible.

It is not at all impossible that the co-operative store may be so perfected in our mining camps that it will become more practicable than it has hitherto proved, in older and more diversified communities.

Anti-Metric Propaganda

THE anti-metric propaganda people are sending out stuff that we could improve on ourselves for effectiveness. The latest batch contains a letter from a man who has been in Norway, where the metric system has been legitimized. He observes:

"From my experiences in Norway and Sweden, I am much averse to changing the system in use in this country, because of the confusion due to the conglomeration of terms that creep into use." Also, he says, "I later discovered that the Swedish metal industries use no less than four systems of measurement: in Norway, there are three systems." He evidently prefers to retain the old confusion rather than follow the universal and logical system into the light of simplicity.

Also, the propagandist relates this fable: "A lady on being told how easily the metric system could be learned, replied, 'I do not believe I could ever learn the meter, so as to think of it other than one yard, three inches, and a little more.'" Enough! We are convinced by the fable of the "Lady and the Meter." We are tempted to put it into a limerick:

A lady who could not be sweeter,
Remarked to a writer named Peter,
"I know what's a yard,
But a meter is hard."
Said Peter to us, "You should meter."

Welfare Work at the Homestake Mine

Avoidance of Paternalism, a Lively Interest in Clean Amusement, and Development of the Community Spirit Have Been the Guiding Influences in Shaping the Human Engineering Plan Followed by the Homestake Mining Co.

By B. C. YATES*
Written for *Engineering and Mining Journal*

MEN and women, to be happy and contented, should have definite work to do, have amusement, and must be allowed to develop their home and community life largely in their own way. Welfare work, to accomplish the most good, must help the people of a community in their daily work, their amusement, and their home life. It should be developed gradually and naturally as the needs of the community are manifested and should never be conducted along fixed lines laid down by a single individual who perhaps lacks full appreciation of human nature. Paternalism should be avoided as far as it is possible to do so in a community where a single business interest dominates. The needs of the people should be carefully studied and anticipated; and the one central idea that each individual employee is a part of the organization—that he is not a machine but a human being with the usual characteristics of the species—must govern if the work is to be successful.

Although the management of the Homestake Mining Co. has always possessed an active interest in the general welfare of the community, it has never undertaken to furnish houses for its employees. It has, however, encouraged the building of homes by giving free permits to occupy company ground and by advancing the purchase price and allowing the employee to pay on the monthly payment plan, with a low rate of interest on deferred payments. After forty years of continuous operation as the sole industry of the community there are few company-owned houses in Lead. Under this policy the town has grown from a typical mining camp, with its log cabins and board shacks, into a modern small city, with paved streets, sewer and water-supply systems, electric lights, and beautiful homes, owned largely by their occupants. The grocer, the butcher, the hardware dealer, the clothier, and the real-estate man carry on their business in this mining camp as in any ordinary town of equal size. Keen competition keeps up healthy trade conditions and maintains prices at a reasonable level.

DURING THE PLUNGE PERIOD. SWIMMING TANK IN THE HOMESTAKE RECREATION BUILDING

No part of the welfare work at the Homestake has met the needs of the people more fully than the Free Library, originally a Christmas gift from the late Phoebe A. Hearst in 1894. It was maintained by her beneficence until her death, and is now carried on through the generosity of her son, William Randolph Hearst. The library was first installed in the Miners' Union Building, moved in July, 1896, to a room over the Hearst Mercantile Co. store building, where it remained until 1914, when it was moved to its present quarters on the second floor of the recreation building.

The first volumes placed on the shelves were such as would appeal to the average reader to be found in an early-day mining camp. The number of volumes has

*Superintendent, Homestake Mining Co., Lead, S. D.

been increased yearly, and the standard of the literature has been consistently raised until now the library contains approximately 13,000 volumes. In the reading room are eighty periodicals, of which two are foreign, and twenty-two newspapers, of which two are foreign.

The close proximity of the high school enables the library to render valuable assistance to teachers and pupils, and the grade teachers use the library freely for reference work. Much assistance is also given to the literary clubs of the town. The magazine collection, with its adequate guides, is especially useful in this work, and each year makes this section more valuable. The library is also used extensively by non-residents from surrounding towns.

KINDERGARTEN AND YARD AT LEAD, S. D.

When the library was opened forms of amusement were scarce in Lead, so it was, in a measure, made a community center. Musical programs were given at intervals and musical organizations and literary clubs used the room as a meeting place. Its use by all nationalities and ages has grown until now the services of a trained librarian and two assistants are required to care for the needs of its patrons.

Besides the excellent collection of books, there are a number of beautiful paintings on the walls. A smoking room is provided for the men, and the children have an alcove for their particular use, provided with low tables and suitable chairs. One end of the stack room is used for mineral exhibits, especially the minerals of the Black Hills region. In short, this is the most complete and best-housed library in South Dakota.

Influence of the Kindergarten on Americanization

The kindergarten, opened in 1900, is also maintained by the generosity of the Hearst family. Sessions are held five days in the week, from the the first of April until the Christmas holidays. A trained kindergartner with from two to three assistants is employed. Children between the ages of four and six are admitted, the older ones attending the morning session and the younger the afternoon. The work is carried out on the latest approved lines, and the school is well supplied with models, sand tables, piano and other aids to interest children.

A small but well-kept park nearby provides a place for outdoor play during the summer months. The kindergarten has been an inestimable aid to the public school by giving the children of foreign birth a start in the English language and teaching them something of American ways and manners, thus relieving them of the handicap resulting from their foreign parentage. It has also proved a large factor in Americanizing the parents by both direct and indirect contact with the teachers. Entertainments are given frequently by the pupils, to which the parents are invited, and these are always well attended, especially by the mothers. Frequent visits to the homes by the teachers also tend to awaken and keep up the interest of the parents in things American. The average attendance under normal labor conditions at the mine is about 125 for the two sessions.

The Public School in Welfare Work

Although the public schools of Lead are supported by general taxation in the usual way, it is not out of place to mention them in connection with the welfare work of the Homestake company, inasmuch as it pays the larger part of the taxes for their maintenance and has always favored a liberal policy for the schools. The Lead public schools are second to none in the state from the viewpoint of excellence of teaching force, equipment and work accomplished.

In the department of science the school is especially strong. Scientific schools of the country bear evidence to the high quality of its graduates, one state school testifying that no Lead graduate has ever failed to make a high record in the institution. Manual training, domestic science, music and art are taught by special instructors, and a complete business course is given. An instructor in athletics is also employed, and the interest in football, basket ball and track meets is most active, the basket-ball team having won the state tournament in 1918. The school maintains a library of about 13,000 volumes in addition to the Hearst Free Library and employs a professional librarian to facilitate consultation.

The attendance in the high school has increased more than 100 per cent in the last three years. This increase comes almost entirely from Lead, as few attend from

AUDITORIUM IN THEATRE, RECREATION BUILDING

surrounding territory. The number of graduates who attend higher educational institutions is also large in proportion to the attendance.

The Homestake company, in supporting a liberal policy toward the schools, feels that it is fully repaid by the stabilizing influence on its working force, due to the fact that men with families are attracted to Lead on account of its educational advantages. Many of the young men now holding important positions in the shops, mills, assay and engineering departments are graduates of the Lead high school.

From 1879 until 1906 the hospital department was conducted under the contract system. Each employee paid $1.10 into the hospital fund and was furnished free hospital and surgical care in case of injury and a reasonable amount of medical and other surgical care for himself and dependents. Under this plan the company engaged the chief surgeon and he employed his assistants. There were frequent dissensions over charges for border-line cases; and, inasmuch as the employees who furnished the funds for maintenance had little or nothing to say about the management, much dissatisfaction was constantly manifested. On Jan. 1, 1906, the Homestake company discontinued the hospital assessment against its employees and assumed the entire cost, thus initiating what is believed to be the first free complete industrial medical service for employees and their dependents. All employees and their dependents are furnished free medical, surgical and obstetrical service of every nature.

Because of lack of room, uncomplicated obstetric cases are not admitted to the hospital, but any other type of case, either medical, surgical or obstetric, demanding hospital care, is furnished, free of charge, whatever is necessary. Employees may employ outside doctors and pay for such services themselves. To carry on this work seven physicians are employed, all graduates of high-class medical schools and experienced both in industrial medicine and general practice. (Recently one of the assistants has been appointed chief surgeon for a large copper-mining company in South America.)

The hospital building is getting old, and in the near future will be replaced by a more commodious and up-to-date one. The equipment is, however, modern and complete. Among the special features of the equipment to be noted is the X-ray outfit, which is now considered one of the necessities in a present-day industrial hospital. Twenty beds are maintained and seven graduate nurses are employed to look after the patients. The medical work is done entirely by doctors, the nurses not being permitted to do routine dressings, give anæsthetics, do X-ray or perform or other laboratory work. It is the opinion of the management that this method is more satisfactory to the employee and is certainly safer from a medico-legal viewpoint. The company spends annually about $60,000 in keeping the hospital service at the highest degree of efficiency.

In addition to the regular duties, the medical staff devotes much time to the general welfare of the community, the chief surgeon having served as city health officer for many years, and to his faithful work in this office is due in large measure the generally clean and sanitary condition of the town. Among the other duties may be mentioned physical examination of all applicants for employment, medical supervision of the employees, mutual-aid association, locally known as the Homestake Aid Fund; promotion of first-aid and safety work in an organization employing normally about 2,500 men, and giving expert medical assistance in handling the welfare work of a modern industrial city of eight thousand population.

INTERIOR OF HOMESTAKE CHANGE HOUSE, SHOWING LOCKERS AND CLOTHES-DRYING SYSTEM

The Homestake recreation building, built and equipped by the Homestake Mining Co. at a cost of $250,000, was opened to the public on Aug. 31, 1914. It is a three-story brick-and-stone structure of the latest design, and is well lighted, heated and ventilated. No expense was spared to make this the recreation home of the employees and their families, and all residents of Lead are given the same privileges as employees, so that it is a community house in the fullest sense. No membership fee is charged and no card or number used. Everybody is welcome and all are treated as special guests by the attendants. The building has always

been conducted on the open-house plan, no hard and fast rules have ever been made, and each guest is allowed perfect freedom so long as his conduct is not objectionable. The only rules posted are those governing the length of time one set of players may use the various tables and games, and specifying the days when the men, women and children may use the plunge. The results from this method of handling the building have proved most gratifying to the management and seem to be appreciated by the patrons, as the average monthly attendance is about 25,000.

On the first floor of the building is a large rest room furnished with easy chairs and lounges, with tables for chess, cards and other games, and directly in the rear of this room is the billiard room, with two regulation billiard and two pocket-billiard tables. In alcoves of the rest room are three tables for children between the ages of six and sixteen. About 2,500 persons play on these tables during a month.

Below the rest room is the gymnasium and a bowling alley of six alleys equipped with automatic pin setters. Over 2,000 persons use these alleys each month, including the ladies, who have one day each week. The gymnasium is well equipped and is also used by two bands as a practice room.

In the rear of the rest room and with a separate street entrance is a well-furnished theatre with a seating capacity of 1,000. Moving pictures are shown, both afternoon and evening, with road shows and vaudeville when available. The average monthly attendance is about 20,000.

Under the theatre auditorium and directly in the rear of the bowling alley is a tank 25 by 75 ft. with a depth of water ranging from 4 to 9 ft. The plunge and floor are lined with white tile. Change rooms, shower baths and hair driers are provided for the bathers. The water is heated, filtered, disinfected and changed frequently. The plunge is patronized by approximately 1,800 persons per month, about equally divided among men, women, boys and girls.

A TWO-BED ROOM IN THE HOSPITAL

A small room called the sun room, because of its particularly sunny exposure, is used as a meeting place by various clubs, societies and committees.

There is no charge for the use of any part of the building to Homestake employees and their families or to residents of Lead, except for the theatre, where a nominal charge is made to cover cost of pictures and other attractions.

A manager of the building, who is also in charge of the theatre, with assistants in the various departments, is always on hand to look after the needs of the patrons. The use of the building by all nationalities and ages has been most gratifying, and it has become a great welfare center where Americanizing and humanizing influences are constantly at work.

MACHINE SHOP, WASH AND LUNCH ROOM

EMPLOYEES' MUTUAL AID ASSOCIATION

After a careful canvass of the sentiment of the employees, the Homestake Aid Fund Association was started in 1910. A board of five directors was elected by ballot and held their first meeting July 16, 1910. These five directors, elected annually, with the superintendent of the company as treasurer, and the chief clerk as secretary, direct the affairs of the Aid Fund, receive applications for aid and direct payment of claims. Its decisions are final in cases of dispute. All employees of the company contribute $1 per month, and, up to the time the South Dakota Compensation Law went into effect, the Homestake company contributed $1,000 per month. Benefits were paid for both accidents and sickness until the state law made it obligatory upon the mining company to pay all compensation for accidents, after which time the Aid Fund has been used to pay sick benefits only.

Originally $1 per day was paid for loss of time from either sickness or accidents, beginning the day of the accident or after the sixth day, in case of sickness, and continuing for a period of six months from date of disability. Later the time was extended to nine months and the benefits were increased to $1.50 per day if the sickness continued beyond three months. The sum of $800 is paid to the beneficiaries in case of death and $200 if a member commits suicide or falls a victim to insanity.

Benefits paid up to April 1, 1920, are as follows: Account of death, $195,200; suicide, $1,000; insanity, $1,400; sickness, $91,183.11; injury, $75,498.25; making a total of $364,281.36.

At the time of the influenza epidemic in the latter part of 1918 the fund carried a balance of approximately $40,000, but this was entirely wiped out, and the fund now has a deficit of about $7,000, which the Homestake Mining Co. has assumed.

Although the Homestake company does not now contribute regularly to the Aid Fund, it does pay to all injured employees $1 per day for all time lost from accident up to the tenth day, at which time regular compensation payments begin in accordance with the state law.

The Ladies' Auxiliary to the Aid Association is a purely charitable organization, liberally supported by the Homestake company, and was organized in 1909 to assist the Aid Association in taking care of the families of employees, who by reason of sickness or other misfortune are unable to care for themselves. This auxiliary has a paid-up membership of about 150, and the work is supported by all residents of Lead and the surrounding communities which are more or less dependent on the Homestake industry. A membership fee of 25c. and monthly dues of 10c. furnish a small income, which is augmented by donations and receipts from the annual Labor Day picnic, which is given under the auspices of the auxiliary, and from other entertainments given during the year.

A relief committee consisting of two members from each ward is appointed annually, whose duty it is to visit the sick and needy and furnish relief when necessary. An average of thirty-five families are helped each month, and the work has grown until any needy family, whether employees of the company or not, is given aid. Since the end of the Great War, the local Red Cross organization has turned over to the auxiliary the work of taking care of those families left destitute by the death of the bread-winner, either while in the service of his country or from the influenza during the epidemic of 1918 and 1919.

The company began the practice of retiring its old employees, on account of old age or physical disability, July 1, 1917. The basis of computing rate of pay after retirement is as follows: 25 per cent of last full year's pay plus $10 per year for each year's service with the company, but not to exceed $600 per year.

An employee may make application for a pension, in which case the application must be approved by the head of the department in which he works, or he may be retired upon request of his foreman.

There are now forty-two men receiving pensions of from $350 to $600 per year. The average age of those receiving pensions, at the time of retirement, was over sixty-five, and the average years of service nearly thirty-one. Nine pensioners have died and one pensioner was re-employed. A pension is also paid to widows of employees who lost their lives by accident prior to the enactment of the state compensation law. Each woman entitled to this pension is paid $30 per month, with an additional $5 for each child under sixteen years old.

At a meeting of Homestake employees of twenty-one years of actual service, held in December, 1905, an organization was effected and a constitution adopted. This organization is known as the Homestake Veterans' Association and was formed for the following purposes: To gather together the older employees of the Homestake Mining Co.; to make a record of past incidents relative to the mine and its first employees; to extend such voluntary aid to needy members of the association as may be determined by majority vote, and to cultivate and keep alive a more lasting acquaintance among its members. The qualifications for membership are as follows: At the time of making his application, the applicant must be in the employ of the Homestake Mining Co. and shall exhibit satisfactory proof that he has been in the active service of the company or associate companies for not less than twenty-one years. He must bear a good moral character and be recommended by two veterans in good standing.

The association started with a charter membership of 103, and the membership at the present time is 157. Employees who have been retired on pensions do not lose their membership. In charity work, not alone among its members, but throughout the community, the association has spent over $6,000, which does not include substantial subscriptions to the Red Cross. The treasury holds $2,100 in Liberty bonds and cash.

The employment department was started in 1904. Previous to that time, men were hired by the foreman and bosses. For several years men for the mine only were hired through the employment office, as there were no rules or precedents to follow. At first only the name, nationality, age and experience of the applicant were recorded. Later, the work was enlarged, until now all labor is hired by the employment office and an application blank is filled out and signed by the applicant, physical characteristics, date and place of birth, weight, height, color of hair and eyes, condition of health, personal history, religious and political affiliations, name of nearest relative, and at least one good reference being recorded. Later, when the employees' insurance was put in force, all applicants were required to pass a physical examination. This serves to insure getting only physically sound employees and to protect the members of the mutual insurance association.

UNDERGROUND DRINKING FOUNTAIN AT THE HOMESTAKE

Early in the work it was found that men are greatly influenced by their first reception. The employment office is the company's front door, and the applicant is made to feel at home and given to understand that he is employed as an individual and not a mere part of a mass, and that the humblest position is just as essential as the highest. The rules of work are explained, and a printed book of rules is handed each successful applicant. He is asked whether he has a place to room and board, and if he has none is directed to several where he can make his choice.

All employees' records are numbered and condensed on cards, which are filed alphabetically, one group for employees and one for ex-employees. When a man leaves the service of the company he gives his reasons when he draws his time. His immediate boss also makes a statement, which is recorded, as to why the man left. Both reasons are copied on the man's card for future reference. When a request is made by some future employer for a man's record, a notation with the address is made on his card, and like requests are made of former employers, especially if the man's work is not entirely satisfactory.

At the end of each month a report is made showing number of men hired for the month, with certain statistics such as nationalities, ages, married or single, and under what bosses placed; also the number of time checks issued for men leaving each boss and the reasons for leaving as given by the man and boss. This department has hired 19,250 men since its organization.

Outside of the regular work of employment, the office keeps a list of all employees who are not full citizens of the United States, and gives all assistance possible in completing their citizenship papers.

In keeping with the policy of the company of looking after the welfare of its employees, a safety engineer was added to the staff in 1917, and a regular organization effected to look after matters pertaining to safety. A workman's committee, made up of men from all departments, with the safety engineer as chairman, meets once a month. The members of this committee report any unsafe practice or condition which they may have observed during the month and discuss matters pertaining to safety. If the condition needs immediate attention, the safety engineer is notified and the remedy is applied without waiting to report to the committee. A central committee, consisting of the superintendent, as chairman, and the heads of departments, meets the week following the workman's committee to act upon the recommendations of the workman's committee, and also to consider safety measures on its own initiative.

The importance of the safety movement is impressed upon the employees by posting bulletins of the National Safety Council, and local bulletins, and by publishing the Homestake Safety Bulletin, containing timely remarks, clippings from other safety publications, and records showing injuries sustained during the month in each department. The mine department is divided into six competitive divisions to stimulate inter-department competition. Shift boss records are also given showing accidents under each one.

Every month each foreman in charge of a mine division receives a slip showing his standing and a comparison with the total mine record for the previous month, together with remarks on practices observed and injuries sustained in his territory during that period. Each shift boss also gets a monthly tabulated comparison of all bosses together, with remarks on practice observed and injuries sustained by men under his supervision. The general mine foreman gets a copy of all these letters.

All dangerous places and mechanical appliances are properly safeguarded, both underground and on the surface. Goggles are furnished free to all men working under conditions hazardous to the eye. First-aid material is available on each level of the mine and in shops and mills. Safety suggestion boxes are placed at accessible points around the works. Men are trained in the use of mine rescue apparatus and in first aid to the injured. During 1919, 127 men were trained in mine rescue work and 204 received first-aid training. This work was under the supervision of the staff of the U. S. Bureau of Mines Car No. 5, and those successfully completing the work hold a Government certificate.

All major accidents are thoroughly investigated by the safety engineer as soon as possible after the accident. The accident severity rate has been materially reduced and the frequency rate slightly reduced, although the labor turnover has been rapid. On the whole, the results of the safety work have been satisfactory, and demonstrate that if each individual workman can be interested much more can be accomplished.

Sanitary Measures

Every effort is made, both in the mine and in the surface plants, to provide sanitary working conditions. Bubbling drinking fountains are placed in convenient places both underground and in the mills and shops, and provided with clear, cold, wholesome water. Clean, well-heated and ventilated change rooms are provided with hot and cold water and individual lockers for clothes. A special underground latrine is used in the mine, which is brought to the surface frequently and thoroughly cleaned. At convenient places near the shops and mills special toilet rooms are placed, which are kept clean by the constant attention of an attendant, who gives his entire time to this work.

Ventilation of the underground workings and dusty crusher rooms is carefully supervised. Much time and attention have been devoted to the introduction of water machines for drilling, until at this time only a small percentage of the men underground are working in dusty places. In these and in many other ways the Homestake company is daily doing something practical to better the working conditions of its employees.

Many religious denominations are represented in Lead and most of them have an organization and a place of worship. The Homestake company makes a yearly contribution of $200 to each church holding regular services, and renders other material aid in various ways. Though impracticable to cease all operations on Sunday, it has been the practice for some time to allow one-half of the force of certain departments to lay off on alternate Sundays and individuals may take their Sundays off if so desired. Church services are well attended and the financial condition of the churches is generally good.

[Note: The author wishes to thank publicly the members of the staff, F. A. Henderson, superintendent of schools, and Miss M. E. Livingston, librarian at the Hearst Free Library, for their valuable assistance in preparing this article. All photographs are by Art Lease, of the engineering department.]

MAIN AVENUE OF AMERICAN TOWN SITE, BRADEN, CHILE

Building Mining Cities in South America

A Detailed Account of the Social and Industrial Benefits Flowing From the Human Engineering Work of the Chile Exploration Co. and the Braden Copper Co.—Organization, Administration and Conception of the Objects Sought

By Harry F. Guggenheim*
Written for *Engineering and Mining Journal*

IN EVERY department of human affairs, "practice long precedes science." To this dictum of John Stuart Mill the welfare movement in the so-called Guggenheim companies has been no exception. The welfare work of the Chile Exploration Co. and of the Braden Copper Co. in Chile is approaching what might colloquially be called a science, which has been preceded by and is the result of experience gained in "common-sense" welfare work practised over a long period of years in mining camps in different parts of the world. These two companies, on account of their isolation and the magnitude of the operations centralized at one point, have lent themselves to the development of welfare work similar to that practised in some of the large progressive industrial works but unusual in mining camps.

The Braden property is situated in a steep mountainous region at an elevation of from 7,000 to 8,000 ft. It was a region without permanent inhabitants. The mines originally were worked in a small way during the summer, but owing to the rigorous climate and the very heavy snowfalls, which cut off communication with the outside world, the region was practically deserted in the winter months.

The Chuquicamata Property

The property of the Chile Exploration Co., known locally as Chuquicamata, is on a high plateau with much less precipitous mountains in the background. The elevation is 10,000 ft.; the climate dry and without seasonal extremes of temperature. It was not a settled country, because of absence of fresh water in the vicinity.

From this it will be seen that these companies had not only to develop and equip their mines, but they had to build railroads and to establish towns, or if you please, cities, complete, sufficient to house from 10,000 to 15,000 inhabitants, and to supply them with food, water, and other necessaries, as well as to keep them clean, healthy, and content.

*Vice-president (in charge of operations) and chairman of executive committee of the Chile Exploration Co. Vice-president Braden Copper Co.

Work at the Braden property began in 1908. It was first developed and equipped for the production and treatment of 3,000 tons of ore daily. In 1915 it was found that the property warranted greater production, and the necessary plant and housing which will place the mine on a basis of a daily production of 10,000 tons of ore is rapidly nearing completion. It has normally at present a population of about 12,000.

Preparations for working Chuquicamata began on a large scale in 1914, and operations were at first on

TYPE "C" ADOBE HOUSES AT CHUQUICAMATA

a basis of the production of 5,000 tons of ore daily. This was rapidly increased to 10,000 tons, and at the present time the plant has a capacity of 15,000 tons per diem. The eventual capacity will be 30,000 tons daily.

Organization of Welfare Work

The important steps in the evolution of the welfare movement in these South American properties grew from conditions of sufficient practical value to warrant a summary. The welfare problems at these properties are divided into two classes, one for the so-called "staff" employees, consisting of Americans, Chileans, and Europeans, and the other for the workmen, who are in the very great majority Chilean and who have had few of the advantages enjoyed by citizens of rich and more industrially and culturally developed American and European countries.

The first attempts at welfare were made by the general managers of the properties with funds appropriated for specific purposes as the necessities became evident. The base of this work was hygiene and amusement for the Chilean workmen and recreation for the staff. Early in 1915 it was realized that, although much more money had been spent for welfare construction by the Chile Exploration Co. than by the Braden Copper Co., at the latter property the spirit of contentment and the real progress of the community, which should be the end in all welfare work, were much more marked. The conclusion reached was that the success at Braden was in a large measure due to the efforts of Mr. B. T. Colley, who was then smelter superintendent and who in addition to his regular duties was in charge of welfare.

Selecting a Welfare Manager

The results of the right man spending but a part of his time on welfare were so successful that it was decided to employ a welfare expert to devote his entire time to this work at the two properties. At that time the field from which to draw for welfare experts was very limited; and the writer, after spending much effort in the search for a welfare expert with knowledge of Latin American people, and with the personality needed in a mining camp, decided that the "expert" qualities, though desirable, were less essential than personal qualities. Mr. Colley possessed the personal qualities; and, heretical as it then was to make of a smelter superintendent a "welfare manager," he was put in charge of the welfare development at the two properties. He knew the Latin American laborers through many years' experience with them; appreciated their abilities and their weaknesses; and primarily had a real interest in their development and a profound faith in the general proposition that humanity progresses.

After several years in the welfare development at the two properties, local organizations were evolved and became a part of the general organization of the plants, with department heads reporting to the respective general managers of the properties. Mr. Colley was then placed on the headquarters staff in New York of the firm of Guggenheim Brothers, that he might act in the same capacity for properties under the management of the firm in regard to welfare problems as the heads of the engineering departments act for their respective subjects. The following is a summary of the duties of the Welfare Department of Guggenheim Brothers as set forth in the organization circular of that firm:

"To make a continuous study of the development of welfare methods in all parts of the world.

"To maintain an organization capable of performing the following functions for and through the chief executive of any of the companies under the management of the firm:

"1. Advise regarding welfare policy.
"2. Study welfare reports.
"3. Study requisitions and tenders for welfare work.
"4. Decide on the selection of welfare personnel.
"5. Supervise requests for welfare appropriations."

Development of Welfare Departments

The last step in the development of the welfare movement has been the amalgamation of the welfare and personnel departments. The personnel department had its origin as a part of the headquarters organization

TYPE "A" ADOBE HOUSE AT CHUQUICAMATA

with the function of carefully selecting "staff" personnel for the properties. With the fund of experience that has in very recent years been accumulating, based on the multifarious profit-sharing plans and the even more recent plans which might be classified under the head of "Industrial Democracy," the function of the personnel department was extended to an investigation of these experiments for the purpose of adapting to South American conditions the good results that had

elsewhere been obtained. The functions of the welfare and personnel departments soon overlapped; and they were accordingly consolidated.

The welfare work in the field consists, first, in the construction of welfare facilities, and, second, in the operation or proper use of these facilities. The plan may be outlined as follows:

The cost of construction work at the Braden Copper Co. has been about $2,500,000, and at the Chile Exploration Co. about $3,600,000. Prior to undertaking the extensive construction of the housing and welfare program determined upon in 1915 the local conditions at the respective properties were carefully studied and plans prepared for standard types of houses for various classes of employees as follows:

Official Houses—Occupied by heads of departments. One-story cottages having six rooms, two baths, and a kitchen. The total floor space in each is 1,500 sq.ft.

Type "A" Houses—Occupied by general foremen, assistant engineers, and senior office employees. One story, with four rooms, kitchen and bath. Total floor space in each is 1,250 sq.ft.

Type "B" Houses—Occupied by sub-foremen, skilled mechanics, and junior office employees. One story, with three rooms, kitchen, and bath. Floor space, 750 sq.ft. each.

Mess Houses—Occupied by bachelors employed as junior engineers and office employees. One-story rectangular buildings of the inclosed patio type, with a living room and dining room in the patio and from nine to eleven bedrooms, a kitchen, baths and servants' room surrounding the patio. The average floor area of this type is 3,020 sq.ft.

Type "C" Houses—Occupied by high-class native foremen and mechanics. One-story, with two rooms, kitchen, and bath. These are semi-detached, built in rows of ten houses each, and the floor area of each house is 560 sq.ft.

Type "D" Houses—Occupied by native laborers and their families. One story, with either two or three rooms. The first 325 of these houses built were detached, two-family houses. All houses of this type built subsequently are in rows of ten. The floor areas are 242 and 363 sq.ft. for the two- and three-room houses respectively. Authority has been granted recently to add shower baths to a certain number of these houses that are occupied by natives that can be classed as permanent employees who have shown more than the usual interest in raising the standard of their homes.

Staff Quarters—Occupied by bachelors holding subordinate staff positions. One-story buildings, having a longitudinal hall with bedrooms on both sides. At one end is a general lounging room and near the middle there is a bathroom with a number of showers. Each of this type of building contains from sixteen to twenty bedrooms, provided with running water.

The standard types have been followed at Chuquicamata and wherever possible at Braden, but the fact that the mine and mill town-sites for the latter property are located on the side slopes of a mountain with limited space for buildings, has necessitated constructing a large number of two- and three-story apartment houses that will accommodate from four to eighty native families. The allowance of space per family is practically the same in both cases.

Plans were also made of schools, club houses, churches, hospitals, sanitary sewers, and potable water supplies. At Chuquicamata a site was selected for the native village, west of the plant, where there is ample room for enlargement, and the area has been laid out in regular blocks and streets around a large central square, which is to be utilized as an amusement park for the native employees.

The execution of these plans was begun early in 1916, at which time the most economical materials available were framing lumber and corrugated iron. The type of construction selected was wooden frames with corrugated iron roofing and siding and beaver-board partitions for the better class of houses, and sheet-iron partitions for the laborers' quarters. This type of construction was not entirely satisfactory, as the houses proved difficult to heat, especially at Chuquicamata, where the difference in temperature between day and night averages as much as twenty-four degrees Centigrade. In addition, the building operations were seriously delayed, due to the increasing scarcity of lumber and corrugated iron supplies as the late war progressed.

Utilizing Tailings in Making Bricks

With a view of securing a suitable building material for Chuquicamata, adobe bricks were manufactured locally of various mixtures of screened tailings, pampa dust and cement, and it was demonstrated that a mixture of these in proportions of 13:4:1 respectively produced adobes that were entirely suitable at a reasonable cost. Since this discovery all of the houses have been built of adobe, and the corrugated iron on a number of those built previously has been replaced with adobe. The adobe houses have proved most satisfactory. They blend attractively with the pampa landscape, maintain a more even temperature and the fact that they can be manufactured locally enables the management to add to the housing facilities as necessity demands without keping a large stock of building materials continually on hand.

At Braden, metal lath and plaster has been extensively used in place of the corrugated iron, especially in the better types of houses.

The building construction that has been done at Chuquicamata from 1916 to date inclusive is shown in the following table:

TABLE A. BUILDING OPERATIONS AT CHUQUICAMATA

Type	Number Built	Under Construction	Average Cost per House	Total Expenditure
Official, 8 room, frame and corrugated iron	7	....	$8,191	$57,337
Type "A," 10 rooms, frame and corrugated iron	11	....	3,287	36,162
Type "A," 9 rooms, adobe	5	....	8,221	41,104
Type "B," 6 rooms, frame and corrugated iron	59	....	2,119	124,990
Type "B," 6 rooms, adobe	17	....	4,580	77,854
Type "C," 4 rooms, frame and corrugated iron	24	....	1,936	46,452
Type "C," 4 rooms, adobe	28	....	3,092	86,577
Type "D," 2 rooms, frame and corrugated iron	557	29	366	204,033
Type "D," 3 rooms, adobe	336	270	802	269,491
Mess houses, total 52 rooms, frame and corrugated iron	8	....	7,025	56,198
Mess houses, 19 rooms, adobe	1	....	14,721	14,721
Staff house, total 20 rooms, frame and corrugated iron	4	....	2,565	10,259
Staff house, total 80 rooms, adobe	4	....	20,229	80,916
American club, frame and corrugated iron	1	....	128,870	128,870
American school, frame and corrugated iron	1	....	2,763	2,763
Police station, concrete and sheet steel	1	....	3,493	3,493
Native church, frame and stucco	1	....	44,966	44,966
Bakery, adobe	1	....	48,283	48,283
Native market, wood and corrugated iron and adobe	1	....	16,510	16,510
Native market place, frame and corrugated iron	1	....	8,101	8,101
Hospital extension	....	....	31,264	31,264
Converting frame and corrugated iron houses to adobe, additions to houses, and miscellaneous items of welfare construction				531,656
Total				$1,922,000

The buildings erected at Braden from 1916 to date inclusive are shown in Table B.

TABLE B. BUILDING OPERATIONS AT BRADEN

Type	Number Built	Under Construction	Average Cost Per House	Total Expenditure
Official houses	6	2	$12,164	$72,984
Type "A" houses	43	4	6,178	265,666
Type "B" houses	22	3	9,372	206,194
Type "C" houses	219	108	578	126,506
Type "D" houses	735	1,046	694	509,985
Staff quarters	9	3	22,582	203,239
Schools	2	2	13,638	27,276
Sewell hospital	1	....	299,538	299,538
Miscellaneous hospitals	3	1	7,056	21,168
Hotels	5	2	9,453	167,265
Miscellaneous			.....	325,180
Total			... ..	$2,225,000

SCHOOLS

At Braden the population is somewhat scattered and a number of small schools, conveniently situated, has proved the most practical solution. At Chuquicamata,

NATIVE SCHOOL AT CHUQUICAMATA

where the Americans and Chileans are collected in their respective villages, central schools for each have been erected. The number of American children of school age is comparatively small, and school facilities have been provided accordingly.

There are 888 Chilean school children enrolled on the property, and a modern school constructed of a wooden framework covered both on the exterior and interior with metal lathing and plaster has been erected. It consists of a front 280 ft. long, with wings at each end extending back 38 ft. at present, but designed for further extension where required. The present building contains four classrooms for boys and four for girls, with the necessary coat rooms and other modern facilities, including a central steam-heating system.

HOSPITALS

The hospital at Chuquicamata had its beginning in one building and has grown with the other features of the plant. At present it consists of six one-story buildings conveniently grouped, which contain an operating room, a dispensary, a sun porch and complete modern equipment, with ward space for seventy-five patients.

Braden is provided with emergency hospitals at isolated communities and a central hospital at Sewell. The latter consists of two stories and basement and contains a well-equipped operating room, dispensary, consultation room, a sun porch and ward accommodations for fifty patients. The building and equipment cost approximately $300,000.

CLUBS

No buildings especially for club purposes have been erected at Braden, the entertainments being held in the Sewell gymnasium or other suitable buildings.

A very handsome American Club has been erected at Chuquicamata at a cost of $128,000. This building contains a large reception hall, a ballroom with a stage at one end, billiard room, reading room, dining room and kitchen, a bowling alley and a swimming pool 20 by 50 ft.

POTABLE WATER SUPPLIES

The general water supply at Braden is suitable for both domestic and industrial purposes, and all that has been necessary is to extend the distributing system and put in house connections as required.

At Chuquicamata the main water-supply system originally installed carries water in which the salt content is too large for drinking purposes, and for a number of years fresh water for domestic use was purchased from the Antofagasta & Bolivia R.R. Co.

The Chile Exploration Co. has now completed a fresh-water supply system consisting of intake works and a pipe line sixty miles long, which connects concrete storage reservoirs at Chuquicamata with the Toconce Springs, situated in the mountain range east of the property. The system delivers 800,000 gal. a day to the plant and cost $1,600,000.

On the Braden property the town-sites for the mine, mill, and smelter are now at Sewell. A new smelter and town are being erected at Caletones, and there are also towns for the company employees at Coya and Pangal. At Sewell the sewage is carried down the steep mountain slopes to the stream below in open or closed drains. At all other town-sites sanitary sewerage systems have been installed.

Chuquicamata is situated on a comparatively flat pampa and a complete sanitary sewerage system has been installed. The system has a modern treatment plant consisting of Imhoff tanks that are capable of treating the sewage for a population of 10,000. The collecting

SURGICAL OPERATING ROOM IN HOSPITAL, CHUQUICAMATA

system can dispose of the sewage from a population of 20,000 and arrangements have been made to install a duplicate Imhoff unit should it become necessary.

SUMMARY OF EXPENDITURES

The total expenditures at the respective properties for welfare since 1915 have been as indicated below:

	Braden	Chuquicamata
Housing	$1,775,000	$1,475,000
Sanitation	125,000	214,000
Hospitals	321,000	34,000
Schools and churches	27,000	141,000
Stores	64,000	89,000
Amusements	17,000	166,000
Miscellaneous	50,000	17,000
Total	$2,379,000	$3,136,000
Additional housing authorized and under construction, but not completed	210,000	500,000
Grand total	$2,589,000	$3,636,000

The cost of operation or use of the so-called welfare facilities is from $400,000 to $500,000 U. S. currency per annum at each property. The following is a brief summary of the more important activities:

Housing

In the beginning, houses were supplied to all without charge. The first three types were entirely equipped with heavy pieces of furniture. At Braden, where hydro-electric power was cheap, these houses were

CATHOLIC CHURCH BUILT BY COMPANY

heated free of charge by electricity. The fourth type was partially furnished and the fifth type not at all.

Experience has shown objection to this system because of a tendency to abuse the free privileges. There was an ever-increasing difficulty in satisfying the employees in the allotment of the houses, and the single men objected that the married men should receive in the grant of a house so much greater real wage in addition to their money wage. At the Braden Copper Co. "staff" wages have now been increased to cover a charge for rent which is made for all staff houses. At the Chile Exploration Co. some of the objections to the free rent system have been overcome by a strict reservation of types of houses for positions in the organization. The problem, as indicated by the different systems in force at the two properties, has not yet reached its ultimate solution.

Single men were at first assigned a room and a house at which to board, but it has been found that greater contentment results from a variety of eating places from which to choose and from homes for small groups. The most popular development has been a special house to accommodate groups of from eight to sixteen men, each man having his own bedroom, with a common living room, dining room, and kitchen.

Complete statistics, which are used in the assignment of houses, are kept both of the proficiency in their occupation and suitability as tenants of the individual Chilean workmen. Prizes are offered to encourage cleanliness in Chilean workmen's homes and beauty in their garden plots.

Sanitation and Hospital Service

The sanitation corps inspect the water, the sewerage systems and the houses of the employees constantly. Garbage is collected daily and is either buried in the tailings dumps or flushed off in open canals to the river.

The hospital service is equal to that of our best American hospitals. Doctors and nurses are both Chilean and American trained and are of the highest type obtainable. The service includes a limited control of the personal habits of the Chilean laborers, who are encouraged to bathe and wash their clothes, and are obliged to be free from parasitic insects. To assure this, appropriate bathing and washing plants have been erected.

The death rate of the community compares favorably with that of other parts of the world, except in the case of the Chilean children. Even in this case the death rate is very low in comparison with other communities in Chile. Much is being done toward the education of Chilean mothers through contact with the American and Chilean nurses who visit the Chilean families regularly as a part of their routine work.

There is probably no other section of the welfare department upon which the contentment of the community is so much dependent as the medical section. The importance of the personality and ability of the chief surgeon in communities of this kind cannot be overestimated. Both Dr. William F. Shaw, of the Chile Exploration Co., and Dr. R. W. Richardson, of the Braden Copper Co., not only have the absolute confidence of the staff employees and their families, but the Chilean laborers have a respect and admiration for them, both as medical advisors and as their friends, which is a powerful and beneficial influence at the respective properties.

Churches

At one of the properties a picturesque Catholic church has been erected. At both the properties Catholic and Protestant services are held in the schools.

Education

There are two school systems, one for the children of foreign employees, the other for the children of Chilean workmen. The school for foreign children begins with the kindergarten and ends with the grammar-school course. Courses in Spanish are available to the foreign employees and their families.

For the Chilean children, native teachers, who are selected with great care, are employed, and although the schools (owing to lack of available government funds) are operated partly at the expense of the respective companies, they are under government supervision. Attendance and interest in these schools are rapidly and constantly improving. The progress that the second generation is making, the outward sign of which is an extraordinary improvement in cleanliness and dress, is quite a remarkable indication of the success of the educational work.

THE CHILEX CLUB AT CHUQUICAMATA

As auxiliary to the school system there have been organized brigades of boy scouts and a corps of girl scouts.

Night schools have been established to instruct the more ambitious Chilean workmen. The instruction in these schools begins with reading and writing and extends to mechanics and languages.

Amusements

It was early recognized that ample and varied diversion is necessary for the employees and their families if they are to be content. Clubs, moving pictures, festivals, bands, games, athletics, and horse races have been provided, and are kept going as actively as possible. They are an offset to the temptations of the various forms of vice which have appeared just outside the companies' properties, especially at Chuquicamata. In so far as it has been possible to do so the management of all clubs and amusements has been turned over to the employees. Wherever there has been the proper leadership in these individual undertakings they have become completely successful and in most cases self-supporting. A most unusual feature to be found in a mining camp is the Chilex Club at Chuquicamata. When one crosses its threshold on a dance night one feels that the ministering genius of the Andes has transported one from the desert to a gay ballroom in some big city of the United States or Europe.

Stores and Markets

The companies operate stores and markets at both properties. Of all the human problems arising in the operation of these properties probably the store problem is the most vexatious and difficult. The companies provide and operate stores of necessity, either because no one else provides them in these isolated communities or else as a protection to the employees from profiteering by independent merchants. The stores at both properties have made heavy losses. It is the aim at both places to operate them without profit or loss.

A recent experiment in connection with the store at Chuquicamata is proving very successful. A committee of ladies, expert in household craft and economy, has been formed to both assist customers in purchasing and to give advice on household matters. The committee has a permanent representative in the employ of the company.

Policing

The police are of two kinds, watchmen and government rural police. The watchmen have no authority and serve little purpose other than to watch for trouble and report to headquarters. On the other hand, the government rural police were generally recruited from the ranks of ex-soldiers and are commanded by regular army officers, who have great authority and succeed in maintaining excellent discipline and order.

A national savings bank has been established at each one of the properties. Deposits of workmen are constantly increasing.

Safety-first work as it has been perfected in the most modern industrial works in the United States has been applied to the full extent in these two South American properties. Perhaps the only deviation from modern United States practice is the difference in the sense of humor between the United States safety-first cartoonist and his Chilean disciple.

NATIVE CHILEAN HOMES AT CHUQUICAMATA BEFORE IMPROVEMENTS BY AMERICANS

The welfare problems at these two properties are made up of conditions that are perhaps unique, in a general subject that is as yet little understood, and from which little empiric information is available. Great strides have been made forward. The Chilean laborer, who five years ago lived in a hovel in filth, with all the mental degradation that is concomitant with such surroundings, today lives in a small but comfortable home, enjoying the fundamental facilities that modern hygiene affords. Instead of the ragged, barefooted, irresponsible laborer of five years ago, there is a well-dressed, well-shod workman with the spark of ambition burning within him. Great as has been the improvement with the men, it has been even more marked with the women and children. The latter, in

their school house, compare favorably in appearance with the children in the public schools of the United States.

With this social change the Chilean laborers have developed great intelligence and adaptability and have advanced rapidly in efficiency. They have been made expert miners, mechanics, smelter, and mill men, steam-shovel and locomotive operators, all through their work at these plants and through the social progress that they have made. Experience at these properties has taught that so-called welfare work is worth while, not only from the human but from the economic results to be achieved. These companies have now a skilled, permanent class of employees instead of the roving, unambitious class of laborers, from which they formerly had to draw.

An analysis of accomplishment evinces two factors that stand out as worthy of consideration in the work that has been done. The first is that the old saw, "What is everybody's business is nobody's business," applies with particular force to welfare development. So-called welfare work is perhaps the most important means to the end of the successful operation of any industry in which, after all, the human factor is the most important agent, and the best leadership and exceptional personality is needed to direct it. Because of this leadership, the staff employees, and more recently their wives, are evidencing a growing interest in the government of their mining cities and in the well-being of their inhabitants. It is the development of this community interest and the widespread feeling of responsibility for the less fortunate by the more fortunate that is the greatest indication of real progress.

The second is that welfare work needs more than a bank check to achieve success. The welfare movement is essentially a human one and unless it is approached in a human way will not thrive. Unless the work has for its foundation principles based upon the firm conviction that humanity progresses, that human progress means efficiency, and, last and first, that commerce is a means and not the end, that there is only one end—humanity—then the welfare movement may become a whirlpool of anarchy, and like a torrent behind an insecure dam may break loose, carrying everything with it to destruction.

Signaling Mine Hoists From Moving Cages

The problem of signaling to the hoisting engineer from a moving cage in the shaft has been considered by many mine operators, says C. A. Allen.[1] Several methods are in use, and it is believed that they have been further developed in Utah than in any other state. The latest installations are of interest because they use a very low-voltage circuit for the shaft wires and also because the wiring can be so arranged that the hoist can be stopped from the cage, if so desired.

The first installation in Utah was placed in the shaft of the Centennial-Eureka mine, and has been in continuous and satisfactory operation for twenty-one years The arrangement consists of two bare wires in the shaft carrying a current at 60 volts potential, with a device on the cage for making connection between the two wires. This device is simply a short piece of wire which is thoroughly insulated from the cage and is operated by a short lever. Whenever the cage rider wishes to signal the engineer he pulls down the lever, forcing the short wire out against the two bare wires, thus making a circuit which rings the bell in the hoist room.

Later a similar system was placed in the shaft of the Eagle and Blue Bell mine, at Eureka, but dry batteries were substituted, reducing the voltage to about 10. This shaft is wet in places, but no trouble has been experienced. The hoist is a double-reel modern electric machine with oil-operated clutches and brakes. The clutch and brake for each reel are actuated by different movements of the same control lever. The hoist has the usual safety devices, such as limit switches in the headframe, position switches for each reel, and ball-governor control. These safety devices are operated by what may be termed the control wiring, which is in series with a no-voltage release on the switchboard. Should the circuit in the control wires be broken, the no-voltage release acts, which cuts off the power and automatically applies the brakes. For example, if the cage should be pulled up to the limit switches, the circuit would be broken, automatically stopping the hoist. This arrangement of wiring for the safety devices is not materially different from that used on other electric hoists.

In the Eagle and Blue Bell shaft there are two No. 4 bare copper wires, one on each side of the shaft guides. One of these wires is used for signaling from the levels, the second wire forming the return. The second wire is also used to make the circuit for ringing the bell from a moving cage.

As regards signaling from the cage, it may be assumed that there is only one bare wire in the shaft, this wire extending into the hoist room and through an ordinary Western Union relay switch to the ground. On the cage is a battery of six dry cells inclosed in a piece of iron pipe for protection. One terminal of the battery is connected to the hoisting cable and is thus grounded through the hoist. The other terminal is connected with an ordinary push-button switch and a piece of curved copper plate which, by means of a small lever, can be pushed out against the bare wire. The push button is on the same lever. When the cage rider pulls the lever, at the same time pressing the button, current flows from the dry cells through the bare wire, through the relay into the ground, thence through the hoist cable back to the cells. The current flowing through the relay closes a separate electrical circuit, which rings the signal bell. The current for the bell circuit is supplied by thirty dry cells in the hoist room, but connection could be made with a direct power or lighting circuit.

The important feature of this arrangement is that the dry cells, placed on the cage, give a low-voltage current, only ten or twelve volts, eliminating all possibility of danger, such as would be present were higher voltage used. Also, if the contact lever should be accidentally struck and contact made with the bare wire, the circuit would not be completed, because, to close it, the button must be pushed at the same time the lever is thrown. The use of the relay in the hoist room is also important, because it permits the use of a low-voltage current in the shaft and a higher voltage to ring the bell.

To stop the hoist from the cage by the same wiring system, it is only necessary to place in the control circuit of the hoist another relay so arranged that when the circuit is completed in the shaft this relay will *open* the hoist-control circuit. As soon as this circuit is open the no-voltage release on the hoist switchboard will be operated, cutting off the power and stopping the hoist.

[1] U. S. Bureau of Mines (Report of Investigations).

Books in Coal and Metal Mining Towns

A Real Need in Most Mining Communities for Libraries—American Library Association To Undertake an Enlarged Program in Providing Reading Rooms for Industrial And Mining Centers—Scope of the Work

By T. S. da Ponte
Written for *Engineering and Mining Journal*

A SPLENDID field for welfare work and for the promotion of better citizenship is to be found among the men who devote their lives to mining. This despite the fact that some mining communities are "model" places in which to live, having modern libraries and schools, as well as other advantages. An infinitely larger number of mining camps and towns, however, possess no such attributes.

It is to the last described communities that the American Library Association desires particularly to extend a helping hand by urging that libraries be installed which shall contain not only books that are American through and through, that tell of the greatness of this country and the advantages of living in it, but which also provide special and technical books from which employees can learn all the details of mining work and processes. In this way those engaged in the mining industry may acquire a broader outlook and become more efficient and capable of advancing in the work in which they are engaged.

An investigation by George S. Rice, chief mining engineer of the U. S. Bureau of Mines, at the request of the American Library Association, has shown a void in the lives of miners and mining engineers which can be filled only by the proper kind of books. As an example, a report from C. A. Herbert, district mining engineer, at Vincennes, Ind., says: "As far as I can recall, the only mining towns in the Central District that offer library facilities to miners are the mining towns of considerable size. I do not recall a single mining camp in this field where the mining companies maintain a library or reading room for the benefit of the miners. I am inclined to believe if efforts were made along this line that a number of the larger companies would be

PERIODICAL AND GENERAL READING ROOM OF THE COPPER QUEEN LIBRARY AT BISBEE, ARIZ.
Maintained by the Phelps Dodge Corporation not only for employees but for residents of the community, which includes five [illegible] and surrounding farms. Books and magazines on trades and industries and special books on mining are pro[illegible]

very willing to furnish a small library, with the necessary reading room, for the benefit of their men."

J. J. Rutledge, mining engineer of the Bureau of Mines, at McAlester, Okla., sent me a letter saying: "In my judgment, library service is needed in Krebs, Carbon, Lehigh and Colgate, Pittsburgh, and Dow, Okla.; in Hartford, Huntington, and Russellville, Ark., and in Frontenac, Franklin, and Baxter Springs, Kan." However, Mr. Rutledge makes a more encouraging report from other localities, saying: "There is a very good city (Carnegie) library in McAlester, which is used, I believe, to some extent by members of miners' families living in McAlester. There is an excellent technical library in the mining town of Wilburton, Okla., where the Oklahoma School of Mines is situated. I have known of this library being consulted frequently by young engineers in search of technical information."

Writing from Golden, Col., D. Harrington, of the Bureau of Mines, says: "Mining camps in which libraries are needed are numerous, though it might be somewhat difficult in many places to establish a library, on account of the smallness of the camps." In the section in which Mr. Harrington is situated, however, he finds that "nearly all the larger mining localities have libraries, and in some of the smaller ones traveling libraries are found. Butte has a well-stocked public library, and at Miami, Ariz., the Y. M. C. A. has a library which is accessible to the miners." Mr. Harrington named Red Lodge, Mont.; Globe, Ariz., and Rock Springs and Sheridan, Wyo., as other districts in which libraries are accessible.

The report made by Carl A. Allen, chief mine inspector of the Department of Mine Inspection, Salt Lake, Utah, says, "In the metal mining districts there are libraries available at Bingham, Park City, and Eureka," and gives the following list of communities "which might be interested in obtaining library service: The Deer Trail mine, Marysville, Utah; the Mineral Product Corporation, Marysville, Utah; the South-Hecla, Alta, Utah; the Cardiff Mining & Milling Co., Sugar House Station, Salt Lake City, Utah; the Salt Lake Copper Co., Tecoma, Nev.; and the Vipont Silver Mining Co., Oakley, Idaho."

Mining communities are a particularly difficult field in which to instill the reading habit, because so many of the miners and their families are newcomers to the United States, and are without a knowledge of English. The American Library Association, however, purposes to surmount this obstacle by urging, as one feature of its enlarged program, the translation into foreign languages and publication of books which tell of American ideals and aims, so that our new citizens may come to know us better, and without the delay that would be inevitable if the information were not available until after the foreign-born worker had acquired a knowledge of English.

DELIVERY DESK IN REFERENCE ROOM OF COPPER QUEEN LIBRARY

Another feature, and one in which the Special Libraries Association is heartily co-operating, is encouraging the installation of special and technical libraries in industrial plants, merchandising establishments, banks, and in fact in all organizations where they will be found useful by both employers and employees. Also, the adoption of the county library system, which is designed to put books within easy reach of the people everywhere, is being strongly urged. The Association is continuing its service to the merchant marine, coast guards, light-

house stations, and men in the Public Health Service Hospitals, and is increasing its efforts to supply the blind with reading matter.

During the war the American Library Association did a great and helpful work in supplying more than 7,000,000 books to the men in service at home and overseas. General Leonard Wood has complimented the Association on its war service and has indorsed its enlarged program. In a letter he said: "I have read with interest the enlarged program of the American Library Association. During the war I followed the work of the Association closely, both at Camp Funston and in the Central Department. It performed invaluable service to our men, both as a means of recreation and education. I wish the Association the heartiest success."

P. P. Claxton, U. S. Commissioner of Education, has written: "I am greatly interested in the proposed plan for the enlargement of the activities of the American Library Association, and I wish for the Association the very fullest possible success in them all. . . . But I am most interested in the establishment of county libraries. Studies recently made by the Bureau of Education indicate that a very small portion of the people who live in the open country and in villages and small towns have access to any adequate collection of books. In more than two-thirds of all the counties of the United States there is no library with as many as five thousand volumes. It is, however, just these people of the small town, the village, and the open country who have most time for general reading and who would use good libraries to best advantage. I sincerely hope the American Library Association may be able to carry forward a plan which has long been dear to me: that of establishing public libraries in good buildings and with trained librarians in the county seats of all the counties, and then establishing branch libraries in the other towns and villages of the county, and using the public schools as distributing centers."

To carry on the work of the enlarged program, the Association, which has been in existence forty years, and which is composed of 4,000 librarians throughout the country, is now raising $2,000,000. This fund, however, will not be raised by an intensive campaign or drive, but will be obtained by library trustees, friends of libraries, and the librarians themselves.

The Potash Deposits of Alsace

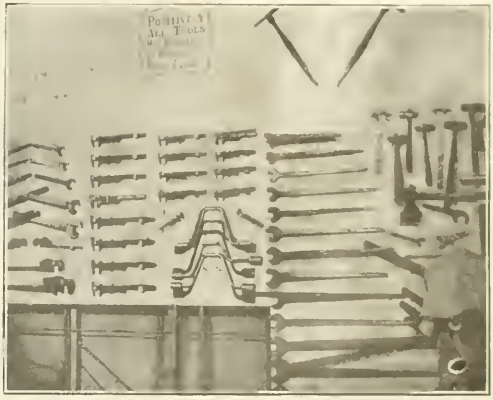
Potash salts were discovered in upper Alsace in 1904, in drilling for oil. Subsequent exploration and development, according to the U. S. Geological Survey, Department of the Interior, indicate that the deposits underlie an area of more than seventy square miles, and that the workable beds have a depth of about 2,000 ft. and range in thickness from 6 to 30 ft. The salts consist essentially of sylvinite, a mixture of sylvite and rock salt. Estimates place the quantity of potash salts in the deposit at 1,472,058,000 metric tons, which gives more than 300,000,000 tons of potash (K_2O).

The first mining shaft was completed in 1909 and production began in 1910. In 1913, a total of 40,707 tons of potash (K_2O) was produced from this source. The German Kali Syndicate, which controlled these mines as well as those at Stassfurt, determined the proportion of potash to be produced by the Alsatian mines at about 4 per cent of the total annual production from Germany. The main object in limiting the output was to prevent overproduction and thus a lowering of the price. When the Armistice was signed in November, 1918, the Alsatian mines were transferred to French control and apparently were in a very bad condition.

Tool Racks

Written for *Engineering and Mining Journal*

The problem of keeping track of tools in such a way as to permit of their being readily obtainable and quickly returned is one that every mine superintendent has had to face. The illustration shows how this troublesome detail is handled on the dredges of the Yuba Consolidated Goldfields Co.



TOOL RACK IN GOLD DREDGE

The number of tools in use on a dredge is large, and a tool board, such as the one shown, though not new in principle, effectively solves the problem. This tool board is placed on the main deck of the dredge on the starboard side and on the wall of the ladder-well close to the digging end of the dredge. Most of the tools too large to go in a rack are also kept at this place. Cleanliness, order, and the prompt return of tools are the invariable rule.

Molding Sands

Steel-molding sand is a white or yellowish clean quartz sand high in silica. It has no bond, and in order to make a mold with it a small quantity of fire clay, molasses water, or other material is added for binder. The size of the sand grain varies with the work to be done, according to the U. S. Geological Survey.

Iron-molding sand or foundry sand is siliceous sandy material used in foundries for making molds and cores for casting molten iron. It is usually of some shade of brown, may be clayey, loamy, or sandy, fine or coarse grained, and has strong bond when moist. From 3,000,000 to 5,000,000 tons is used annually.

Brass-molding sand includes sand used for molding brass, bronze, and aluminum. This is a very fine-grained sand with strong bond which will take sharp detailed impressions.

The Manufacture in Canada of Metallic Magnesium has been undertaken by the Shawinigan Electro Metals Co., Ltd., at Shawinigan Falls, Que., according to the Department of Mines.

Change Houses in the Michigan Iron Country

DRY HOUSE AT THE MORRIS MINE OF THE CLEVELAND-CLIFFS IRON CO. NEAR ISHPEMING, MICH.

DRY HOUSE AT THE NEGAUNEE MINE OF THE CLEVELAND-CLIFFS IRON CO., NEGAUNEE, MICH.

Group Insurance Plan Popular

Meets Wide Application in Michigan Copper Country, First by the Calumet & Hecla, and Has Extended to Other Mining Districts—How It May Be Introduced, and The Approximate Cost to Employers

By Ballard Dunn*
Written for *Engineering and Mining Journal*

James MacNaughton, vice-president and general manager of the Calumet & Hecla Mining Co., has earned a reputation as a man of affairs. Like many American business executives who have been successful in a big way, there is an intensely human side to his character—in addition to being a practical business man, he is an apostle of practical humanity. The interests and welfare of the employees of those companies of which he has charge has always been the subject of his solicitude.

Workers in copper mines do not usually carry much life insurance, and the lack of it at the death of the bread-winner early attracted the attention of Mr. MacNaughton. He discovered that much misery commonly followed the death of one of the miners, and an investigation revealed the startling truth that about 20 per cent of his employees could not get life insurance if they desired it, because for one reason or another, they were not able to pass the necessary physical examination. He also found that approximately another 20 per cent could secure insurance if they wished, but had not provided for the contingency of death.

The result of these investigations was an arrangement with the Equitable Life Assurance Society for a policy of group life insurance, covering all employees in the Calumet & Hecla properties, an insurance policy amounting to nearly $10,000,000 and protecting the beneficiaries of between 9,000 and 10,000 employees.

Every employee who has served six months with the Calumet & Hecla Mining Co. is given an individual life insurance certificate for $1,000. At the end of the first year this certificate is increased to $1,100, and for every year of completed service thereafter an additional $100 is provided, until at the end of five years it has reached a total of $1,500. This maximum of insurance continues throughout the employee's services.

To make this arrangement, the entire number of employees was insured without medical examination and regardless of age, sex, or nationality. The premium for the entire program of insurance is paid by the Calumet & Hecla Mining Co.

Within a few days after the insurance went into effect, five deaths occurred among the older employees, upon which insurance benefits were promptly paid. This, in the language of Mr. MacNaughton, "did more toward making the insurance acceptable and appreciated by their employees than anything else could have done."

Employees Appreciative

One of Mr. MacNaughton's friends, speaking about his attitude toward group life insurance and his interest in it, said:

"Mr. MacNaughton is very enthusiastic about the group plan, and says that he has received several letters of appreciation from his employees. He also states that this is very unusual, as in all his experience in the handling of men, and he has had considerable, he has never received appreciations of this kind."

The most interesting side of the entire group plan, however, is in its effect upon the problems of employment. Mr. MacNaughton, expressing himself upon this point, says:

"I feel very confident that in order to compete with us in the employment of men, the other mining companies in this district will eventually have to adopt this or a similar plan."

This prophecy has in a large measure been fulfilled. Most of the mines in the northern peninsula of Michigan have introduced a similar program of group life insurance, among them the Seneca and Gratiot mines of the Lewisohn interests, the Michigan Copper Mining Co., the Mohawk Mining Co., and the Wolverine Copper Mining Co.

In addition to these copper mines in Michigan, the program has been extended to the Tonopah district of Nevada, where the employees of the gold and silver mines of the Tonopah Mining Co. are thus protected, and to the Ontario nickel district, where the International Nickel Co. has adopted the plan.

Group Insurance Was First Introduced Ten Years Ago

The Equitable introduced group insurance about ten years ago. It is based upon the principle that the selection necessary in securing proper employees furnishes the safety essential in all well-founded insurance programs. The business of issuing group insurance has grown rapidly, and today about one million industrial workers are protected by group life insurance, with a total insurance risk of nearly a billion dollars. It has been extended to such substantial concerns as the Union Pacific System, the Standard Oil Co., the DuPont companies, the American Sugar Refineries, the Skinner & Eddy Shipbuilding Corporation, the American Woolen Co., Montgomery Ward & Co., the General Electric Co., and the Thompson-Starrett Co.

The plan has been adopted by practically every character of business enterprise, from banks to foundries, and only recently the city of Albuquerque, N. M. has arranged for the insurance of all municipal employees, including the members of the fire and police departments and the teachers in the public schools.

The great mail-order house of Montgomery Ward & Co. was one of the first institutions in the country to cover its employees with this form of insurance. It has been in successful operation in that organization for nine years. Another organization which was a pioneer in group insurance is the Pantasote Leather Co., where the plan has also been in force for nine years.

*Equitable Life Assurance Society, 120 Broadway, New York.

Now for the practical side of the question: First, what is its cost, and, second, what is the basis of the plan upon which such a program can be introduced? I will consider the last of these propositions first, for the reason that the matter of cost, in a sense, depends upon the kind of plan adopted.

Broadly speaking, three general plans have been introduced and have been found effective: First, a flat sum for all employees, such as $1,000 or $1,500, to be paid to the beneficiary of deceased workers. Second, a sum predicated on the annual salary. Third, an amount graded according to length of service.

In all three programs a probationary or waiting period is usually provided before an employee becomes entitled to protection. This is for the purpose of making certain that the employee is really earnest in his desire to remain in employment. This waiting period varies from three months to one year, depending on the character of employment in the industry adopting the program. In both the plan based upon salary and the plan based upon service, a minimum is provided, as well as a maximum. The minimum has in many cases been set at $500, but, because of the increasing cost of living, the tendency is to make this minimum more nearly approach $1,000. Under the service plan, the usual program is to add to the minimum established, $100 for each year of completed service, until the maximum reaches the amount which has been set, which may be as high as $3,000.

A higher level of insurance is provided, if insurance be in the second form noted, for executives and department heads. A safe rule is to stipulate a level two and one-half times the level of the average of the general group. Here, too, there is a maximum of $5,000, but this higher maximum will be possible only in large groups. In fact, the maximum in all instances is regulated mainly by the total number of lives covered in the group.

Cost 1 to 1¼ Per Cent of the Annual Payroll

The cost of group insurance can be determined accurately only upon the statistics within the industry, the number of employees to be covered, the ages of these employees, and the amount of insurance at risk in each individual case. If the program is based upon length of service, this further fact must be taken into consideration, as it may involve increased amounts of insurance to those longer in service, who, in most instances, are also the older lives. It may be fairly stated, however, that the cost of a program of group insurance ranges from 1 to 1¼ per cent of the annual payroll. If the service program is adopted, the amount of insurance at risk is often less than the amount of the payroll, and in these instances, of course, the cost is predicated on a like percentage of the amount of insurance at risk. The cost will be somewhat reduced if the insurance is taken in companies issuing participating forms, as this program guarantees to each employer the benefit of any superior mortality which may be experienced in his industry as an outgrowth of improved working conditions.

The law provides that those to be covered under a program of group insurance must all be employees of one employer, and the number of employees to be covered in any one group may not be fewer than fifty. It is possible, however, to insure all of the employees in any one or more of the departments of a business, if these employees number at least fifty. It is also provided that in determining the amount of insurance, or the individuals to be entitled to it, the basis of selection must not rest upon the individual selection of the employees themselves or the employer. In other words, all employees in a given class must be covered, without regard to the individuals themselves.

Osmiridium Production in Tasmania

The mining of the rare mineral osmiridium in Tasmania is attracting widespread attention, and it is said that the island promises to be the world's chief producer for some time.

For months the Tasmanian Mines Department has been investigating the osmiridium fields of the west coast. The work includes a complete geological survey of the various fields in which osmiridium occurs, from Nineteen Mile Creek, in the north, to Wilson River, in the south; and the manner of the occurrence and distribution of this precious metal, which is now worth about £40 [$195 at normal exchange] per oz., has been carefully investigated. The publication of the complete bulletin is expected to throw much light on a highly interesting mineral occurrence.

It was not until 1910 that the Tasmanian Mines Department officially took notice of osmiridium among its mineral resources, and then efforts were made to ascertain values and outputs. These have since been carefully placed on record, thus enabling the state to enter the world's markets and attract attention to its new and promising source of mineral wealth.

The Department of Mines ascertained in 1910 that 120 oz. had been produced in that year, and by its assistance the output in the following year was more than doubled. In 1912 the output rose to 778 oz., and in 1913 it was 1,261 oz. This figure would have been far surpassed in 1914, it is stated, but for the war, and actually stood at 1,018 oz., despite the check the industry received. Under the influence of the war for the next three years the output was 247, 222, and 332 oz., respectively.

As osmiridium was a precious metal requisite for munitions of war, manufacturers, finding their usual sources of supply cut off, turned their attention to Tasmania. This resulted in keen buying, which sent the output up to 1,606 oz. in 1918. With the close of the war the rush collapsed, and for the first quarter of 1919 only 209 oz. was produced, but more stable conditions set in, and the production for the year reached the record total of 1,669½ oz.

The Tasmanian Mines Department recently published a highly interesting bulletin on osmiridium mining in Tasmania, prepared by Campbell Brown, who personally investigated the fields. According to this bulletin, the precious metal is found in various districts in the west of Tasmania, all of them more or less remote and somewhat distant from each other, yet bound together by a common invariable feature, namely, the occurrence in the neighborhood of great masses of serpentine rock. On the brow of Bald Head, in the Savage River district, facing Nineteen Mile Creek, there occurs an osmiridium mine which is unique. Here a well-known miner, according to the official bulletin, has been quarrying solid serpentine rock for over six years, and by crushing it obtained a high grade of metal. He is the first and only miner in the world, so it is officially noted, to find the precious metal actually occurring in the solid rock.

A Specialist in Human Engineering

Charles L. Close

SHAKESPEARE said, "The man that hath no music in himself, nor is not moved with concord of sweet sounds, is fit for treasons, stratagems, and spoils . . . Let no such man be trusted." The modern philosopher decrees that a man need not necessarily possess a fondness for music to merit the esteem of his associates, but he should at least acquire a hobby. And in this respect Charles L. Close is indeed fortunate, for he has two—fishing, and the study and administration of welfare work. Vacations are few in the life of a man as active as Mr. Close, but to one who is fortunate enough to listen to a recital of one of "Charlie's" fishing trips there remains little doubt as to the keen enjoyment which he obtains from his visits to the haunts of the finny tribe during his holidays. Certainly Izaak Walton never had a more ardent disciple. But thoroughness is characteristic of the man and his work, and so it is that C. L. Close is recognized today as one of the foremost figures in the development of safety, sanitation and welfare work in the iron and steel industry. Probably the first attempt at a concerted study of the human side of industry in this country was instituted in 1906 when the United States Steel Corporation initiated activities which resulted in the appointment of committees to investigate welfare matters. This action was followed by the appointment of a safety committee, comprising officials of the corporation and representatives of the larger subsidiary companies who had already given some study to the subject of accident prevention. Finally, in March, 1911, the Bureau of Safety, Sanitation, and Welfare was organized. This bureau carries on the administration work of the various committees dealing with these subjects. Although established primarily for the benefit of the corporation, the Bureau is constantly in touch with state and national authorities, other employers of labor, representatives of foreign countries, and many other individuals interested or actively engaged in this work. Such co-operation has been of great benefit not only to labor but to the operators as well.

CHARLES L. CLOSE

Space does not permit more than the most condensed statement concerning the accomplishment of the welfare movement as developed by the United States Steel Corporation. During the last eight years the company has spent over seventy-one million dollars in welfare, sanitation, accident prevention, relief, pensions and stock-subscription plans. That this expenditure has been justified is evident from the facts that the work is being continued and other companies have instituted similar organizations. The mining industry in particular has gained from the example set by the corporation in the splendid work of humanizing industry. The two metal-mining subsidiaries, the Oliver Iron Mining Co., operating in the Lake Superior region, and the Tennessee Coal, Iron & R.R. Co., in Alabama, in carrying out the general plan instituted by the Bureau, have set the safety standards now followed by several other mining companies, so that the industry today is free from many of the former hazardous conditions. Healthful and pleasant surroundings, better housing conditions, education, and Americanization have supplanted earlier ideas in regard to mining communities. Charles L. Close was born at Shelby, Ohio, in 1874, and at the age of nineteen entered the employ of the Shelby Steel Tube Co. Later he was transferred to the position of assistant superintendent of the company's plant at Greenville, Pa., following which he was made superintendent. In 1908, as safety inspector for the National Tube Co., he became an active figure in the safety movement, which was then beginning to receive attention in this country. Upon the formation of the Bureau of Safety, Sanitation, and Welfare by the United States Steel Corporation, Mr. Close was made manager, and he still remains in active charge of that work. It is through his efforts and those engaged with him that the conditions under which the employees of the iron and steel industry work and live today are superior to those in any other basic industry in this country or throughout the world.

Mr. Close's service to the mining industry is well illustrated by the interest in human engineering, some examples of which are detailed in this issue.

By The Way

"The Term Is Archaic"; Excuseitplease

The *Canadian Mining Journal* takes exception to our reference to "British American" nickel deposits. The editor says: "'British America' is correctly used to cover Canada, the British West Indies, British Guiana, and Honduras, from a geographical point of view, but applied to Canada today the term is archaic, if innocently used; and if deliberately chosen it is not well chosen."

On the Welfare of Bees

State bee experts of Arizona, well known, of course, like all experts, have found a very sickly condition to prevail among the bee colonies of the Verde Valley. This is attributed by the bee owners to the smelter smoke from Clarkdale and Clemenceau, the resulting mortality among the bees being so great as to be expressed in terms of hives instead of lives. Thus, perhaps, begins a new chapter in the smoke-nuisance history. It is said that, in consequence, chemists at the smelters referred to are running around taking samples of air about the plants, though there is nothing new about this practice. Perhaps the bee experts can breed a bee that will thrive on SO_2 and even give a sulphuretted honey. Springtime users of sulphur and molasses may be glad to make a change. This is a better course for the bee owners to pursue than that of suing the smelters, which policy has been followed somewhat to extremes.

Oil Behind Donnelly's Store

The *Kennebec Journal* reports oil on the water behind Donnelly's store in a town up river from Augusta. "Much interest," it says, "is being shown in the mysterious finding of some form of oil along the river banks and in the water behind the Donnelly store and above there for some distance. During the week," it adds, "a chemist has worked on it but has found no solution. The further it is investigated the greater seems the mystery." Truly, here is a subject for a dime thriller. "The Donnelly Store Mystery or Who Upset the Oil Can?" We are not experts on Kennebec oil, but our guess is that, year in and year out, they will get more ice than kerosene back of Donnelly's store.

Yo Tambien

A little knowledge of foreign languages is often of advantage, but there are times when silence ranks second best to absence. In the old days, before New Mexico attained statehood, a garrulous follower of mining became stranded in the Red River camp, in Taos County. This genius tried his hand at everything, from soliciting trade for an expiring assay office to acting as capper for a clique of poker sharps, careful always to seek what promised the minimum of actual physical labor. As the county election approached, there seemed a faint chance of getting nominated for sheriff. One of his own party in camp advised him to get solid with the Mexican element; coached him for two days in common phrases of salutation, and together they set out to contribute their society and a gallon of fire-water at a *junta* over in Taos. Arriving at nightfall, they tied their mounts and approached a large adobe building where waving pine-knots indicated that several Mexicans were conversing about something important. To each shrug and muttered curse, Barkis responded with bobbing courtesy and a cheerful "*buanus tardus, ahmeego,*" or "*salood, hairmanno*"; while his escort made a slower but more diplomatic progress with the jug. With a growing feeling of importance, Barkis crowded his way toward the platform, where a grimy and impassioned orator was reaching the climax of a denunciation of all *gringos*. Finally the speaker cast down his mantle, tore open his shirt, suddenly flashed a long knife from some place of concealment and vehemently pounded his chest as he declaimed, "*Si tuviera yo el conocimiento que aun una pequeñissima gota de sangre gringo atravesaba este humilde corazón, con este puñal me abro el pecho para arrancar de mi cuerpo tal mancha vergonzosa**." The silence of the ensuing dramatic pause was broken by the prospective candidate, who pounded his own chest as he reverberated "*Yo tambien*†!"

Dangerous Ignorance

A fire boss at some Eastern mine recently asked for information regarding the nature of explosives, temperature of detonation, and the like. The desire to inform himself is praiseworthy in the man. But it seems as if he ought to have known some of these things before he got the job. How many fire bosses are there underground in our coal and metal mines who are similarly ignorant?

Local Color

The *Press Bulletin* of the U. S. Geological Survey is a staid sheet that deals with statistics and gives advanced digests of geological reports and activities of the Survey. One does not look for high lights except in figures, and something more than a liberal education is needed to appreciate such high lights when they do occur. Probably one of the least promising in this way of interest is the description of a topographical map. We must confess that we would find it difficult were we put to the task of describing one. But not so with a recent description of a new Government map of an area in southwestern New Mexico. The writer of this description is indeed one who is not held down by the four walls of a government office in Washington, as the following short quotation will show:

> It is typical of the desert region of the Southwest, where the flats are very flat and the mountains are very steep; where all the year's rain comes down at once in a torrential flood; where, for more than ten months of the year, few clouds fleck the copper dome of the sky; where the intense glare of the afternoon sunlight gives way to a rich golden sunset, which is in turn followed by a soft, purple twilight. Here the summers are long and the days are hot, but the nights are invariably cool. No trees grow here except the hardy mesquite—which produces more wood for fuel from its roots than from its trunk and branches—and a stunted juniper, which is found in the hills. Turbulent creeks come tumbling out of the Tres Hermanas Mountains, in the western part of the quadrangle, but on reaching the level lands, overcome by the heat, they vanish into thin air or crawl underground.

Cochise County, Ariz., was named for the famous chief of the Chiricahua Apaches, according to H. H. Bancroft. But wherefore "Cherry cow" for "Chiricahua"?

*If I knew that even the least drop of gringo blood coursed through this humble heart, with this dagger would I open my breast, to tear such a disgrace from my body.

†So would I.

CONSULTATION

Resources and Commercial Application of Iceland Spar

"Several ledges containing Iceland spar have been discovered recently in the Warner range of mountains in Modoc County, Cal. These ledges are not made up entirely of the Iceland spar but are a mass of calcite crystals in which the Iceland spar occurs in kidneys.

"A portion of the spar in one of these kidneys may be perfectly transparent and show marked double refraction while another part of the same crystal will be cloudy. I will appreciate any information as to how this stuff is mined, where the crystals large enough for lenses can be sold and also where the smaller fragments of clear material can be disposed of.

"My information is that there is only one other deposit of this stuff in the U. S. and that is in Montana. Can you tell me whether or not this is being mined at this time and just where it is located?"

Iceland spar is a variety of calcite, clear and transparent and unusually free from imperfections and impurities. Transparent crystals or cleavage pieces of calcite of any appreciable size are very rare, and as Iceland has furnished almost all of such material used, the name Iceland spar has been given it. Optical uses consume the highest grade of Iceland spar.

Elongated cleavage rhombohedrons of Iceland spar are used in the manufacture of nicol prisms, which are an essential part of optical instruments requiring plane polarized light, as, for example, certain microscopes, dichroscopes, and saccharimeters. The material, on account of its simple chemical composition and purity, finds application in chemical standardization. Iceland spar is also used in the manufacture of some kinds of glass, and some of it is sold as mineral specimens.

Pieces of Iceland spar, according to the U. S. Geological Survey, either in single untwinned crystals, or parts of such crystals, or in homogeneous untwinned cleavage rhombohedra, which are large enough to yield a rectangular prism at least 1 inch long and half an inch thick each way and which possess the properties described below, are suitable for optical purposes. The colorless material must be so clear and transparent that it is limpid and pellucid. It must not be partly opaque on account of numerous cracks or fractures, must not show any internal, iridescent, or rainbow colors due to incipient cracks along fracture lines, nor any cleavage, nor twinning planes. Neither can there by any capillary or larger tubelike cavities, nor cavities or bubbles of any shape, nor inclusions, as isolated particles, veins, or clouds, composed of minute crystals of some other mineral or of any kind of foreign substance. The spar should not be discolored or stained by the presence of any clay, iron oxide, or other material. It should be noted that many of the inclusions and imperfections of Iceland spar are not always scattered irregularly through the mineral or even segregated in distinct masses, but frequently lie in a distinct but very thin plane which can hardly be seen if looked at on edge. In examining a piece of Iceland spar for defects the piece should therefore be turned in all directions while held to the light.

The material suitable for optical uses naturally brings the highest prices, as it has to be at least of the dimensions already given. Specimen material is generally of a larger size. The material used for standardization, chiefly chemical, need be of no special size, and the smaller pieces are as usable as the larger ones.

The optical variety of Iceland spar produced in the United States, sold, per pound, for $3 to $4 in 1914, about $8 in 1915, as high as $20 in July, 1918, and in 1919, according to the U. S. Geological Survey, was worth $15 per pound. The specimen variety sells for considerably less, and material for standardization sells for from $1 to $2 a pound.

The following firms are buyers of Iceland spar suitable for optical use: Bausch & Lomb Optical Co., Purchasing Department, Rochester, N. Y.; Central Scientific Co., 460 Ohio Street, East Chicago, Ill.; Gilbert S. Dey, Superintendent Optical Department, Eastman Kodak Co., Rochester, N. Y.

The market for specimen spar is irregular, as the demand is usually very light. The best market will probably be found with some of the larger mineral dealers.

Standardization material may be sold to large dealers in general chemicals as well as to mineral dealers.

Although calcite is, next to quartz, the commonest mineral, the only locality outside of Iceland known to produce the variety Iceland spar in commercial quantity is in Montana, about 9 miles from Greycliff, Sweet Grass County, on the main line of the Northern Pacific Railway. The spar occurs in a nearly vertical fissure vein from 3 to 8 feet thick, which strikes northwest, traversing a gneissic rock for several miles, and has been produced by Dr. J. P. Rowe, Hissoula, Mont., and R. H. Cartwright, Greycliff, Mont.

Uses of Feldspar

"Will you kindly tell me if there are any other uses for feldspar than for ceramic purposes? What does the demand depend upon?"

Although most of the high-grade feldspar is used in the manufacture of pottery or the ceramic industry it also finds application as an abrasive in the manufacture of scouring soaps and window wash. A special use of exceptionally fine quality feldspar is used in the manufacture of artificial teeth. The cheaper and inferior grades of the material find use as a binder in the manufacture of emery and corundum wheels, in roofing material and concrete work and in the manufacture of glass.

The demand for feldspar is almost directly dependent upon the ceramic industry and hence closely follows the prosperity of that industry. During the latter part of the war the demand for pottery experienced a sharp decline because of the non-essential character of the pottery industry. With the return to peace, however, the consumption of feldspar will very likely increase, continuing the trend exhibited in the pre-war years from 1908 to 1914. Present prices for both crude and ground feldspar are higher than in 1917 of 1918.

THE PETROLEUM INDUSTRY

The Economic Importance of Oil Shales

BY MARTIN J. GAVIN*

It is the opinion of many that the oil shales of Utah, Colorado, Wyoming, and Nevada, and possibly other states, are extremely important as new sources of petroleum products similar to those now obtained from oil-well petroleum. Oil shales have been worked in Scotland and France for upwards of sixty years. In the former country the industry has been a successful one from a financial standpoint, especially of late years, although it is passing through a difficult period at present. The industry in France has not been nearly so successful as that in Scotland. The success of the Scotch shale industry has been partly brought about by the development of cheap processes for treating the shales and the oils produced from them, but mostly by local conditions, such as competition only with high-priced petroleum products, low labor costs, and the fact that the industry grew up in a densely populated region where a ready market for oil and ammonium products was available. A recent reorganization of the Scotch shale companies, combining them into one organization, is hoped to better the present condition of the industry in Scotland.

Oil shale contains little or no oil as such, but it contains substances which when the shale is subjected to destructive distillation yield gas, crude oil, and nitrogen-containing compounds, notably ammonia, as well as other products in small and probably of unimportant value for the most part. Oil shale as a rule must be mined much as coal is mined, crushed, and heated to a relatively high temperature in closed retorts which may operate continuously or intermittently. These steps are necessary to produce the gas, crude oil, and ammonia, the latter of which is in solution in the water obtained along with the oil.

The ammonia water is then distilled and the released ammonia passed into sulphuric acid, producing ammonium sulphate. The crude oil must be refined, much as petroleum is refined, to produce the various commercial products. The refining of shale oil is more complex and in all probability more costly than the equivalent refining of petroleum. However, undoubtedly the shale oils can be refined and can be made to yield many products similar to those produced when petroleum is refined. The oils produced from the oil shales of this country will yield gasoline, burning oils, and paraffin wax, all of which when properly treated will undoubtedly be satisfactory commercial products. Whether the more viscous grades of lubricating oils, such as lubricants for internal-combustion motors, can be produced from shale oils is doubtful, but it may be possible to do so.

Our immense oil-shale deposits practically assure us that, come what may, this country will still have its own sources of petroleum products. We should never have to be wholly dependent on foreign countries in this respect. From another standpoint the shales are also of great economic importance. The oil shales, especially of the Rocky Mountain country, occur in sparsely settled regions. Their development on a large scale means the bringing into these regions of a great number of miners and other laborers, often with their families, who will earn their living in the shale fields and spend their money in the same locality. Millions of dollars must be spent in erecting plants, developing mines and the like, much of which will be spent in the states where the oil shales occur. The shale-oil refineries will require sulphuric acid and other chemicals and supplies, which logically will be produced as near to the shale fields as possible, thus bringing in more capital and labor. Transportation facilities will be extended to meet the requirements of the shale operators, thus benefiting the regions now inadequately supplied in this regard. Prices of petroleum products in the regions contiguous to the shale operations can be expected to be relatively lower than they would be if similar petroleum products had to be shipped in.

It should again be emphasized, however, that development of an oil-shale industry to a scale sufficient to be of so much economic importance will require much study, time, and money. The oil-shale industry is no business for the man of little experience and small capital. It may be compared with the development of the low-grade copper ores of the West, in that it is a large, low-grade, chemical manufacturing enterprise, requiring capital, time, and trained men. The investor in oil-shale operations should know that he will probably have to wait for a long time for a return on his investment and that returns in all probability will be conservative. In spite of this, the day of the oil-shale industry is coming. When, it is difficult to predict, but some day it will undoubtedly be one of great importance.

*U. S. Bureau of Mines, Reports of Investigations.

Shipping Board Bids Meet With Slight Response

WASHINGTON CORRESPONDENCE

The outstanding feature of the oil situation as it pertains to the Shipping Board, as described by the recent bids, is that practically no bids were received from the older and well-established companies. With requirements of 30,000,000 bbl. per year on the Atlantic Coast and European ports, only one bid, that of the Mexican Petroleum Co. for 4,465,000 bbl., is considered to be satisfactory. No announcement of the attitude of the board has been made, but it is believed that some action must be taken by the board itself to control its own sources of supply. The needs of the Pacific Coast have been cared for through a contract with the Department of the Interior for the purchase of oil obtained as royalties under the oil lands leasing bill. Most of the bids contained stipulations for the loan of funds by the board for the construction of terminal and pipeline facilities and for the development of oil fields.

NEWS FROM THE OIL FIELDS

Welfare Plan Prevents Strike at Bayonne Plant

Demands of Men for Higher Wages to Await Return of Department Manager

An excellent example of the appreciation of welfare work by employees was furnished on July 28 at the Bayonne plant of the Standard Oil Co. of New Jersey, when the men declared themselves as unwilling to strike during the absence of W. B. Koehler, general manager, who put in the welfare department and is now on his vacation. Twenty pilers employed in the case and can department quit work after making a demand for more pay.. Several hundred laborers at the plant stated that they were dissatisfied with their wages.

The demand of the pilers for more pay will be presented to the officers of the company in New York by Superintendent Thomas R. Parker.

It is expected other workers in the Constable Hook plant will present a request for increased pay to Mr. Koehler upon his return. The welfare plan, instituted at the time Mr. Koehler took charge for the company, provided that the men should appoint representatives to treat with the company on all matters involving welfare or wages.

The welfare department is said to have been popular with the employees, and has been responsible for the formation of a band, baseball, and other athletic teams and many entertainments.

Rising Star District Proved

New Well Places Field Fourth in List of Eastland County Producers

From Our Special Correspondent

The Hilburn No. 2 well, in the Rising Star district of Eastland County, Tex., is reported by the Humble Pipe Line Co. to be making a good flow of oil from 3,100 ft. after having been shot. This is the second producing well in the district and proves the fourth oil field in the county. Hilburn No. 1 well, the first producer, was completed some time ago, and is one-half mile to the north of No. 2 well. The other fields in the country are the Ranger, Desdemona, and Pleasant Grove, brought in the order named. In the latter field, the Texas Co. reported two completions recently on its Littleton lease, making 500 and 200 bbl. of oil respectively.

Oil-field workers' unions are being organized in Texas by delegates of the Oil Field, Gas Well and Refinery Workers' Union of America. Local unions have been organized at Wichita Falls, Burkburnett, and Bridgetown, and an attempt is being made to induce all oil field and refinery workmen to join. No statements have been made yet as to the changes the union will demand.

Anglo-French Oil Agreement Announced

Co-operation between Great Britain and France with respect to Anglo-French oil interests in Rumania, Asia Minor, Russia, Galicia, and the French and British colonies is provided in an agreement the text of which recently has been made public by Parliament. The agreement provides for an equal division of interests in Rumania and for an equal share in the capitalization, management, and exploitation of such interests. In Mesopotamia France will receive, upon development, 25 per cent of the net output of crude oil at current prices; Great Britain agrees to support France in getting 25 per cent of the Anglo-Persian Co.'s oil piped from Persia to the Mediterranean through territory under French mandate. In consideration thereof, France agrees to the desire to construct two special pipe lines and adjunctive railways for the transport of oil from Mesopotamia and Persia through French spheres of influence to the Eastern Mediterranean. France generally renounces royalties and export and transit dues on such oil.

Boundary Disputes To Be Surveyed by Airplane

From Our Washington Correspondent

Twelve square miles and $200,000 worth of oil afford the basis for a dispute between the states of Texas and Oklahoma which will result in original proceedings before the U. S. Supreme Court during the December term. The territory along the Red River for several hundred miles eastward from the 100th Meridian to Texarkana is affected by the vagaries of this stream, which fluctuates from season to season. Twelve counties of Texas are thus uncertain as to just where their northern border lies. However, the present suit affects only twelve square miles where the oil rights are of such great value as to make the difference between the two states of serious consequence.

The preliminary engineering and mapping work which has been necessitated by this dispute is being arranged for by Arthur A. Stiles, State Reclamation Engineer of Texas. Mr. Stiles has been in Washington for about two weeks engaged in the necessary conferences looking to co-operation with the U. S. Geological Survey, U. S. Land Office, and the Air Service of the Army. It is anticipated that mapping by airplane under the latter service, together with topographic and land surveying work of the former two, will all be required by the Attorney General of the state, who is in direct charge of the suit.

Arkansas Proved as Oil Producer

Important Transfer Covering Large Acreage in Ouachita County Completed — Development in Other Counties

From Our Special Correspondent

The bringing in of the Hunter well in Sec. 13-15-19, Ouachita County, has proved the existence of commercial oil in Arkansas. Late in April the well had a show of oil at 2,121 ft. Immediately the Standard Oil Co. of Louisiana and the Louisiana Oil and Refining Co. jointly purchased this property, and operations were suspended, pending the perfecting of the title to the land on which the well was situated. The leases transferred by S. S. Hunter, the owner of the well, to the companies covered 21,410 acres in Ouachita, Union, and Columbia counties, for which the consideration was as follows: $850,000 cash; $1,000,000 to be paid for one-quarter of the first $4,000,000 saved and sold from the wells drilled on the properties, and an additional consideration of one-twenty-fourth of all the oil produced after the deduction of the one-eighth royalty. After the companies resumed operations about July 5, they decided not to drill further, as the mechanical condition of the hole was uncertain. The well was bailed and swabbed, and it was decided to put it on the pump, estimating that it would produce between 150 and 200 bbl. of oil daily of 38 deg. oil.

In Cleveland County materials are on the ground for a well near New Edinburgh, and a rig is in place for a well near Rison. The Arkansas Natural Gas Co. is going to drill near Hampton, Bradley County. Drilling is to be started near McGhee, Desha County, by the Shaffer Co.

Probably the next production in Arkansas will be the Humphries Petroleum Corporation well No. 1 in Sec. 23-15-19, Ouachita County. The present depth of this well is 2,940 ft. and it is being drilled in with standard tools. It is expected that the oil sand will be picked up at about 3,100 ft., this depth being correlative with the depth of the Straughan and Crawford well No. 2, Sec. 15-12-18. The latter well is now about 3,100 ft. and is in the producing oil sands.

June production of [illegible] bbl. per day, as reported by the Standard Oil Co. of California, shows a decrease of 5,254 bbl. daily as compared with May. June shipments were 313,769 bbl. per day, an increase of 18,660 bbl. daily as compared with May. Stocks were decreased 1,220,994 bbl. during the month. Thirty-six new wells were completed during June, with an initial daily production of 6,455 bbl.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Efficiency of Mine Labor from the Surgeon's View

Dr. Murray of the Bureau of Mines Lays Down Some Pertinent Principles

In a recent bulletin of the United States Bureau of Mines,* Dr. Arthur L. Murray points out very pertinently that the inefficiency of mine labor is often not the fault of the men but of external circumstances, some of which the employer can improve.

"During recent months," he says, "much criticism as to the efficiency of mine labor has been heard from various sections of the country. No doubt much of this criticism has been well founded. The present lack of efficiency and of stability is due primarily to a spirit of restlessness and partial irresponsibility engendered during the transition from war conditions to peacetime conditions.

"Besides this important element of war restlessness there are others which the intelligent employer must pay attention to. First, if they are to get satisfaction from men they must select them intelligently for the work which is to be done.

"In the selection of men the two main considerations are physical ability and adaptability. The laws of mechanics should be applied in the selection of men as in the selection of machinery. If a machine is required for a certain class of work, the type of machine known to be mechanically fit for such work is selected. Likewise, men should be selected with regard to their physical and temperamental fitness for the kind of work expected of them.

"So far as possible men should be selected for their stability. Frequent labor turn-over is costly in many ways. The cost of breaking new men in, the disrupting of mine crews, the increased office work of opening and closing accounts, to say nothing of the effect on morale, can be measured in dollars and cents."

Also, once the employee is selected and on the job, all previous precautions are useless unless he is handled right. Dr. Murray's remarks on this score are not new, but they will bear an endless amount of repetition.

"The successful and continuous operation of a mine is just as much dependent upon proper supervision of its manual labor as upon its mechanical equipment and technical supervision. Supervision of mine labor, if the desire is to build up an intelligent and efficient force, must be firm but sympathetic and understanding. The old type of boss characterized by his ability to drive men rather than direct and lead them is passing. Today we look more to intelligent leadership, technical training, and sympathetic understanding as attributes of successful supervisors of labor. Generally, workers will exert greater effort and accept direction from a man they respect and admire more readily than from a man whose chief claim to a superior position is his driving power."

Naturally, the physiological safeguards which must be provided for the employee, as well as the psychologic content, are present in the minds of the surgeon in full force. Dr. Murray observes on this score:

"Industrial medicine is one of the most potent means of promoting labor efficiency and has application to every branch of mining operations. In the selection and planning of camp sites, the sanitary engineer is indispensable in determining adequate water supplies; methods of drainage, including proper sewage disposal; suitable housing arrangements as regards light, ventilation and overcrowding; and provisions for the disposal of refuse and waste. Through medical welfare work, especially by popular instruction in personal and public hygiene, much sickness with its resultant suffering and time loss may be prevented. The average loss of time due to illness among the workers of the United States is nine days per year, or 900 days per 100 employees (about 2½ years). The greater part of this illness, with its time loss, is due to preventable causes."

This medical care, he points out should be prompt to be efficient.

"The medical and surgical care for workers should be as good as can be provided. The time loss from disabling sickness and injury can be materially lessened by prompt and efficient medical attention.

"This leads to the question, not only of remedial medicines, but of disease preventatives.

"Drinking fountains and sanitary latrines underground are recognized necessities of large mining operations and add much to the comfort and health of the men. The general care of underground workings in respect to keeping them clean and free from débris has a marked effect on the men. The sight of débris in passageways, drifts and tunnels encourages shiftlessness and carelessness."

Next to actual illness prevention comes the necessity of keeping men not only up and about, but fit.

"As a man lives so is he liable to work. The living conditions at any mine largely determine the type of labor that seeks employment and remains at that mine. A camp where housing conditions are poor, where sanitary conditions are below standard, where the general morale has been permitted to become lax, does not attract the best element.

"Not only is good food and good sleep necessary, but a man must have relaxation and that of a healthy kind.

"Approximately one-third of a man's time is employed at his labor. Another third is usually given over to sleep. The remaining third a man seeks diversion through recreation. This spare time through environment may be influenced for good or for evil. Every mining camp, if it desires to progress, must recognize that wholesome and health-building facilities for recreation are a necessity."

*Monthly Reports of Investigations.

Human Engineering by New Cornelia Company at Ajo

Modern Town and Dividend-paying Co-operative Store in Arizona Desert

The booklet description of the plant of the New Cornelia Copper Company at Ajo, Ariz., describes not only the mine and the reduction plant, but the human engineering works whereby the desert was made habitable for the employees.

The report states:

"To accommodate the employees of the New Cornelia Copper Co. and their families a new town was built. This town is located on the edge of the desert, within convenient reach of the mine and the plant. The attractive mission architecture preserves the traditions of the Spanish fathers whose hardihood made possible the development of the desert."

The artistic designing of this unusual mining town is shown in the accompanying illustration.

The life of the town, according to the report, "centers about a plaza, 360 by 200 feet in size, with bandstand, walks, trees and spacious lawns. On summer evenings dances are held on the broad concrete walks, and the shady lawns are the favorite meeting places for the citizens.

"On the east side of the Plaza is the railroad station. The large co-operative store, bank, restaurant and other business and amusement places occupy the modern business block, behind its broad arcades. Around the Plaza are grouped the attractive tile or frame dwellings of the American employees, and the new school building. A complete water, lighting and sewer system was installed before the town site was occupied."

The Mexican employees have their own town.

"Over the hill toward the mine is the Mexican town site, with its one-,

two- and six-family hollow tile houses, all harmonizing with the general architectural plan. The Mexicans have taken great pride in their clean and attractive homes."

The hospital is a substantial modern building of the best type.

"On a hilltop overlooking the desert is located the hospital. This has been the particular pride of the New Cornelia management. There are beds for thirty-five patients, and all the equipment is of the most modern type. Based on their earnings, employees are charged $2.00 and $1.50 per month for medical and hospital service for themselves and families. For this fee they receive all necessary treatment, including operations, hospital care and medical visits."

The problem of supplying food and other necessities to employees at a reasonable price, and frustrating the profiteering of the small merchants who so often infest a mining camp, was met by a co-operative store financed by the company.

Since there were no adequate stores at Ajo, the New Cornelia Co-operative Mercantile Co. was organized to sell merchandise to the employees of the New Cornelia Copper Co. and allied companies. The New Cornelia Copper Co. advanced money to erect the store and buy the stock, and assumes all risks. The store is managed by a store manager appointed by the New Cornelia company. A committee of seven workmen, representing the various departments, meet with the store manager once a month, making suggestions for the betterment of service, and presenting complaints which have been brought to their attention.

"The store carries a large and well-assorted stock. Prices are at the same level as in other Southwestern mining camps. At the end of each year, after deducting for depreciation on store equipment and fixtures, and a proper sum for surplus account, the rest of the profits are divided among the employees of the company in proportion to the amount of their purchases.

"To participate in store profits, employees must have been in the employ of the New Cornelia Copper Co., or allied companies for at least four months previous to the distribution of profits, which is made on December 20 of each year. This rule promotes the stability of the working force."

Actually the profit-distributing plan has worked, and resulted in substantial dividends.

"The following profits have been distributed by the Co-operative Store up to the present:

1917 (9 months)	$12,062.60 to 172 employees
1918	32,777.71 to 773 employees
1919	40,825.06 to 618 employees

"The average discount has been 15 per cent on total purchases by those who receive a share in store profits."

A STREET IN AJO, ARIZ., THE MINING TOWN BUILT BY NEW CORNELIA COPPER CO.

Lens Mines Resume Production

Pumping out of the coal mines of the Lens district is still in progress, as many of the mines are still flooded. The first coal brought to the surface there since the armistice in November, 1918, was hoisted July 20, 1920, according to an Associated Press report.

Plan New Token Money in France

Subsidiary Coin Supply To Be Reinforced and Safeguarded

Ever since the war began French currency has been reinforced by paper money of small denomination issued by, or rather guaranteed by, deposits at the Bank of France by the French Chambers of Commerce. These small bills were limited to circulation within the district of the Chamber of Commerce issuing or guaranteeing it. Today the steady and rapid disappearance of France's new silver coinage is compelling that country to adopt a similar policy for the protection of her supply of small change. According to a Paris correspondent of the *New York Evening Post*, the French mint has announced that metal counters, secured in the same manner as the small bills mentioned above, are to be issued and used as fractional currency throughout the republic. It is stated that:

"The new counters are to represent two francs (forty cents at par), one franc (twenty cents), and fifty centimes (ten cents). It will be impossible to make them a subject of illicit trading either for melting down or smuggling across frontiers, and they are not likely to be hoarded. They are to be made of an alloy nearly gold color, which will not tarnish like copper or bronze. They will have even the metallic ring associated with money."

In this connection it is interesting to note that a very recent advice from London states that in Germany the porcelain factory at Meissen is preparing, for the use of the cities of Meissen and Hamburg, porcelain tokens.

Good Lighting in Industry

It Fosters Safety, Contentment and Loyalty—The Cost Is Small for Results Attained

"Some one has said that light is a tool which adds to the efficiency of every other tool. The modern industrial manager goes a step farther, for he realizes that adequate lighting, both artificial and natural, is indispensable not only to efficiency but also to safety. He knows that the dark plant is the dangerous plant," writes C. W. Price, of National Safety Council, in a recent communication.

One of the large insurance companies made a careful study of the reports of 91,000 accidents and discovered that 10 per cent—9,100 accidents—were caused directly by the absence of proper lighting and that in 13.8 per cent—more than 12,000 accidents—inadequate lighting was a contributing cause.

The British government, in an extensive investigation of accidents, found that stumbling and falling are the most frequent causes of accidents resulting from the absence of light; and the report of the United States Census Bureau for 1918 says, "The greatest number of deaths charged to any one accidental cause, 10,330, is shown for falls." The investigation of the British government also revealed that during the four winter months deaths and serious injuries resulting from falls were 39½ per cent greater than during the four summer months, thus showing the bearing of light on accidents.

In all of the industries where efficient safety work is being done and where large reductions in accidents have been made, strong emphasis is placed on good general illumination of all departments. Investigations conducted by one of the leading illuminating engineers of America in 200 plants in which modern lighting systems were installed revealed that where rough work is being done, as in foundries and steel mills, the total output was increased 2 per cent, while in textile mills, shoe factories, machine shops and other industrial plants where fine work and close application are required, production has been increased 10 per cent by the installation of proper lighting equipment.

The economic value of good lighting becomes readily apparent when it is known that the overhead cost of adequate lighting is not more than one-half of 1 per cent of the payroll. In other words, a workman who is being paid $4 a day can be made a more efficient and a more careful workman through the expenditure of approximately 2c. a day for adequate lighting. Any plant manager appreciates that only a slight increase in production is necessary to add 2c. to the daily earning power of a workman.

Industrial managers are coming to realize that light not only increases output and decreases accidents, but also plays a most important part in making the plant a cheerful and pleasant place in which to work. In these days when management is giving the most serious attention to the attitude of men toward their work, and to questions of contentment and loyalty, a plant that is light, cheerful, and attractive no doubt has a great advantage over the dark, cheerless, and unattractive establishment.

Light has a positive influence in encouraging orderliness, cleanliness, and efficiency. In a plant where the windows have been washed, the walls whitened with paint specially designed to reflect light, and effective lighting installed, there has followed, almost invariably, a housecleaning on the part of both foremen and workmen—all of which makes for efficiency, safety, and contentment.

United States Mint at Manila Begins Operations

Complete Outfit Made at Philadelphia Mint—Coining Presses the First Ever Built at Any U. S. Mint

The United States Bureau of Insular Affairs is advised that the Philippine Islands mint at Manila commenced operations on July 15 and that the first coins minted there were bronze one-centavo pieces. The complete coining equipment at Manila is electrically operated and all its machinery has been constructed at our Philadelphia mint. The machinery as listed in the *Report of the Director of the Mint for the Fiscal Year 1919*, comprises 2 coining presses, 2 rolling mills, 1 cutting press, 1 topping machine, 1 strip shear, 1 upsetting machine, 2 tumbling barrels, 1 coin-reviewing machine, 1 automatic weighing machine, 1 six-foot bullion balance, 4 hand balances, 1 rotary annealing furnace, 6 oil melting furnaces, 5 sets of punches and beds, 5 ingot molds, and all accessories needed for the coinage of silver, nickel, and bronze.

The patterns of the coining presses are at the disposal of the United States, and these Manila presses, which have been built in the machine shops of the Philadelphia mint, are the first coining presses ever built in any mint in the United States. The accomplished task of designing, building, taking down and reassembling the equipment for the Manila mint, constitutes in itself a sufficient commentary on the ability and resources of the machine shop at the Philadelphia mint.

Students Flocking to French Mining Schools

There is a great congestion of applicants for admission to the French mining schools this year. The École Centrale has 3,000 candidates for about 540 vacancies; more than 900 are applying to the École Nationale Superieure des Mines, where there are but sixty-odd places; and for the sixty-five permissible admissions to the École des Mines de Sainte Etienne there are 250 candidates.

Breathing in Abnormal Atmospheres

Dr. A. Mavrogordato, M.A., M.R.C.S., of the South African School of Medical Research, recently lectured before the School of Mines, Johannesburg, Union of South Africa, on "Breathing in Abnormal Atmospheres." The follow abstract is from the *Financial Times* (London).

"Temperature, humidity and stagnation all entered into every atmospheric question. They were common factors in all work carried out in enclosed spaces, and were bound to have effect on breathing if ventilation were not properly attended to.

"For the purpose of his lecture Dr. Mavrogordato classified abnormal atmospheres into four groups: (1) Where the abnormal atmosphere was due to alterations in pressure, as shown in mountain climbing, aviation and in circumstances surrounding the work of the diver, and of men who worked in diving bells and deep caissons. The local effect of such alterations in pressure was felt by South Africans coming from the coast to the Rand, and vice versa by those who left this high altitude and went to a lower one. Mountain sickness and aëroplane sickness were quite common with many people.

"(2) The abnormal atmosphere obtained where air altered in composition. The normal constituents of air were oxygen (one-fifth), a trace of carbonic acid, and the remainder nitrogen. If the oxygen were removed the air would not support life; neither would it if the carbonic acid was increased. Sometimes they had both these things happening with fatal effects, as in the case of a recent fatal sewer accident. In that instance there would be present only a small amount of oxygen in the sewer and a very large amount of carbonic acid, and that was sufficient for a fatal effect. It was not due to any abnormal condition caused by sewer gas. It was, in fact, the 'black damp' of the mines, and was one of the great difficulties met with in the early days of the submarines—the presence of an abnormal quantity of carbonic acid formed in the process of the using up of the air within the submersible.

"(3) Then there were abnormal atmospheres caused by the fumes from burning explosives, introducing into the air the abnormal carbon monoxide. Coal gas was instanced by the lecturer, as were also the gases used in war—chlorine and phosgene.

"(4) The last abnormal atmosphere indicated was that caused by suspended particles in the air, reference being made to the dust problem, coal dust in coal mines and the harder and fatal dust of the Rand mines. According to the particular industry people were engaged in, where dust was prevalent, so there prevailed a particular type of trouble, instances being given of the diseases associated with the cotton and grinding industries and of the deadly fibrosis associated with quartz mining on the reef."

Book Reviews

Silver. By Benjamin White. Cloth, 5 x 7; pp. 144. Published by Isaac Pitman & Sons, Ltd., New York. Price $1.

We admire the compact form in which this handy little volume is issued. It is essentially the same book that appeared a few years ago under the same title in much greater and more impressive bulk. The present size is no criterion of its valuable contents, for although the size and price have decreased the value of the text has been enhanced by recent additions and changes to the pages.

The production, industrial consumption and utility of silver as money are dwelt upon at considerable length. Several chapters are devoted to descriptions of the silver minefields of the world and the modern methods of extracting silver from its ores. The historically interesting facts about silver used as an ornament, and in the arts generally, receive much attention. The evolution of British coinage is traced and the important part played by the Indian rupee and the Chinese tael and syece in the demand and consumption of silver is interestingly and clearly expounded. Many tables and illustrations are interspersed throughout the text.

Not the least important feature in the book is the section describing the marketing of silver and the control over the silver market exerted by four London brokers. The author, from his lifelong association with the silver market, is well qualified to write upon this phase of his subject.

The book is well worth the attention of anyone interested in silver, whether producer, seller or observer. F. E. W.

Technical Papers

Nickel Mining—There may be single ore deposits somewhere in the world of greater value, extracted and potential, than that of the Creighton mine, in Ontario, but we do not know where they are. To the end of last year, the mine has produced nearly nine million tons of about $35 ore, and the end is not in sight. The shoot of chalcopyrite and nickeliferous pyrrhotite dips at about 45 deg., and its cross-section varies in form from oval to narrow lenticular. The system of mining is shrinkage stoping, with main drifts in the foot wall, crosscuts in ore, and the use of rib pillars. The system of mining and the underground and surface equipment devised by J. C. Nicholls are scientific and modern, and the mine is one of the show places of America. It is described in an interesting manner in a thirty-six-page paper appearing in the "Bulletin of the Canadian Institute of Mining and Metallurgy" for July. (503 Drummond Building, Montreal; price not stated.)

Waste-Heat Boilers—The May issue of the "Proceedings of the Engineers' Society of Western Pennsylvania" (Union Arcade Building, Pittsburgh, Pa.; price 50c.) contains a thirteen-page article on this subject by members of the Babcock & Wilcox staff. Eight pages of discussion follow. Formerly, waste-heat boilers were constructed with a large gas-flow space to interfere as little as possible with the draft of the furnace to which they were attached. They were solely an appendage. As now designed, they are an integral part of the furnace installation and are generally provided with suction fans in the flue to maintain the draft to the stack. The article discusses the best arrangement to use, the subject of economizers, overload capacities, temperatures, and other interesting topics.

Potash—"Potash Deposits in Spain," (U. S. Geol. Survey Bulletin 715-A, 16 pages) and "The Potash Deposits of Alsace" (Bulletin 715-B, 38 pages) have been issued and may be obtained on application to the Survey at Washington, free of charge. In Alsace, mining began in 1909, and it is estimated that the known deposits contain the equivalent of about 300,000,000 tons of pure K_2O. The Spanish deposits were only discovered in 1913, and their extent is problematical. Suria and Cardona are the principal localities where the salts are found, and optimistic engineers report a potential production of 200,000,000 tons of pure K_2O at the former place.

Powdered Coal—Thirty pages of the May issue of the "Proceedings of the Engineers' Society of Western Pennsylvania" (Union Arcade Building, Pittsburgh, Pa.; price 50c.) are devoted to a paper on powdered coal and subsequent discussion. The subjects covered are: the conditions justifying the use of powdered coal; the cost of installation; the cost of handling and preparing coal; thermal efficiency; combustion; furnace and flue-gas temperatures; radiant heat; non-combustible matter; refractories; upkeep; human element; cleanliness; and safety. In an appendix, several pages of valuable data are given, including costs, comparing powdered coal against stoker firing of a 22,000-hp. boiler plant.

Australian Statistics—The Official Year Book of the Commonwealth of Australia, No. 12, brings up to the end of the year 1918 statistics on all manner of things connected with the commonwealth. It is a book of over 1,200 pages, containing a 29 x 39-in. orographical map of the country. Obtainable from the Commonwealth Bureau of Census and Statistics, Melbourne; price not stated.

Centrifugal Pumps—The mechanical principles underlying centrifugal pumps, their testing and practical operation, choice of motors for driving, and the methods of measuring head and discharge are described by Prof. R. S. Lewis in the *Mining and Scientific Press* for July 17. (420 Market St., San Francisco; price 15c.)

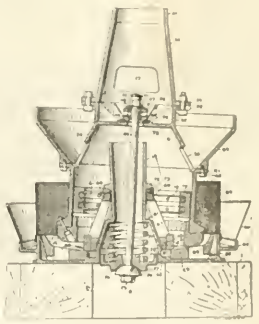
Recent Patents

1,341,686. Process of Extracting Platinum and Similar Metals from Their Sands and Ores. Russell Thayer, Philadelphia, Pa. Filed June 26, 1919.

A process for the recovery of platinum and similar metals from granular ore, which consists in commingling, with a charge of ore, a halogen compound of an alkali metal; subjecting the charge to the action of heat, whereby the metal is volatilized and removed from the ore; and collecting the volatilized metal, substantially as set forth.

1,341,581. Gyratory Crushing Mill. William W. Gibson, San Francisco, Cal. Filed Feb. 18, 1918.

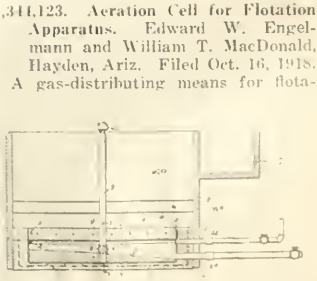
In a gyratory crushing mill, the combination of a die, a muller, means for gyrating said muller, a spring for pressing the muller toward the die, a



centrally located tension device for receiving said pressure from said spring, and rollers for receiving said pressure from said device and transmitting it to said muller.

1,341,123. Aeration Cell for Flotation Apparatus. Edward W. Engelmann and William T. MacDonald, Hayden, Ariz. Filed Oct. 16, 1918.

A gas-distributing means for flota-



tion apparatus comprising a cell having impervious concrete sides and a porous concrete top.

MEN YOU SHOULD KNOW ABOUT

L. F. Noble is preparing reports on nitrate deposits of southeastern California.

E. P. Mathewson, mining engineer, 42 Broadway, New York, N. Y., returned from Anyox, on July 17.

F. E. Downing, assistant general manager of the Shenango Furnace Co., is visiting the iron region of Alabama.

W. J. Loring, of San Francisco, Cal., was in Washington late in July. He was expected in San Francisco again by July 31.

Frederic R. Weekes, mining engineer, 233 Broadway, New York City, has returned from examination work in Montana and California.

Harold A. Linke, mining engineer, 266 Dooly Building, Salt Lake City, Utah, is at Hailey, Idaho, examining lead-silver properties.

Adolph Knopf and Mrs. Knopf, geologists, are at Mina, Nev., where they are engaged in a study of the ore deposits of the Simon district.

Frank M. Wichman, mining engineer, of Salt Lake City, announces that he is now at his new address, 307 Newhouse Building, Salt Lake City, Utah.

Mowry Bates, petroleum and mining geologist of Tulsa, Okla., will be in Wyoming and Montana on professional work during August and September.

George S. Rice, chief mining engineer, U. S. Bureau of Mines, is making a trip through western mining states during this and next month.

P. A. O'Brien, mining engineer, formerly manager of Constancia-Siempre viva mines, Pispis district, Nicaragua, was in New York City recently on a visit.

Jay Carpenter, formerly with the West End Consolidated and other Nevada companies, is now conducting a metallurgical testing works at Los Angeles.

K. C. Parrish, mining engineer, has established himself permanently in Barranquilla, Colombia, S. A., where he will engage in general engineering practice.

Col. John C. Greenway, general manager of the Calumet & Arizona Mining Co., is visiting the Eighty-five Mine, recently purchased in the Lordsburg, N. M., district.

Sir James Loughhead has recently been selected to succeed the Hon. Arthur Meighen as Canadian Minister of the Interior and head of the Department of Mines of the Dominion.

D. E. Winchester has completed his report for the Geological Survey on the oil shales of the Rocky Mountain region and now will devote his entire time to the direction of the oil shale operations of the Carter Oil Co.

Edwin E. Chase and **R. L. Chase**, mining engineers, Denver, Col., were making examinations of mining properties at Lake City, Ouray, and Rico, Col., during the third week of July.

A. C. Dart, of 1722 Williams Street, Denver, Col., is superintendent of the mine and mill of the Whale Mines Leasing & Reduction Co., at Cassells, Col., where he should be addressed.

Marshall O. Leighton, **C. T. Chenery**, and **A. C. Oliphant** have formed a copartnership under the name of M. O. Leighton & Co. with offices at 700 Tenth St., N. W., Washington, D. C.

Robert Linton, president of North Butte Mining Co., who has been in Butte, Mont., for a week in July looking over the company's properties, has gone to Nevada to inspect properties there.

ROYD R. SAYERS

Royd R. Sayers, past assistant surgeon in the Bureau of the Public Health Service, who has recently been appointed chief surgeon of the U. S. Bureau of Mines, completed a health survey of the Joplin, Mo., district shortly before his appointment in the Bureau of Mines. Dr. Sayers, who was born at Crothersville, Ind., in 1889, and obtained his primary schooling there, is a graduate in electro-chemistry of the University of Indiana. After completing that course he was graduated in medicine from Buffalo University and completed post-graduate medical courses at Chicago and New York. Immediately on finishing his schooling, Dr. Sayers joined the staff of the Public Health Service. His first assignment was at the Immigration Station at Ellis Island, New York. From there he was transferred to the Coast Guard cutter service which was engaged in ice patrol. He studied rural sanitation in Missouri and Oklahoma and was attached to the Hygienic Laboratory in Washington. At the request of the Bureau of Mines, the Public Health Service sent Dr. Sayers to the Butte district to study industrial hygiene. The assignment was extended so as to include several months' work in the Lake Superior region. Later he was put in charge of the study of the physiological effects of war gases. With the appointment of Dr. Sayers as chief surgeon, the Bureau of Mines is developing increased activity in the study of sanitation and general health conditions at United States mines. At present there is in progress a health survey of the iron district of the Lake Superior region, in which Dr. Sayers is himself taking some part. A similar survey is also being made in Utah. Dr. Sayers retains his commission as past assistant surgeon in the Bureau of Public Health Service.

Victor C. Heikes, of the U. S. Geological Survey, Salt Lake City, Utah, and **H. L. Williams**, of the Empire Zinc Co., Denver, Col., recently visited the Simon Silver Lead Mines Co. property in the Bell district, Nevada.

E. H. Gould, mining engineer with the Co-operative Mining Co., Lordsburg, N. M., has resigned to accept a similar position with the Duncan Mining & Milling Co., of Duncan, Ariz., whose general manager is **J. M. White**.

Arthur Crowfoot, superintendent of concentrators of Arizona Copper Co., has been spending a few days in Chicago and New York. On his way back from the East he visited Houston, Tex., to investigate the fuel-oil situation.

T. R. Arnold, chief electrician of the mining department of Arizona Copper Co., Ltd., Morenci, Ariz., has resigned to accept the position of electrical engineer for Southwestern Portland Cement Co., of El Paso, Tex., and Victorville, Cal.

Gerald G. Dobbs, safety engineer, St. Joseph Lead Co., Bonne Terre, Mo., has resigned to accept the position of general manager with the Southern Mineral Co., Winnfield, La. His present address is with the latter company at Winnfield, La.

L. A. E. Sauvage, professor in Ecole Nationale Supérieure des Mines, and Inspector General of Mines, Class II, has been retired at his own request. The decree of June 11 granting the request sets Aug. 16, 1920, as the date of retirement.

Rudolf Gahl, mining and metallurgical engineer, has been retained by Cerro de Pasco Copper Corporation, of New York, as consulting metallurgist in connection with that company's milling projects. Mr. Gahl sailed from New York on June 30 for Peru.

C. E. Carlson has been elected first vice-president of the Duluth, Missabe & Northern Ry. **Joseph Seifert** succeeds him as secretary of the railway. The new board of directors is: W. A. McGonagle, C. E. Carlson, J. W. Kreitter, J. W. Kempton, Joseph Seifert, W. H. Hoyt and C. W. Kieswetter.

J. Leonard Replogle, president of Vanadium Corporation of America and chairman of board of Replogle Steel Corporation, has been elected director of Berg & Hutton Steel Corporation in Teschen, Czecho-Slovakia, according to a *Sun and New York Herald* copyright Paris cable. Schneider Co. of Creusot, France, controls Berg & Hutton company.

Third International Mining Convention Held at Nelson, B. C.

Representatives of Mining and Allied Industries of Pacific Northwest Meet for Third Time This Year—Huge Market for Steel Declared To Exist on Coast by Nicol Thompson—Many Exhibits of Minerals and Manufactured Products

By L. K. Armstrong
Special Correspondent *Engineering and Mining Journal*

LOCAL and outside delegations, including about five hundred representatives of mining and allied industries, assembled in Nelson, B. C., on July 20-24, for the most notable convention yet held in this section of the Pacific Northwest. This, the Third International Mining Convention, held under the auspices of the Nelson, Slocan and Eastern British Columbia Mining Association, assisted by numerous other affiliated bodies, was also the third convention to be carried through to a successful conclusion this year in the territory mentioned. The first at Spokane was followed by one at Seattle and then, as if with the old German proverb in mind that "all good things are three," the third was arranged at Nelson.

About one hundred and fifty exhibits of the minerals and manufactures of the Northwest mining and manufacturing districts, together with displays of furs, publications, maps and reports of the Mines Department of the province were housed under one roof in the convention hall. The addresses and discussions in many cases bore upon these and on the opportunities for investment in the Pacific Northwest. The sessions were followed by excursions through Slocan, Ainsworth and other camps, thus affording the delegates abundant opportunity to inspect the mining and metallurgical operations at first hand. Delegations from local camps, Vancouver, Victoria, Seattle, Portland, Spokane and other points on both sides of the international boundary were in attendance.

Prominent among the visitors were R. F. Green, a member of the Dominion Parliament; Dr. W. O. Rose and J. H. Schofield; William Sloan, the Minister of Mines of British Columbia; and A. G. Langley and T. E. Freeland, resident engineers of the provincial Bureau of Mines.

After preliminary ceremonies of the usual sort in which Mayor J. A. McDonald, of Nelson, Mr. Sloan and others participated, the first session of the convention came to order with Sidney Norman, of Spokane, in the chair. Mr. Norman formally thanked Nelson and the citizens of British Columbia for the opportunity afforded those on the American side of the border to express their good will.

The first paper was presented by A. G. Langley, who gave a résumé of the mining industry in the Nelson district and dwelt on the important role filled by the prospector. J. W. Mulholland, president of the British Columbia Prospectors' Protective Association, followed. Mr. Mulholland pointed out the necessity for better roads and more of them, even though the province is unusually generous in the matter of road building. Following this was a luncheon served to about two hundred at the Strathcona Hotel, at which M. J. Carrigan, of Seattle, spoke on the subject of mining conventions.

The afternoon session was presided over by S. S. Fowler, manager of the Blue Bell mine. Nicol Thompson, chairman of the mining committee of the Vancouver Board of Trade, had for his subject the iron deposits of the Northwest in their relation to the manufacture of steel.

NELSON, B. C., ON WEST ARM OF KOOTENAY LAKE

Mr. Thompson stated that having been commissioned by a group of British and American capitalists to collect information on the iron resources of the Pacific Coast, he had found markets on the Coast for over two billion tons of steel per year, the Orient absorbing much of this in forms of final manufacture. There were abundant raw materials and manufacturing sites within the borders of British Columbia, and British ships to deliver the final products wherever desired. He was followed by H. J. Brown, of the Brittania Steel Rope Co. Mr. Brown spoke of the new wire rope company which he represents as being able to make and deliver at competitive prices to the Northwest markets.

Glenville A. Collins, of Seattle, spoke on the subject of financing the prospector whose ideals and ambitions, he said, should be fostered and whose ideas of finance must be remedied and corrected. He stated that stock selling methods are being succeeded by syndicating which requires grouping of prospects in concert with grouping of capital in order to determine financial sufficiency and competent management, both of which qualities, according to Mr. Collins, are foreign to the prospector.

At the session on the morning of the second day, L. K. Armstrong, of Spokane, occupied the chair. Mr. Armstrong cautioned patience in the present strained conditions of the mining business, and advised that a policy be pursued of stricter adherence to the principles of conservation of resources, as well in their use as in their preservation. S. S. Fowler addressed the delegates upon the subject of oxidized lead ores. He supplemented his speech with an exhibit of types of ores procured from the Blue Bell mine and vicinity, and cited the geological and mineralogical influences which produce such ores. Mr. Fowler stated that although prospectors do not usually regard these ores as important, a considerable tonnage had been produced from the Blue Bell and North Star mines, of British Columbia, and from the Electric Point mine, of Washington. In touching upon ore-dressing methods as practiced at the Blue Bell mine, W. Penick, who discussed the subject, cited the present practice in Arizona, where modern methods have been adopted after long research, with good results.

W. Pellew Harvey, of London, a member of the council of the Institute of Mining and Metallurgy, who at present is in the Northwest to look over the mining situation, met many old friends of his in British Columbia and consented to address the meeting. He stated that he has been engaged for some years in examining and estimating the mineral resources of other countries, and has now returned to look into the possibilities of aiding the development and preparation of minerals in British Columbia.

The afternoon session opened with Nicol Thompson, of Vancouver, in the chair. A short résumé was given of the recent advance in metallurgical practice. Special reference was made to the plans of the Consolidated Mining & Smelting Co. of Canada at its Trail smelter, where efforts are being made to increase production at this, the most complete metallurgical plant in America.

F. M. Smith, manager of the Bunker Hill & Sullivan smelter in the Cœur d'Alene district of Idaho, invited shippers to test the facilities of the plant when suitable rates can be obtained and conditions warrant the diversion of the surplus tonnage of lead ores elsewhere than to the local smelter. William Sloan, Minister of Mines of British Columbia, addressed the meeting on the potentialities of the mineral resources of the province, as only a man who is perfectly familiar with the subject can do. C. W. Beale, the British Trade Commissioner, entertained the delegates for a brief period with a discussion of inter-empire trade development. In his speech he indicated the usual British determination to convert war enterprises into others equally efficient but for commercial purposes.

Resolutions were passed condemning local bolshevism, and recommending that the Dominion government discourage it by legal action. Another resolution was introduced asking that all minerals found upon any reservations be made available to location and development by prospectors. The usual resolutions of thanks to all those responsible for the success of the convention were made a part of the record by unanimous consent. The success of the convention was in large measure due to the efforts of Fred A. Starkey, of Nelson, the secretary manager.

The mineral exhibits included many unusual specimens, such as manganese from Kaslo, mica from Tetejaune, bismuth-gold ore from Lardeau, native silver from the Boundary district, zinc ores from H. B. mine, and oil shales and crude petroleum from Flathead. Typical minerals were exhibited by A. G. Langley and another collection including about two hundred specimens was shown by A. H. Adam. Larger and more comprehensive displays have been shown before, but the exhibits reflected the trend of public inquiry.

THE MINING NEWS

LEADING EVENTS

Minerals Separation Hearings End at Salt Lake

Letters From Company's Secretary at New York to E. H. Nutter Read Into Testimony

The last hearing in Salt Lake City in the investigation by the Federal Trade Commission into the methods practiced by Minerals Separation has been concluded. The hearings will be continued in Denver, and later in the east. Letters exchanged between C. B. Allen, secretary of the company at the New York office, and E. H. Nutter, chief engineer at San Francisco, were read into the testimony and afforded further evidence as to the way in which possible infringers were checked up, as well as to the process of elimination by which, according to a letter from Mr. Allen, certain enterprises were classed as "useless and juiceless," and others as preferred infringers, which were to receive "prompt attention and plenty of action when the harvest time arrives." The term "coyote howlers" is used to designate licensees making complaints. Correspondence placed in the records showed that a local ore buyer had been employed to receive reports from men detailed to secure information in regard to operations at big plants, such as would be of value to Minerals Separation company. Most of the letters to the ore buyer were reports of the activities of two agents employed at the Butte & Superior and Miami mills, and reports of money disbursements made by him to them for Minerals Separation.

WEEKLY RÉSUMÉ

The new Mexican government is reported to be taking steps to collect delinquent mining taxes. A concession for a railroad in Sonora to San Jorge Bay on the Gulf is said to have been granted to promoters at Ajo, Ariz. In the Joplin-Miami district, the lead-zinc operators have succeeded in effecting a curtailment of 25 per cent in production. In the Cœur d'Alene district of Idaho, the Federal M. & S. Co. has insured all its employees. An option on the control of the Senator Mining Co., owning the east Flynn group, has been secured by the Cœur d'Alene Syndicate. In Canada, the amendments to the Yukon Placer Mining Act have been made effective. From Australia, it is reported that Great Cobar's assets are to be realized.

In Washington, the practice of using Pittsburgh as a basing point for steel prices has been upheld by the Federal Trade Commission. A hearing on the War Minerals Act before Secretary Payne has been scheduled for Aug. 10; Cuban claims for relief are now being studied.

Mexican Concession for Road to Gulf Reported

A concession has been granted by the new Mexican government to railroad promoters of Ajo, Ariz., for the construction of a railroad from the Mexican line in Sonora to San Jorge bay, located on the Gulf of Mexico, according to news received in Juarez recently. The railroad will start at Ajo, connecting with the line from Gila Bend to Ajo, which in turn connects with the Southern Pacific. It is understood that a survey of the proposed road will be made in the near future by the interests concerned.

A Letter from Mexico City

The Prospects for Silver Mining in Mexico

Special Correspondence

The pyrotechnic fall of silver frightened some people in Mexico, but does not appear to have left many scars. In some few cases certain heavy buyers were caught with $1.30 silver and were glad to unload at 90c. but these unfortunates were isolated and far between. The legitimate industry is still very much in the ring. For the last ten days silver has hung around 90 and 95c. an ounce and mining interests in which the white metal plays a predominent part have had a chance to catch their breath.

Last year Mexico produced 62,500,000 oz., more than 35 per cent of the silver output of the world, and it is predicted that the output this year will reach, possibly exceed 75,000,000 oz. This increase is expected because many properties heretofore abandoned are now being exploited by the most modern methods and literally hundreds of forgotten dumps and mines of low values are being optioned and preparations are under way for their intense exploitation. As an example, lively interest is now being shown in the old mining camp of Zacatecas where it was generally believed that its mines had been "bottomed" or exhausted. It is now found that ores on old dumps and those near the surfaces which could not be treated or handled with profit in former times, exist in abundance, and are profitable under any price of silver

above 90c. an ounce. In consequence all vacant mining ground in the Zacatecas district is being redenounced and options are being taken on nearly all the old abandoned properties which have been considered practically worthless.

Regarding the recent silver flurry it is the opinion of one of the most successful mining operators in the Republic that the drop in silver was about the best thing that could happen to the silver industry. His view is based on the argument and experience that we have had to the effect that the price of other commodities follow more closely the price of silver than any other metal. In common parlance, the squeezing of water out of any sort of stock does the legitimate operator no harm. The gentleman quoted cites for example that 40 per cent dynamite at present sells for about 35 pesos a case. The price of dynamite when silver was 50 to 60c. an ounce was about 15 pesos per case. This is a single item. Miners were better off with 56c. silver and 15 peso dynamite than they were with $1.30 silver and all the extraordinary costs of mining and treatment. According to this gentleman's views, if the silver miner in Mexico can obtain 90c., or better, on fine silver bullion, the industry is not only assured but production will break all records within the next few years. The sudden drop has, of course, caused some interruption among small miners, but with reasonable aid on part of the government, at least a friendly lift, the industry will strike a steady gait.

The government has already shown its friendly disposition by a reduction in the output tax and the presentation of a scale for material reduction in the tax on *pertenencias* or claims. Regarding the former, under special Presidential decree, silver at 60c. an ounce pays 5 per cent; from 60 to 75c., 5½ per cent; from 70 to 80c., 6 per cent; from 80 to 90, 6½ per cent; from 90c. to $1, 7 per cent; from $1 to $1.10 8 per cent; and from $1.10 to $1.20 9 per cent; and from $1.20 to $1.40, 10 per cent. Should silver exceed the price of $1.40 the tax will be 12 per cent. In addition to the above production tax, the amount paid in national currency is duplicated in old revolutionary currency paper which is worth 10c. on the peso, or an additional 10 per cent tax. This has been done for the purpose of retiring the last paper currency issued by the Carranza government. Aside from a reduction in production taxes the government has expressed its willingness to consider a substantial decrease in the yearly tax on *pertenencias* or claims. At present, the progressive system worked out by some astute mathematician under the immediate former regime has seriously affected the mining industry and has not produced the anticipated favorable results for the treasury, as many large companies forfeited their claims rather than submit to what they considered an imposition that was unwarranted. As an example, X mine with 347 hectares pays 6 pesos a hectare on the first 5 hectares; 9 pesos a hectare on the next 45 hectares; 12 on the next 50 and 18 on the following 247. Much of the time during the last five years the X mine has been unable to work because of brigandage, strikes incited by radical local officials, shortage of dynamite and other materials, not to mention extraordinary loans assessed or requested by either the ins or the outs, or both. With a frank desire on the part of the government to assist the miners, it will not be difficult to place the industry in general on its feet despite fluctuations in prices.

The principal feature affecting the mining industry at this writing is the strike at the smelters of A. S. & R. in Aguascalientes, Matehuala and Velardeña, the big steel plant in Monterrey and the Minerales y Metales smelter at Monterrey. Apparently the situation has been satisfactorily arranged at Aguascalientes by C. L. Barker, in charge, and there is a confident feeling that the entire strike problem will be settled. At Aguascalientes the pay of peons was advanced from one peso to one peso forty cents a day, and the rest of the employees receive an advance in wages of 25 per cent. At Monterrey, the question of recognition of the unions is one of the principal points of difference.

New York State Buys Radium for Medical Research

The purchase by New York State of two and one-quarter grams of radium, the largest commercial transaction of its kind ever made and the first purchase of radium by any state for a purpose of social utility, was announced by Governor Smith on July 26.

The acquisiton of the radium was made possible through an appropriation of $225,000 by the 1920 Legislature. The radium will be used for research work in behalf of the New York State Institute for Malignant Diseases, under the direction of Dr. H. R. Gaylord and his staff at Buffalo.

Elbow Lake District, Manitoba, Drawing Prospectors

Some Gold Discovered—Many Quartz Veins But Few of Promise—Section Held To Merit Investigation

The chief rocks of the Elbow Lake district of northern Manitoba, which is attracting attention at present, appear to have been originally for the most part intermediate or basic flows, with here and there tuffs and pyroclastics. These rocks have been highly metamorphosed and at present consist of massive green stones and chlorite-schists. In some places narrow bands of sericite schist occur, which were probably originally dykes of more acid composition. In a few places fairly large areas of these rocks occur. The whole complex has been referred to the Amisk series of rocks. Granite is intrusive into all the rocks of this area, though there are few occurrences actually on the lake. The mineralization has been generally ascribed to the later granitic intrusions. Near these the rocks of the Amisk series often look like diorites, but are probably greenstones impregnated with granitic material.

OUTCROP OF GOLD-BEARING VEIN DISCOVERED BY T. WEBB IN ELBOW LAKE DISTRICT, NORTHERN MANITOBA

There are a large number of quartz veins in this district but so far few give promise of sufficient values. At the north end of the lake, however, T. Webb has discovered a small vein in which gold occurs plentifully. Indeed, he has already collected about $1,000 worth of gold with pestle, mortar and pan. On a large island about two miles away he has located a fairly large dyke which carries some values. This dyke appears to have consisted of quartz and felspar. Considerable shearing has taken place. The felspars have been crushed and foliated, and only a few phenocrysts of quartz remain visible. There has been considerable development of secondary quartz, with which some galena occurs; the original dyke material is fairly well mineralized with iron pyrites. Some arsenopyrite is present, but whether in the original

dyke or the later mineralization was not ascertained. There is on the same property a remarkably irregular quartz vein, which is very well mineralized with pyrite, galena and some chalcopyrite or arsenopyrite. This vein pans freely and assays indicate a probable average of about $20 to the ton.

About two miles west of Webb's discovery of high-grade A. Forrest has located a quartz vein, pannings from which give indications of good values. Altogether the district would appear to be well worth investigation, though the large number of barren veins is apt to discourage the average prospector.

Novel Safety Contest in Butte

Much interest has been aroused in the Butte district over a safety first contest in which all the mines are participating. The contest started July 20 and will conclude Aug. 21. Daily results are being displayed on an "accident-o-meter," placed in the central part of the city and arranged with large glass tubes holding a colored liquid which rises and falls in accordance with the standings of the mines as they are kept free from accidents, all of which are recorded, no matter how trivial. The winning mine will be awarded a large banner at a miners' field day to be held at the Columbia Gardens in Butte sometime in August. The contest is designed to promote efficiency and curtail accidents. At a recent contest held in Cleveland, Ohio, a reduction in accidents of 35 per cent was shown.

Yukon Placer Mining Amendments Now Effective

Amendments to the Yukon Placer Mining Act, passed at the last session of the Canadian Parliament, have been brought into operation. The most important provision enables a man to secure prospecting rights on five miles of abandoned claim for a three-year period, or on one mile of virgin territory for one year. It is expected that this change will induce many mining men and prospectors who would otherwise have gone to Alaska to remain.

National Copper's Equipment To Be Sold

An inventory of all machinery, movable equipment and supplies owned by the National Copper Mining Co. of Mullan, Idaho, has been completed and several parties are understood to be figuring on buying the entire outfit, the estimated value of which is between $160,000 and $175,000. The equipment includes a modern 500-ton concentrator, flotation plant, electric motors, compressor, hoist, tool-sharpening outfit, and in fact everything necessary in the operation of a mine and mill employing 100 or more men. The appraisement does not include mine or mill buildings. In addition to these assets, the National company owns nine patented claims, four in process of patenting, a water right which with flume cost over $20,000, and 160 acres of land in the flat adjacent to the mill site.

Federal M. & S. Co. of Wallace, Idaho, Insures Employees

Another Large Company Adopts Practice Now Becoming Popular—Amount Ranges from $500 to $1,500

The Federal Mining & Smelting Co. of Wallace, Idaho, has insured the lives of all employees as from July 1 for the benefit of their families and dependents, the entire expense being paid by the company under a contract with the Metropolitan Life Insurance Co. of New York. The amount of insurance is graded according to length of service. All employees on July 1 who had been with the company less than one year were covered with $500 insurance and new employees will be covered with the same amount after three months' service. Employees with the company more than one year and less than two receive $600 insurance, and $100 is added each year thereafter up to the maximum sum of $1,500. The adoption of this insurance policy by the Federal company was announced by Frederick Burbidge, general manager, in a circular letter delivered to each employee.

Curtailment of Output Succeeds in Joplin-Miami District

Success that is gratifying to the mine operators of the Joplin-Miami district has attended the recent efforts to hold down production of zinc ores in this field. The present car shortage and the slackness in the zinc market ordinarily would have meant a rapidly accumulating surplus of ore in the bins, but this is being avoided by the combined effort of a majority of the leaviest producers in the field, who are putting into effect a systematic and carefully planned curtailment.

This curtailment was begun following the two weeks' complete shutdown starting June 26. During this shutdown the operators got together and decided that to meet the situation properly a curtailment of not less than 25 per cent should be put into effect, and proceeded to make plans for it. Contrary to the predictions of many in the field, it has been a complete success and careful estimates place the curtailment at fully 25 per cent. It will be maintained for several weeks, according to present plans, and should result in holding down the ore surplus that the car shortage would otherwise naturally cause.

Silver mining throughout Montana is beginning to decrease at a fairly rapid pace in consequence of the slump in the price of the metal. Leasing in the Butte district at the present quotation of the metal is said to be unprofitable and operations in this direction are showing a slowing up.

Unless there is a material enhancement in the silver price within the next three months it is said that silver mining operations aside from the larger companies will come to almost a standstill throughout the state.

Mexico To Collect Delinquent Mining Taxes

Companies May Secure Remission of Additional Charges by Paying Up for First Half of 1920

The *Diario Official* of Mexico City published on July 20 an executive decree relating to the payment of delinquent mining taxes in Mexico. Regulations covering the payment of taxes due are set forth in the decree, which provides that additional charges will be remitted to companies complying with the present laws and paying the taxes for the first two quarters of 1920.

"1. All the additional charges owed by those liable to the annual tax on mining property are hereby remitted, provided the parties interested pay the first and second quarters of the present year before Aug. 31 next.

"2. The proprietors of mines who were owing quarters previous to 1920 and shall have paid the two quarters of the year in conformity to the preceding article shall have the right to pay quantities (amounts) quarterly which they are in arrears in as many installments as there are quarters that they owe and thus settle the amount of one quarter in arrears every time they make payment on the regular taxes.

"3. If the parties involved do not take advantage of the exceptions established by this decree or do not make payment on the dates on which the respective periods for such payment expire this failure shall give occasion to the declaration that their respective titles are revoked without leaving room for any further recourse.

"4. The owners of mining properties who complied with the articles of the decree of June 28, 1919, shall continue to meet their obligations in accordance with that decree.

"5. The main tax officers are authorized to receive in conformity to the present decree the payments which those owing the annual tax on mining property may wish to make, but they should include at the end of the monthly accounts which they render to the Department of Hacienda a report in which they express the customary data with a notation as to whether the interested parties have complied with the exemptions referred to in the foregoing article.

"Transitory articles three, four, five, six and seven of the decree of June 27, 1919, are revoked."

Recent Production Reports

Compagnie du Boleo, Santa Rosalia, Baja California, produced 802,474 lb. copper in June against 650,908 in May.

G. F. Loughlin of the U. S. Geological Survey has just returned to Washington after visiting the old Chipman mine at Newburyport, Mass. He reports that the mine is being cleaned out rapidly. Five levels have already been reopened and some shipments of silver-bearing galena already have been made. Development, however, has not gone beyond the exploration stage.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Administration of War Minerals Act To Be Discussed

Mining Congress To Ask Changes at Hearing Before Secretary Payne—Cuban Claims Being Studied

The outstanding feature in the war minerals relief situation is the hearing scheduled for August 10 before the Secretary of the Interior, at which the American Mining Congress will request certain modifications of the policies of the War Minerals Relief Commission. At that hearing, it is expected that the whole question of the administration of the law will be discussed.

The Cuban claims under the War Minerals Relief Act are now being studied by the commission. A report on these claims is being submitted by D. F. Hewett, who made a personal examination of the property. An opinion by the solicitor of the Department of the Interior, which was confirmed by the Attorney General, admits the Cuban claims on the same basis as the domestic claims. The claims are mostly clear-cut as there is no question as to Government stimulation. At least two Government engineers visited Cuba during the war and urged increased production of manganese.

In the whole matter of stimulation, the commission is attempting to be particularly liberal. In all cases where the claimant admits that he had no direct stimulation, the commission inquires specifically if by any chance he attended a meeting addressed by a representative of the U. S. Bureau of Mines, the Geological Survey or any other Government agency, at which miners were urged to increase production of war minerals.

Awards recommended by the commission for the week ended July 17 are as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): C. H. Plumb, manganese, $213.14, 3 per cent; Pillsbury, Crowder & Kay, chrome and manganese, $3,760.83, 67 per cent; Manganese Associates, manganese, $32,551.73, 13 per cent; Puterbaugh & Touhy, chrome, $5,993.88, 75 per cent; Charles Puterbaugh, chrome, $266.35, 41 per cent.

W. R. Crane, the chief engineer of the Commission, is in the field making personal examinations. Engineer Examiner Van Sicklen has left for the field to do similar work. Engineer Examiner Eddingfield is back at his desk after a leave of absence without pay to undertake private work.

The total amount of silver purchased up to July 15 under the Pittman Act was 7,165,130 oz.

Decision on Federal Taxation Regulations Soon

The Commissioner of Internal Revenue is expected to rule within a short time whether or not certain sections of the tax regulations applying to mines are to be amended or are to remain as they are. The discovery and depletion portion of the regulations are those most likely to be amended. With the exception of these clauses, the regulations are working out quite to the satisfaction of the specialists in the national resources subdivision of the income tax unit.

J. C. Dick continues as active head of the natural resources subdivision. He has made arrangements so as to be able to continue directing this work until January 1. C. F. Powell is in charge of the oil and gas section; O. R. Hamilton of the metals section; and G. M. S. Tait of the coal section.

Chief Engineer Visiting Bureau of Mines Stations

George S. Rice, the chief mining engineer of the U. S. Bureau of Mines, has left Washington on an important tour of the western experiment stations for the bureau. On this trip, Mr. Rice expects to call the attention of mining engineers to the possibilities of using liquid-oxygen explosives. During a trip in Europe after the war, he made a careful investigation of the uses to which liquid-oxygen explosives are being put. They were used successfully by the Germans as a military explosive, in addition to their extensive use in mining and quarrying operations.

Mr. Rice intends to discuss with Daniel Harrington, the supervising engineer of the bureau at Denver, the matter of ventilation in metal mines and the prevention and laying of siliceous dust. Mr. Harrington has been investigating these matters for several years. In this connection Mr. Rice will also confer with the bureau's representatives and other engineers at Butte.

Another object of Mr. Rice's trip is to look into matters pertaining to the leasing regulations relating to oil shales and coal. At Salt Lake City, Berkeley and Seattle, he will discuss with the station superintendents the program for mining investigation during the coming year.

On his return, Mr. Rice will attend the meeting of the American Institute of Mining Engineers at Houghton, Mich. He expects to call into conference on that occasion the bureau's mining engineers stationed in the Lake Superior district. At this conference the various mining problems in that region will be discussed.

Dismiss Protest in Pittsburgh Steel Basing Point Case

Federal Trade Commission Upholds Practice as Fair to Fabricators—One Member Dissents

The practice of using Pittsburgh as a basing point for steel prices has been upheld by the Federal Trade Commission in dismissing the protest of the Western Association of Rolled Steel Consumers. The vote on the dismissal of the case was 3 to 2. Commissioners Murdock, Colver and Gaskill voted for dismissal. In handing down the decision each commissioner made a statement. An extract from that of Commissioner Murdock is as follows:

"Those steel companies which have plants in the Pittsburgh section and elsewhere, under the practice in question, have sold steel at a less price at Pittsburgh than elsewhere. Steel made at Gary, or Duluth, has been sold to fabricators in or near those cities at higher prices than the Pittsburgh fabricators pay. Similarly, the fabricators tributary to Birmingham have been charged a higher price for steel than Pittsburgh price, although there is a differential which modifies the charge against Birmingham fabricators to a certain extent. This, taken alone and viewed separately, is discrimination on the part of a selling corporation having plants in and away from the Pittsburgh district, in the ordinary acceptation of that word. Its practice appears, at first blush, arbitrary.

"But there is a second approach to the problem—the consideration of supply and demand—which opposes the conclusion that it is an arbitrary discrimination such as is forbidden by the statutes herein invoked. It is not disputed that the Pittsburgh section is now the point of heaviest surplus production of steel in the United States. In the steel industry, the point of heaviest surplus production under the operation of the law of supply and demand necessarily must influence strongly the price in other markets with excess demand. Viewed in this light, a base price plus freight device is not discrimination, arbitrarily determined, and such as the statutes forbids. Approaching the problem from this side, it would appear to follow that the force, functioning in the creation of a base price plus freight device, is the market-place law of supply and demand, not contrary to law but rather confusedly applied herein by differentials expressed in terms of freight rates."

A paragraph from Commissioner Colver's statement is as follows:

"The practice is not unfair competition with respect to the manufacturers of steel, nor does it inject an unfair

competitive element into the business of the fabricators. If the base price system were abolished, it might result in giving some advantage not now enjoyed to certain fabricators, but it would place other fabricators at a corresponding disadvantage. Thus, at best, the shifting of the boundaries of competitive fields probably would not affect the fabricating industry as a whole, except to throw it into confusion. The Pittsburgh base price was an established thing in the theory and practice of steel manufacture and sale when the steel fabricating industry came into being. It was one of the factors taken into consideration by fabricators when they selected the sites for their plants. It is no new thing; no unforseen factor imposed upon the fabricators. Therefore it does not project any new method of competition, fair or unfair, into the industry of steel fabrication."

Commissioner Gaskill, among other things, says:

"Whatever evil there may be in this base-plus practice and however great may be the inequalities which result, I fail to find in the powers of the Federal Trade Commission any remedy therefor. An unfair method of competition, according to the definition laid down by the U. S. Supreme Court in the Gratz case, must be opposed to good public morals or contrary to public policy; the former because characterized by deception, bad faith, fraud or oppression, the latter because tending unduly to hinder competition or create monopoly. If any principle is to be applied to the corporate ownership of a number of plants, differing from that applicable to the operations of a real person, and the location of the several corporate enterprises is to give rise to a different basis of price determination which will recognize a local price right, it will be necessary for Congress so to declare."

In his dissenting statement, Commissioner Thompson says in part:

"The strife caused by two competitors in seeking the business of a consumer, in the natural course, should reduce the price, whereas it is contended here that the price is never reduced but is increased in an artificial and arbitrary way in respect to steel manufactured in Chicago by taking the Pittsburgh price at which the corporation sells the material and adding on a 'fictitious' freight charge to that price. In my opinion, a *prima facie* case of an unfair method of competition has been made out sufficient upon which to issue a formal complaint. It may very possibly be that when the disputed claims have been subjected to the test of evidence and cross examination of witnesses, with a formal hearing before the Commission, the *prima facie* presented will fail."

Definite Program for Alaska Expected

With the return of the Secretary of the Interior from Alaska, it is expected that immediate steps will be taken to put into effect a more definite program looking to the stimulation of the industries of that territory. As the matter of improving transportation conditions between Alaska and the United States is regarded as the most acute factor in the situation, an effort is being made to work that out first. This task has been assigned to J. Y. Saint, of the Shipping Board, who is expected to enter upon the work at once.

NEWS BY MINING DISTRICTS

MEXICO

Planned To Unwater Soto Mines at Guanaceví—Asarco Smelter Running Two Furnaces

Durango

Guanaceví — Wilber Judson, representing Col. William B. Thomson's interests, has just been in Durango visiting their Guanaceví holdings, the properties that once belonged to Mexico Consolidated Mining & Smelting Co. The Soto Mines Co., one of their companies, is operating a 200-ton flotation plant. Unwatering of the mines is planned now. The erection of an 800-hp. electric plant in San Pedro, Guanaceví, and the driving of a big tunnel to Todos Santos and Predilecta are subjects of careful study on the part of the Soto people.

San Dimas—The San Luis Mining Co. is working its Tayoltita properties at full capacity. It has built a large hydroelectric plant for electrifying both mines and mills. The Mexican Candelaria Co. is following the same program; this company is the one controlled by Daniel M. Burns.

Otaez—The Basis Gold & Silver Mining Co. has been operating in the camp uninterruptedly for the last three years. It is working the mines and running its smelting plant, the bullion being shipped via Durango.

The properties of the Santa Cruz Mining Co. are being worked under the management of George Stoker with Lorenzo Elder as superintendent. A new manager is expected soon at the mines.

Topia—This camp has been idle for the last few years; but the Topia Mining Co. is now taking steps toward resumption of operations.

Avino—The properties of the Avino Mines, Ltd., are being worked by gambusinos. Gerald E. Norton is in charge.

Velardeña—The American Smelting & Refining Co. has started working the mines and mill. Its Asarco smelter is running with two furnaces.

Mexico

El Oro — The Esperanza company, which has been opening up a group of gold properties near Las Penas, in the state of Jalisco, is completing a 1,000-ton plant.

The Mexico Mines of El Oro are also spending a large amount in developing properties in the same vicinity. The revolutionary conditions that have interfered with operation in other sections of the country have apparently not affected work in this section.

Michoacan

A considerable force has been at work for some months on Las Truchas, one of the largest iron properties on the Pacific Coast, diamond drilling and sinking pits to demonstrate the extent of the fields.

Mescalhuacan—A French syndicate which has been working on gold properties near Mescalhuacan, Michoacan, has completed a 5-stamp test mill.

ARIZONA

Ray Verde Installing New Equipment To Deepen Shaft—U. V. Copper's Coke Bins Burned

Kelvin — The Cowboy mine, in the Dripping Springs district, is being reopened by its owner, C. W. McGraw. In the past the property has been worked for gold and at one time there was a small mill on it. At present the ores being mined are those of vanadium. A Moyle crusher and two Card tables have been installed. As soon as the gas engines are received milling will be started on the ore accumulated during the spring.

The Ray Verde Copper Co. has recently installed a hoist and compressor. The new equipment will be used in deepening the present two-compartment shaft. About fifteen men are employed.

Ray Boston Copper Co.'s No. 1 diamond-drill hole is down over 1,300 ft. Some ground had to be cemented off at about 1,260 ft., the formation having become softer and much more broken.

The old Bobtail and Copper King groups south of Ray have been taken over by eastern people, who are preparing to begin operations August 1. Considerable development was done years ago on the Bobtail group, which is now known as the South Ray. The Copper King, sometimes called the Alma group, joins the Ray Consolidated ground on the south and is owned by John A. Tillman.

Winkelman—The Antelope Peak company has had to suspend shipments

recently for a short time owing to a shaft accident. The last hundred feet of the shaft has been rendered unsafe by swelling and caving ground. Recently several sets of timbers went out. Development will be carried on at the 300-ft. level in the meantime.

The Continental Commission Co., operating the "79" mine, is rapidly completing the last stretch of new wagon road. This last section has been especially difficult to build, being all rock work and over a mile in length. For the present, shipments have been kept at a minimum and only a small force is at work in the mine. About 60 men are working on the road which should be open for use by August 1. Trucks will be put on to haul the ore to Burns from whence it is shipped to El Paso.

Sombrero Butte—The Magma Chief continues development and the management is having ore tests made preparatory to putting in a small concentrator.

Sonora — D. Durazo is installing a Gibson mill and concentrating table on the Saus property southwest of Ray, near Copper Butte. The property has been developed slowly during the last two years with a small force. The shaft has been sunk 100 ft. on a 2-ft. vein of gold ore. Some drifting has been done at 50 ft. and in all a considerable tonnage blocked out. The property is reached by wagon road from Ray Junction.

Miami—Certain employees of the Miami Copper Co. and Inspiration Consolidated recently asked through the grievance committees of their respective companies a general increase of $1 per day. The petition was based on the claim that the cost of living has advanced from 80 to 150 per cent since 1917, while wages have increased very little. The Miami company refused the request on the ground that the decreased price of copper made an increase in wages impossible.

Prescott—Settlement of accounts due from the Verde Apex Mining Co is sought in a blanket suit filed on July 20 in behalf of Charles A. Raible, assignee for claims aggregating over $24,000.

Jerome — The old coke bins of the United Verde Copper Co. were destroyed by fire on July 14. The breaking of a pipe leading from fuel oil tanks at the same time caused a loss of several thousands gallons of oil which also caught fire.

Black Canyon District—In the Black Canyon mining district, Yavapai County, practically all properties are under bond. The Thunderbolt has 20,000 tons of good milling ore blocked out, and has recently made shipments of high-grade.

The Silver Zone, a promising prospect next to the Thunderbolt, is down about 140 ft. and is drifting in a northerly direction. The vein is 3 to 4 ft. wide and carries milling values of about 14 oz. silver per ton.

The Silver Cross company, with two groups of three claims each, is developing its Southern Cross group. A hoist and a three-drill compressor have been installed, and two shifts are working. The vein is 5 ft. wide in the narrowest place and the ore being mined averages 16 oz. of silver per ton. The company is controlled by Lawton Mines Finance Co., which also controls the L. T. S. Milling Co. operating a 50-ton custom mill nearby.

The Howard Silver Mining Co., which is developing the extension of the Southern Cross vein, has opened up good ore. A hoist is being installed. The Howard Copper Co., an affiliated corporation, is developing a copper prospect two miles away. The orebody was cut recently, and found to be about 18 ft. wide.

Kingman — William Neagle has brought suit for $50,000 against Hackberry Consolidated and G. S. Holmes on account of the conversion of stock in that corporation.

Chloride — During the first half of July three cars of ore have gone from Chloride to the Humboldt smelter. These were from the Altata, Rainbow and Dardanelles. The new cross cut to the shaft on the 100 level of the Dardanelles has been completed and the pump installed. Sinking to the 225 level is under way.

The Pay Roll has a day shift of five men at work getting ready for sinking the main shaft another lift.

Cerbat — The Dudley interests have closed down the Daisell. After a period of steady development for the last three years this property has a large tonnage of milling ore blocked out and is ready for a mill. As the management is busy with the final steps in equipping its C. O. D. property with a mill it was thought best to suspend operations at the Daisell for the time being. As soon as the C. O. D. plant is in operation, work will be started on the Daisell plant.

Hilltop—Construction by the Southern Pacific of a branch line from San Simon station to the property of the Hilltop M. & M. Co., in the Chiricahua Mountains, 26 miles away, is under consideration. Under the plan proposed, the mining company will pay the cost of construction.

CALIFORNIA

Central Eureka Shaft Completed—Mason Valley Mines Enters Engels District

Engelmine—The Uncle Sam group of 18 claims, located a half mile from the Engels Copper Co.'s property, has been taken over by John Reinmiller, formerly superintendent of the latter. There has been little development on the Uncle Sam, but it is said to have an unusually good surface showing. It adjoins the group of the Reinmiller Copper Mining Co., where the bottom of the 60-ft. shaft is in ore that averages better than 8 per cent copper. Reinmiller is driving a tunnel which will attain a depth of 110 ft. If the ledge is cut at this depth it is intended to drive another tunnel from the bottom of the hill and tap the vein at 450 ft.

The Mason Valley Mines Co. has also entered the Engels district and has taken over a promising group owned by Murphy & Barnes.

Sutter Creek—Sinking of the Central Eureka shaft was completed on July 18, and all timbers have been set in place. The main track will be extended and the 3,900-level station will be cut in hard rock without timbering. Because of labor shortage only twenty stamps are dropping this month in the mill.

Downieville—The Gold Exploration Co. has made a promising strike of gold ore. The orebody is said to be over 30 ft. wide and has been proved so for 200 ft. on the strike.

Oroville—The Table Rock Mining Co. near Howland Flat is steadily pushing development, despite labor troubles. A large deposit of excellent gravel has been reported.

A five-stamp mill at the Rose property near Rackerby has been purchased by the Horseshoe mine at Challenge, and will be erected at the Horseshoe.

Sonora—The Jones-Tarantula has uncovered high-grade gold ore in virgin ground. The property adjoins the Shawmut mine.

Nevada City—Litigation between the Twenty-one and Sixteen-to-One mining companies here has been closed by the Sixteen-to-One acquiring all of the property of the Twenty-one. The purchase price is stated also to liquidate the $60,000 judgment secured by the Sixteen-to-One against the Twenty-one in Federal Court a few months ago on the showing that ground belonging to the former had been worked by the latter. The mines of the two companies are located near Alleghany and are adjoining. Operations will continue through both tunnels.

At the Bunker Hill ore from the 600-ft. winze from which so much was expected is so low in value that it goes over the dump.

Some months ago the Pacific Gas & Electric Co. made application to the California Railroad Commission for permission to divert all water used for power in the Grass Valley district to the Bear River plant, for the generation of electricity for power. Opposition was raised from every user and principally by the Empire and North Star companies. The commission recently decided in favor of the water users.

The Golden Gate mine near the Idaho-Maryland has been permanently closed.

Because of a lack of pay ore and high costs the North Star Mines Co. has decided to abandon the Champion mine near Nevada City and dismantlement is in progress. There are two hoists and a 40-stamp cyanide mill.

The Alleghany M. Co., owners of the Tightner mine at Alleghany, have taken over the Gold Canon mine below Moore's Flat.

COLORADO

Mountain Top at Ouray Finds Faulted High Grade—Less Activity Owing to Drop in Silver

Ouray—A real "find" has been made by the Mountain Top Mining Co. Suspension of work on its high-grade orebody below the tunnel level, pending arrival of larger pumps, permitted development and prospecting of other ground above, where an unexplained disappearance of the ore streak had long been a subject of speculation. A small crosscut showed that the ore had been faulted about 18 in. and continued strong beyond the fault. Although this is not fully explored, it seems certain from previous development that the new ore is simply a continuation of the main high-grade body. Rough estimates are that this will add at least $300,000 in high-grade ore to the output in the near future. The ore is shipped crude and yields $100 to $300 per ton, most in silver.

Camp Bird continues active development, though with a small crew. The work consists principally of drifting west on the new tunnel level, with results not known to the public. No work on the mill is in evidence.

The Guadaloupe Leasing Co. is shipping its winter's accumulation of high-grade copper-silver ore and active work at the mines is temporarily suspended.

The Whitecloud M. & M. Co. continues development in the Monas Queen and Paymaster mines and is shipping its winter's stock of lead-silver ore. This comes from the orebody discovered in the Monas Queen.

E. R. Baur, of the Hidden Treasure, has opened the road and is shipping the large pile of excellent lead-silver ore mined last winter.

The only mills in operation are at the Atlas, Mountain Top, Red Mountain Mines, and Barstow; the last two are making summer runs only. Outside of active development on the Eurades, no other mining operations of importance are in progress. Silver Mountain Mines Co. continues development, driving a raise, with a small crew. The genuine activity in a preliminary way which was in evidence last spring has dwindled greatly; the fall in silver without doubt killed many embryo projects, although the more substantial ones are in active operation and the San Juan country is the most active and substantial mining district in the state.

IDAHO

Cœur d'Alene Syndicate Acquires Other Flynn Group

Wallace—The Cœur d'Alene Syndicate has taken an option on control of the Senator Mining Co. The Senator owns or controls what is known as the east Flynn group of claims joining another group owned by the Flynn Group Mining Co., control of which is already under option to the Cœur d'Alene Syndicate. In taking over the Senator the syndicate gains possession of all the ground between the Frisco on the west and the Morning and Star on the east aggregating forty claims divided about equally between the two Flynn groups. Under the direction of Rush J. White, mining engineer of Wallace, the Black Bear tunnel on Canyon Creek is being extended into the Flynn ground, a new compressor of large capacity is being installed and all necessary equipment provided for rapid development. Men prominent in mining affairs are associated in the Cœur d'Alene Syndicate and it is stated authoritatively that $225,000 has been set aside for the development of the Flynn ground. The trustees of the syndicate are Colonel S. W. Mudd and Phillip Wiseman, of Los Angeles. Others interested are D. C. Jackling, Horace V. Winchell, the North American Exploration Co. and its representative in this country, Carl O. Lindberg.

What appears to be an important ore shoot has been cut by a diamond drill in the Nipsic, owned by the Callahan Zinc-Lead Co. and which is being explored from the 600 level of the Callahan mine. The drill core, besides several feet of low-grade ore, shows about 2 ft. of high-grade lead-silver ore and about the same amount of high-grade zinc. Crosscutting to the strike is going on, the distance to go being nearly 400 ft.

The Bullion company in the St. Joe section of the Cœur d'Alene district, will build a 100-ton mill next year, according to James H. Taylor, manager, who states that sufficient ore is available to keep such a mill running for years. The ore is said to average better than 2 per cent copper and carries 6 or 7 oz. of silver and some gold. The mine is about 7 miles from the Milwaukee railroad, along the St. Joe River.

MICHIGAN

The Copper District

Wolverine Discarding Concrete Pillars for Timber on Lower Levels—C. & H. Shipping Copper Abroad

Calumet — Seneca Copper should reach the elevation of the terminal within ten days as sinking is now progressing at the rate of 20 ft. a week, and the fifth level is in sight. The third level has reached the southern boundary. The fourth level to the south will go 125 ft. further before reaching the boundary. The laterals to the north are continuing in the same good-looking high-grade Kearsarge lode. The second level, to the north, went to the boundary at 350 ft., but the lower levels, to the north, go an interminable distance. The thirteenth level of the Gratiot is now in 400 ft. and the copper runs about the same as formerly. Frederick Lewisohn, president; Walter Lewisohn, treasurer, and directors, W. F. Bartholomew and Thomas F. Cole, visited the mine last week.

Calumet & Hecla is shipping 1,500 tons of copper to France in one order, 500 tons to Montreal by rail, for foreign shipment on another order, and 1,600 tons of copper left Sunday by water for the East. The French order is billets and wire bars, a special order. Kenosha, Wis., took 320,000 lb. of Calumet copper during the week.

Houghton—Isle Royale is utilizing No. 3 hoisting plant from Tamarack, which is being set up at No. 5 shaft.

Mayflower's south drift has been opening good ground since the resumption of work in that direction. The raise to the west crosscut has been started and is breasted in trap. It is hoped that this work will cut the Mayflower lode. The north crosscut continues in the conglomerate, the same formation that was entered by the crosscut 140 ft. further west and 520 ft. from the shaft. Mayflower's development program at the 1,700-ft. level is far from complete and is continuing along practical and sensible lines.

Kearsarge—Wolverine is reopening No. 4 shaft with a limited working crew following suspension for twenty days, during which time concrete pillars on three lower levels, 26, 27 and 28, have been discarded and replaced by timber. All mines in the Lake Superior district that have tried the concrete experiment have come to the conclusion that it will not do as the shifting of the ground breaks the concrete.

Gogebic Range

Ore Shipments Improving But Coal Continuing Scarce—Large Coal Dock for Pabst Mine

Ironwood—The shipping situation continues to be the prime question with the mine operators. Ore shipments are now going forward at a slightly better rate, but coal is as scarce as ever. In June the ore shipped from this range was about 350,000 tons more than was shipped in June 1919, totaling about 1,300,000 tons.

Some of the steel for the Pabst-Puritan transmission line has arrived on the ground. The 50-ft. towers are to be erected on steel footings or anchors, instead of the usual concrete footings.

At the Pabst mine a coal dock is being built which will have a capacity of 35,000 tons. The coal will be stored in three or four parallel piles for safety from fire and will be loaded by locomotive cranes equipped with grab buckets and dumping into a movable hopper under which the small coal cars will run. An electric locomotive will haul these to the crusher, whence the coal will be taken by bucket elevator to the hoppers above the stokers in the new boiler house. This dock was made necessary by the uncertainties in the coal supply the last few years, and by additions to the load carried by this power plant.

The underground work at the Pabst mine was again stopped for a day recently by a breakdown in the haulage burned out.
system. The rotary converter had

Officials of the Steel & Tube Co. of America were on the Gogebic Range the week of July 22 visiting their Newport and Palms-Anvil mines.

JOPLIN-MIAMI DISTRICT

Missouri-Kansas-Oklahoma

New Development at Galena May Be Abandoned—Kansas Line Mill Started

Galena, Kan.—A pseudo mining revival in this veteran zinc-lead camp has apparently been knocked to smithereens by an old, old failing in mining communities. The Eagle-Picher Lead Co. had become interested in the stories of deep-ground deposits in the camp and is understood to have decided to make a careful investigation by drilling, provided something like 1,500 acres of leases could be secured as a preliminary assurance of a chance to get the development money back if deep-ground ore were found. To date about 800 acres of leases have been obtained for the company, but the proposition has been checked and possibly defeated by land owners who decline to give leases or else ask unreasonable bonuses. The officials of the Eagle-Picher company are known to be on the point of abandoning the whole project, which would necessitate extensive drilling and drainage work.

Baxter Springs, Kan.—The Kansas Line Mining Co. has started its 250-ton mill which is about three miles southwest of Baxter Springs. Early development is reported as promising. The principal production will be zinc. The plant is owned principally by J. C. Nichols, of Kansas City, and George C. Meese, of Joplin.

Picher, Okla.—The Cosmos mine of the Lucky Tiger Combination Mining Co. has recently completed a second field shaft and is now getting ore from it. A quarter-mile surface railway is used, with a gas locomotive, about 15 tons being taken each trip. The new shaft proves up ore deposits over the entire lease.

MONTANA

Barnes King Negotiating for Black Hawk Claim in Marysville District

Butte—Unofficial reports are to the effect that the No. 2 vein has been picked up on the 2,700-ft. level of the Colorado mine of the Davis-Daly company and that 9 ft. of good ore is in evidence.

Shipments from the Tuolumne Copper's Main-Range mine are ranging from 100 to 150 tons daily. A winze sunk from the 1,200-ft. level to a depth of about 50 ft. has afforded sufficient showing to warrant sinking the shaft, according to the management. This work will start Sept. 1 with the 2,000-ft. level the objective.

Sinking operations by the Butte & Plutus are disclosing well mineralized ground in the Plutus claim. The shaft on this property will be sunk to the 400-ft. level and a fissure in the Norwich claim adjoining crosscut.

Negotiations are in progress by the Barnes-King company to acquire the Black Hawk claim in the Marysville district of Montana. This property is in the neighborhood of the Shannon mine, the company's chief producer at present. It would occasion no surprise were the Barnes-King to suspend operations at its Gloster property, also in the Marysville district.

A statement will be issued soon by this company in connection with the opening of a high-grade orebody on its 2,500-ft. level by the Davis-Daly Copper, which company is working the deposit through a profit-sharing arrangement with the Butte & Ramsdell. The ore is said to run up as high as 20 per cent and to have a width of 5 or 6 ft.

NEVADA

Retimbering Broken Hills Shaft—Claims in Tolicha District Attracting Attention

Broken Hills—Arthur Perry Thompson, consulting engineer, has announced that three shifts will be put to work retimbering the main shaft of the Broken Hills mine to the 150-ft. level, after which the shaft will be continued on the vein and levels run every 100 ft. A new shaft, known as the Belmont, has been started on a newly discovered vein 500 ft. southeast of the main shaft.

The Utah, Nevada & Idaho Telephone Co. will extend its line from near the old camp of Fairview to Broken Hills, a distance of about 15 miles.

Virginia City—Three hundred tons of ore is being hauled from the West End mine in the Flowery district to the Fisher mill in the Sixmile Canyon section of the Comstock district. The vein from which this ore came is 20 ft. wide at a depth of 40 ft.

Plans for a new and extensive campaign of development on the Comstock-Phoenix have been agreed upon, according to George H. Drysdale, superintendent. The new plans call for additional work on the 800 level, and also for sinking a winze from the 800 to 1,200 level.

Eureka—The Eureka Holly shipped to the smelter last month 300 tons of ore averaging about $75 per ton. The main orebody averages 10 ft. in width.

The Eureka Climax is building a chute from the tunnel portal to ore bins on the road about 40 ft. below to handle the high-grade ore recently encountered. The tunnel, which is to crosscut the mountain, is in 1,100 ft.

Tybo—The smelter which was recently blown in at the Tybo mine is running smoothly and is said to be doing excellent work. The company has large reserves of crude ore, as well as concentrates from the 125-ton mill which has been in operation for some time. F. W. Draper is general manager.

Tolicha—Considerable interest has been attracted to the Tolicha district by the excellent showing which has been made on the property of Jack Jordan and "Jumbo" Yeiser. When the vein was tapped in a tunnel the values were not very high, but a drift found ore of better grade. The best showing is in a winze where at 10 ft. depth the entire bottom is in high-grade.

An option on the Southey and Staplin groups, two miles east of Tolicha on Quartz Mountain, has been taken by the W. J. Loring syndicate. There are big ledges on the properties and the new owners hope to develop large bodies of low-grade ore.

Osceola—Four feet of silver-lead ore of commercial grade has been encountered in a crosscut from the main working shaft of the Lucky Boy company near Osceola in White Pine County.

Goldfield—The Goldfield Deep Mines Co. has started to sink its 3,000-ft. vertical shaft on the Blue Bell section. This is intended to develop the Goldfield construction vein at depth below the proven ore-bearing area.

NEW MEXICO

Operations in Lordsburg District

Lordsburg—Ore shipments in June from the Lordsburg district totaled 97 cars, or 4,715 tons, of an approximate value of $75,725. The bulk of this went to the C. & A. smelter from its 85 mine. Fluorspar shipments were delayed owing to the operation of the Great Eagle mine changing hands, Bell & Wright having taken a lease and erected a new ore crusher at the S. P. Ry. ore platform.

The Bonney Con. is doing considerable work preparatory to installing new machinery. A topographical survey of the company's 700 acres will be started at once. Fifteen claims will be patented, making 22 claims so held.

Columbus—The Romaho Mining Co. in the Tres Hermanas Mountains, is erecting a new head frame at the Waterloo shaft and will install a new hoist, already on the ground. New buildings have been erected, a water supply established and by August 1 everything will be ready for development to the 300-ft. level. Robert L. Howze is president and J. Peter Mack superintendent.

UTAH

Miners Still Scarce in Most Camps—Ontario Silver To Resume on 2,000 Level

There is at present a scarcity of metal mine workers in Utah owing to various reasons. A good many of the men are supposed to have saved wages earned during the war, when their earnings were large, and to have applied the funds thus gained to the purchase of farms or to have entered into other enterprises. In the case of foreign labor many of this class have returned, after the prosperous years of the war, with their savings to their native countries. A considerable number of miners also are engaged in leasing.

Park City—The stock of the New York Bonanza, owning ground adjoining the Naildriver, and formerly included in the assets of the Merchants Bank, now defunct, has been acquired by Salt Lake men, who are planning to finance the company with eastern

capital for active development. The Naildriver is said to have developed an orebody within 50 ft. of the Bonanza line.

The Ontario Silver, after doing no work on the 2,000 level for 20 years, is planning to resume work there owing to its successful operations on the 1,700 and 1,800 levels, where persistent and strong shoots of shipping ore have been opened.

There were eight shippers from the Park City district in the week ended July 16, Ontario Silver heading the list with 1,450,000 lb. of ore and concentrates; Judge M. & S., 854,110 lb. ore and 412,000 lb. zinc; Silver King Coalition, 674,000; Daly West, 485,820; Daly Mining, 201,500; Naildriver, 230,000, and Keystone, 220,000; total, 4,528,430 lb.

In the case of the Western Securities Co. as assignee of H. P. Clark, formerly president of the Merchants Bank, against the Silver King Consolidated, Solon Spiro, John Pingree, C. E. Kaiser and L. R. Eccles in regard to the sale of stock in the Silver King Consolidated given by Mr. Clark as security for money owed the mining company, the state supreme court has reversed the decision of the district court, which found in favor of the plaintiff, and declared the sale to have been valid, ordering the dismissal of the suit. Mr. Clark was indebted to the Silver King Consolidated to the amount of $50,000, for which he gave four notes, delivering 29,089 shares of capital stock in the company as security. In default of the payment of these notes the stock was sold by the mining company.

Eureka—Tintic shipments for the week ended July 16 amounted to 136 cars from 16 shippers, the Chief Consolidated heading the list with 36 cars. Others were: Tintic Standard, 30 cars; Eagle & Blue Bell, 10 cars; Grand Central, 9 cars; Dragon Consolidated, 8; Iron King, 7; Victoria, 7; Centennial-Eureka, 6; Mammoth, 6; Iron Blossom, 6; Gemini, 2; Tintic Drain Tunnel, 2; Colorado Consolidated, 2; Bullion Beck, 2; Gold Chain, 1, and Swansea Consolidated, 1 car.

WASHINGTON

American Arsenic Co. Has Small Mill Ready—American Mineral Production Board Reorganized

Index—The American Arsenic Co. has completed a 15-ton concentrator at its property four miles north of Reiter, a station on the Great Northern Ry. The ore is to be crushed by a jaw breaker and Hardinge mill, and then floated. It is principally realgar which occurs as a filling through a fractured zone in granite. A small production of high-grade red arsenic may be expected in the near future.

Valley—A reorganization of the Board of the American Mineral Production Co has been effected. Howard F. Wierum has tendered his resignation as vice president and hereafter will serve as general manager and director.

WISCONSIN

Operations in Zinc-Lead District

Linden—C. W. Stoops and others have proved up the Jerry Rule lease adjoining the Fearless mine on the north. Seventeen drill holes indicate a good lode of high-grade blende at the average depth of 110 ft.

J. H. Dugdale and others have drilled the Optimo No. 3 property, which is equipped with a 150-ton mill, and plan to re-open it together with the Hinkle & Wicks, two other former producers.

Mifflin—Piquett & Altenburg have unwatered the old Squirrel, which is taken under sub-lease, and have begun mining.

CANADA

British Columbia

Road Work Started in Portland Canal District—Unwatering Blue Bell at Riondel

By Robert Dunn

Stewart—The road work to be undertaken by the provincial government in the Portland Canal district will be started under the supervision of G. A. Young, of the Public Works Staff. Repair work on the Bear River road has already begun. Special attention is being given the tributaries of the Bear, along which there is much prospecting and mineral development.

Good ore is said to have been struck on the Unicorn Group, Salmon River, and ore of high grade has been brought into Stewart from the Glacier Creek property. An open cut 20 ft. long on the latter is in ore carrying galena and iron sulphides.

Nelson—Four of the levels of the Blue Bell mine, at Riondel, are being unwatered by a pump recently installed. Last year the Blue Bell shipped to Trail 1,249 tons of crude ore and 36 tons of concentrates.

Sandon—In order to sidetrack the famous slide on the Cody road to the Noble Five mine, a "cut-off" is to be constructed, work on which will start soon. The Washington, Argo Fraction, Majestic, Hope, Black Colt, Silver Hill, Cinderella, Chicago and Climax are properties in the Sandon district on which development is in progress.

Princeton—The Princeton Mining & Development Co. is working to put its property, situated five miles east of Princeton on the Great Northern Ry., on a shipping basis. There are three full claims on which the ledge has been opened by three tunnels. The operators assert that they have a large body of concentrating ore averaging 4 per cent in copper and 1 oz. in silver. A three-drill steam-driven compressor is in use and another is to be installed.

Ontario

Cobalt—The Gillies timber area, lying south of the Cobalt silver district, was thrown open to prospectors on July 20 with some reservations at the southern portion, which is heavily timbered. Many prospectors have gone in.

La Rose Mines has entered an action against the Mining Corporation of Canada and the Cobalt Reduction Co. to recover damages for the alleged conversion by the defendants of tailings from La Rose ore deposited by the Northern Customs Concentrator on the bed of Cobalt Lake, or on lands leased by the Cobalt Townsite Mining Co. and the Northern Customs Concentrator. As an alternative the plaintiff company asks that it receive a proper proportion of the tailings deposited on these lands.

Butt Township—The Mining Corporation of Canada has started work on its radium ore locations in Butt Township, where camp buildings are being erected preparatory to carrying on exploration work. Pitchblende has been found at three points in the district. It is stated that the ore occurs in patches throughout the main dyke, and that the commercial value of the discovery depends on whether these patches occur often enough.

AUSTRALIA

Great Cobar's Assets To Be Realized

From our Melbourne Correspondent

Melbourne—A representative of Great Cobar, Ltd., recently visited Australia and instructions have now been received to realize the assets on behalf of the debenture holders. This step will mean a big blow to Cobar and district and it is hoped that some steps will be taken so that the mine and works will not be altogether abandoned. Cobar is the center of an extensive copper mining area and there should be scope for a customs treatment plant to handle the ores from the smaller producers. It is unlikely that the property of the Great Cobar, Ltd., which comprises not only the Great Cobar mine but also the Cobar-Chesney copper mine, the Peak & Conqueror gold mines, and the Cobar gold mines will be worked again on the same scale, but the field is one that has still many years of life before it and justifies large scale operations on the lower grade deposits.

The Great Cobar, Ltd., which was floated in 1906 with a capital of £1,000,000, and in addition raised debentures for £750,000, fell on evil days in 1914, a receiver being appointed in April of that year. Subsequently Mr. Pellew-Harvey was sent to Australia by the English debenture holders to report on the property, and in order to carry out his recommendations the sum of £102,000 was raised, £40,000 of the amount being advanced by the New South Wales government. During the war period operations were profitable and the whole of this money, with interest, was refunded, but no interest was paid to the original debenture holders whose holdings were valued at £667,000. The ordinary shareholders had, of course, lost all their interest in the concern by this time. Operations ceased in March, 1919, owing to the low prices and the embargo on the export of copper.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Daily Prices of Metals in New York

July	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
22	18.50@18.85	45.50	48.00@48.75	8.60	8.25@8.75	7.75
23	18.50@18.85	46.00	48.50@49.25	8.60	8.25@8.75	7.75
24	18.50@18.85	46.00	48.50@49.25	8.60	8.25@8.75	7.75
26	18.50@18.85	46.00	48.50@49.00	8.60	8.25@8.75	7.65@7.75
27	18.50@18.85	45.25	48.25@48.50	8.60	8.25@8.75	7.65@7.75
28	18.50@18.85	45.25	48.50@49.00	8.60	8.25@8.75	7.65@7.75

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered" which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin

London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
22	91	93¼	107	263½	268	35¼	36	41½	43¼
23	91¼	93¾	107	270	275	37	38	42¼	44
24	.	.	.	.	.	.	.	.	.
26	92	94¼	108	270¼	275¾	37⅛	37⅝	42	44
27	92	94¼	108	267	271	36¾	36¾	41¾	43½
28	91	93½	108	267	271½	36¼	36¼	41½	43¼

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

July	Sterling Exchange	Silver			July	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
22	380	99⅜	93½	55⅛	26	378	99⅜	95	56⅜
23	377½	99⅜	91½	54⅜	27	378	99⅜	93¼	55⅜
24	377¾	99⅜	91⅜	54⅛	28	377¾	99⅜	94¼	56⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, July 28, 1920

Whether caused by the midsummer business lull or not, the metal markets are certainly lifeless, and no business of any magnitude has been done during the last week. Prices have shown little variation. Producers are seriously considering the effect of the expected increase in freight rates, which are variously prophesied to be from 10 to 40 per cent. These will affect costs all along the line. Copper will feel the increased burden most, for this metal is sold delivered. The cost to the sellers will, therefore, probably be from one-half to one cent more than under present conditions.

Transatlantic freight rates on metal are now about as follows: England, $13 per long ton; Hamburg, $12; Rotterdam, $8; and Havre, $7@$8. There has been a slight reduction recently in the rate to Havre. Transpacific rates to Hongkong and Kobe are $11 per long ton.

Copper

The large producers are selling some metal to regular customers at 19c. delivered, but copper may be obtained of smaller producers and traders at from ¼@½c. less. Most of that sold now is for August-September delivery. Producers do not care to quote for anything later than October. Copper for shipment from Japan was offered last Thursday for 18½c. On Monday, English inquiry for electrolytic developed, and several hundred tons were sold at ¼c. under the domestic price. Export demand has, however, been only fair.

Small buyers have no difficulty in getting spot copper at 18½@18⅝c. delivered.

Lead

This metal continues scarce for all positions, but inquiries have not been as numerous, particularly the last two or three days. Small quantities, one or two cars, are in demand for spot and early August shipment, at 9@9.25c. New York and 8.75@9c. St. Louis. No one wants to sell futures, but one producer reports that 8.75@9c. has been realized for October lead. Another large interest is offering October lead in large quantities at 8½c. without finding buyers. Practically all sales have been on a contract basis, so that our price is largely governed thereby.

The storage-battery business is evidently booming, judging from the demand in that quarter.

Zinc

Business continues dull. Galvanizers apparently refuse to buy unless they can pick up a bargain. Producers who held for 7.80c. in the closing days of last week did no business, and a price of 7.75c. on Monday failed to prove attractive. A small amount of business was done at slightly under these figures.

Practically no price differential exists between spot and future delivery. The London price is now equivalent to about 6.50c. St. Louis.

Tin

Tin has been even more lifeless than usual, and only small amounts have been sold. Buyers in general want immediate shipment, and no demand exists for futures. Small quantities of electrolytic have been sold for whatever they would bring, from 46c. to 47c. Dealers hope for, rather than expect, an improvement by mid-August.

Straits tin for future delivery: July 22nd, 48.25@48.75c.; 23rd, 48.50@49c.; 24th, 48.75@49.25c.; 26th, 48.75@49.25c.; 27th, 48.25@48.50c.; 28th, 48.50@49c.

Arrivals of tin, in long tons: July 14th, Hongkong, 25; 21st, Liverpool, 10; 23rd, London, 420; 24th, Singapore, 225; 26th, Straits, 240; China, 125; 27th, Liverpool, 25; Singapore, 125; China, 225.

Silver

The general undertone of the London market has improved on Indian demand and a cessation of offerings from the Continent for the present. The China demand continues flat.

Our local market for foreign silver follows closely the London price, subject to fall in sterling exchange. Domestic demand is only moderate. The Mexican government is now buying from 1,000,000 to 2,000,000 oz. monthly for mintage purchases at about 4c. premium over N. Y. quotation. The U. S. Treasury continues to purchase domestic production, and has so far bought a total of about 8,500,000 oz. under the Pittman Act.

Mexican Dollars—July 22, 70¼; 23d, 68¾; 24th, 68¾; 26th, 71¼; 27th, 71; 28th, 71¼.

Gold

Gold in London on July 22d, 107s. 9d.; 23d, 108s. 3d.; 26th, 108s. 9d.; 27th, 108s. 9d.; 28th, 108s. 9d.

Foreign Exchange

Unsettled political conditions in Europe and increased exports from this country, caused by the slackening of domestic demand and the recent more favorable exchange rates, have combined to depress somewhat the value of foreign money during the last week. On Tuesday, francs were 7.85c.; lire, 5.54c.; marks, 2.45c. and New York funds in Montreal, 13⅛ per cent premium. Argentine exchange has declined further to 88.15c.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 6¾c. W. C. C. brand, 9c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $2.50 to $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$80 per oz.

Platinum—Market weak at $80@$85 per oz.

Quicksilver—Market steady; $88@$90 per 75-lb. flask. San Francisco wires $85. Weak.

Ruthenium—$200@$220 per troy oz.

[1]Selenium, black, powdered, amorphous, 99.5 per cent pure, $1.75@$2 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Other ports show gain in shipments.

Manganese Ore—75@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 60@85c. per lb. of contained sulphide, New York.

[1]Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6.50@$7.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 5c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., July 24—Zinc blende, per ton, high $51.50; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $44.24; calamine, $37.04; all zinc ores, $44.16.

Lead, high, $102.95; basis 80 per cent lead, $92.50@$100; average settling price, all grades of lead, $99.85 per ton.

Shipments for the week: Blende, 6,777; calamine, 78; lead, 1,839 tons. Value, all ores the week, $431,950.

Two consecutive weeks' buyers responded to the demand of sellers for an advance each week of $2.50 per ton, but declined flatly to consider another advance of $2.50 this week, prices of zinc blende remaining, therefore, unchanged. Calamine was advanced $1 per ton and lead $7.50 per ton.

Platteville, Wis., July 24—Blende, basis 60 per cent zinc, $51@$53 base for high grade. Lead ore, basis 80 per cent lead, $95 per ton. Shipments for the week: Blende, 1,314; lead, 151 tons. Shipments for the year: Blende, 40,223; lead, 3,645; calamine, 2,240; sulphur ore, 1,098 tons. Shipped during the week to separating plants 2,032 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $1,800@$2,500; No. 2, $1,100@$1,500; spinning fibres, $400@$700; magnesia and compressed sheet fibres, $300@$400; shingle stock, $100@$150; paper stock, $60@$80; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $25@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10 f.o.b. Maine; ground, $22@$30, car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Kentucky and Illinois mines; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $50@$60, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $20 in less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc—Paper making, $9.50@$14 per ton; roofing grades, $8.50@$9; rubber grades, $9@$15, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, carload lots, $12 per ton; less than carload, $15, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $10@$20 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, $225, freight allowed; Spiegeleisen, 18 to 22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$8.25 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets—No change in Jan. 7 price of 29½c. per lb.; wire, quoted 32½c.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. in quantity, mill lots.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅝ to 3 in., 23¾c.

Zinc Sheets—$14.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 14c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$90@$95 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $45@$53 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $40. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick — $100 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—9-in. per 1,000, $51@$55, Birmingham, Ala.; $50@$55, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, July 27, 1920

The shortage of gondola cars for shipping steel mill products, as well as pig iron, has grown still greater in the last week. In box cars there is no appreciable improvement, but there has hardly been any change for the worse in several weeks. The gondola car shortage is due, of course, to the preference being given the coal mines. Strong hopes are now entertained that this preference will soon be found to have performed its function.

Pig Iron—The strained situation in the pig-iron market is still more pronounced, with many furnaces piling iron, stocks being now fairly large. A few consumers are seeking to buy actual deliveries, almost regardless of price. If transportation conditions should permit the sudden moving of a large quantity of iron the market situation might be entirely reversed. We quote: Bessemer, $46; basic, $46; foundry, $45, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel—A sale of 3,000 tons of sheet bars for early shipment is reported, for conversion, at $75, buyer's option, bessemer or openhearth, and this seems to be the prevailing market for conversion bars, but some mills believe they could buy from regular sources at $70. Billets are inactive, and practically nominal at $60@$65, buyers being interested in getting deliveries, already long delayed, against old purchases.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

The Outlook for Silver

Foreign Silver Remains But Little Below "Dollar Silver"—Dullness of Chinese Business and Reversion of India's Trade Balance to Pre-War Tendency Have Depressed Prices—Pittman Act Has Removed United States Silver From the World's Supply

ON JUNE 16 silver was quoted at the lowest price for the year, 80c. per oz., but since that date has gradually risen to the present (July 25) quotation of 95c., which is only 5c. below the price of "dollar silver" established by the Pittman Act. For the last few weeks foreign silver has reach a stable level close to the firm domestic price, with daily fluctuations that do not seem warranted by the amount of business done, although this circumstance itself is likely to make the market unusually sensitive in price changes. That the speculative influences at work in the silver market, caught in the recent big drop, have partly worked themselves out is indicated by the recent advance to the 95c. quotation, and might be explained by the absorption of the large accumulated stocks formerly in the hands of speculators who had played for a rise, but who have been consistently unloading their silver since the beginning of the decline. It is also not unlikely that the paucity of general supplies is being felt, helping to raise the price relatively close to dollar silver.

One Effect of the Pittman Act

The direct effect of the Government's purchases of silver produced in the United States is to withdraw from the world's available silver production fifty to sixty million ounces for the next four years, provided, of course, that silver generally does not rise above one dollar an ounce. The burden of meeting the entire world's requirements is therefore thrown upon other silver-producing nations, such as Mexico and Canada. Even the United States' consumption in the arts will likely be met by foreign silver, as no silver consumer will purchase dollar silver when lower priced foreign silver is available.

The Pittman Act has withdrawn about one-third of the world's total annual silver production and directed it into the United States mints. The result of this step would undoubtedly be more marked were it not for the unprecedented action of European nations in recently placing on the market large quantities of silver coin and bullion, thereby balancing the effect of the American withdrawals. One bullion broker has estimated that in the last three months fifteen million ounces of Continental silver were marketed, because silver is one of the few commodities in the possession of European nations with greatly depreciated currency that commanded a relatively high value and that could be readily and satisfactorily marketed for relatively enormous realizations in depreciated currency. According to Gresham's law the depreciated currency would have a tendency to displace the silver coinage. The European meltings were one of the great contributing agencies to the recent demoralization in the market.

The world's production of silver from available accounts has shown a decline during 1919. An estimate for that year follows:

	Production in Ounces
United States	55,300,000
Mexico	62,500,000
Australia	5,900,000
Canada	15,675,000
Others	37,000,000
	176,375,000

In 1918 production was estimated by the Bureau of the Mint at 197,394,900 oz.; in 1917 at 174,187,800 oz., and in 1916 at 168,843,000 oz.

The 1919 output, despite the high price of silver, exhibits a marked decrease in the world's production from 1918, and can be explained as being caused first by the unsatisfactory copper situation, with the consequent decrease in byproduct silver production, and second by a sharp decrease in Canadian production.

Considering the smallness of the silver market covering the arts in the United States and in the world in general the major interest in this country is probably on the side of the producer in maintaining high silver prices, although there are instances where a low silver price is desirable. This inclination toward the market is characteristic of practically the whole North American continent, as it produces most of the world's silver. On the other side of the fence is presumably the dominating consumption of India, controlled by the British government through the London market, whose interests do not lie in a high price for silver. China, another silver-consuming country, finds it advantageous to maintain silver at a high value, thus permitting enlarged imports and high prices for exports. This condition, however, is not favorable to European interests controlling Chinese markets, who do not like to see the volume of trade affected by high silver prices, as high silver implies a costly settlement for a favorable trade balance.

Conditions in the Far East

Exporters have keenly observed the effect of present silver prices upon the Far East. Business conditions in China are reported dull, with an improvement in the silver market necessary to encourage business. It has been estimated that the fall in silver has resulted in a loss of about $70,000,000 to Chinese merchants, in settlement for goods bought from them, and has put a strong brake to import trade, with export trade continuing dull.

The situation in India is none too bright, the balance of trade having turned against India. Normally India has an adverse trade balance of $90,000,000, and although there was a favorable balance that reached unusual proportions during the war reversion has now set in to the pre-war tendency. The financial difficulties of Japan have affected the exports of cotton from India, and the exports of raw produce have come to a low point. India is still refraining from making extensive silver purchases.

India's Enormous Silver Consumption

The following official figures as given by Samuel Montagu & Co. show the powerful absorption of gold and silver by India:

NET IMPORTS OF GOLD

	Average of Five Years 1909-10 to 1913-14 (Pre-War Average)	1917-18
On private account	£19,242,000	£13,292,000
On government account	476,000 (net exp.)	3,483,000
Total net imports	£18,766,000	£16,775,000

The following year the movement of gold was reversed and net exports were recorded as follows:

	Net exports 1918-19
On private account	£1,656,000
On government account	2,053,000
Total	£3,709,000

NET IMPORTS OF SILVER

	Average of Five Years, 1909-10 to 1913-14 (Pre-War Average)	1917-18	1918-19
On private account	£4,806,000	£ 457,000	£678,000
On government account	2,346,000	12,238,000	44,601,000
Total net imports	£7,152,000	£12,695,000	£45,279,000

It will be noted that in the last year almost seven times as much silver was imported as for the average pre-war rate, which is a gage of India's tremendous silver accumulation.

The Outlook for Silver

The future position of silver will be influenced by the same consideration that holds for most commodities, supply and demand, but the enigmatical behavior of silver makes

prophecy unusually risky. The world's supply will reflect the ability of Mexico to provide for any increased demand for silver, something which that country is well able to do, if the Mexican government firmly exercises its authority. Production in the United States for the next few years need not be considered as it is being taken care of under the Pittman Act.

The world demand is exceedingly difficult to judge. Continental European coinage demands will have to be satisfied at some future date to replenish the exhausted stocks, but this is not to be looked for until silver rules at a lower price. India's puzzling requirements are as much a matter of whim as of trade, and reasoning along the latter line may lead to an erroneous conclusion. The consumption of silver by India for the past fifteen years in per cent of the world's production is given by the director of statistics for India as follows:

	Per Cent
1904-5 to 1913-14	35
1909-10-11-12-13-14	26
1914-15	32
1915-16	17
1916-17	53
1917-18	40
1918-19	112

During the last year China imported gold estimated at $300,000,000, and as China is a silver-standard country there is a possibility that this gold may be converted into silver, but to facilitate this exchange the Chinese must be induced to believe that silver is relatively cheap, and the question arises as to when the Chinese will consider silver cheap. Chinese exports are now at a standstill, and the only absorption of appreciable amounts of silver would seem to be in exchange for this Chinese gold.

July, 1920, Mining Dividends

The following is a partial list of mining dividends paid during July, 1920:

U. S. Mining and Metallurgical Companies	Situation	Per Share	Totals
Am. Smelt. Sec., pfd. A	U. S.-Mex.	$1.50 q.	$146,071 00
Am. Smelt. Sec., pfd. B	U. S.-Mex.	1.25 q.	39,855 00
Caledonia Mining Co., l. o	Idaho	.01 m.	26,050 00
Camp Bird, Ltd., pfd., g. s	Col.	8 2/5 d. s-a	£38,502
Daly Mining Co., s. l	Utah	.10 q.	$15,000 00
Daly West Mining Co., s. l	Utah	.25 q.	62,500 00
Electric Point Mining Co., l	Wash.	.03 k.	23,812 50
Inspiration Consol. Copper	Ariz.	1.00 q.	1,181,967 00
Judge Mining & Smelting, s. l	Utah	.12½ q.	60,000 00
Phelps Dodge Corp	U. S.-Mex.	2.50 q.	1,125,000 00
Portland Gold Mining Co	Col.	.01½ q.	45,000 00
Tintic Standard Mining Co., l. s	Utah	.10 q.	117,470 00
Tonopah Extension Mining Co., g. s.	Nev.	.05 q.	64,140 00
United Eastern Mining Co., g	Ariz.	.15 q.	204,455 00
U. S. Smelt. Ref. & Min	U. S.-Mex.	1.50 q.	526,671 00
U. S. Smelt. Ref. & Min., pfd	U. S.-Mex.	.87½ q.	425,555 00
Vanadium Corp. of Amer	Col.-Peru	1.50 q.	560,001 00

Canadian, Mexican, Central and South American Companies	Situation	Per Share	Totals
Alvarado Mining & Milling, s. g	Mex.	$0.50 q.	$17,500 00
Asbestos Corp. Canada, Ltd.	Quebec	1.50 q.	45,000 00
Asbestos Corp. Canada, Ltd., pfd.	Quebec	1.75 q.	70,000 00
Consol. Mining & Smelt Co., Canada	B. C.	.62½ q.	263,342 00
Dome Mines Co., Ltd., g	Ont.	.25 q.	100,000 00
Frontino & Bolivia Gold Mining Co.	Colombia	5% k.	£7,000
Frontino & Bolivia Gold Mining, pfd	Colombia	5 % k.	£10,000
Howe Sound Co., c	B. C.-Mex.	.05 q.	$99,208 00
McKinley-Darragh-Savage, Ltd., s.	Ont.	.03 q.	67,431 00
N. Y. & Honduras Rosario M. Co., s g.	Honduras	50 q.-x.	100,000 00
Nipissing Mines Co., Ltd., s	Ont.	.25 q.	300,000 00
St. John del Rey Mining Co., Ltd., g.	Brazil	1 sh. 3 d.	£6,250
St. John del Rey Mining, Ltd., pfd	Brazil	1 sh.	£5,000
Santa Gertrudis Co., Ltd., g. s	Mex.	1 sh. k.	£75,000

m, monthly; q, quarterly; s.-a., semi-annual; k, occasional; x, includes extra dividend.

The comments made in this column on p. 1147 of our issue of May 15 still indicate present tendencies. Inspiration Consolidated Copper and United Eastern Mining both show decreases in their quarterly dividends. Caledonia Mining changes with this month from a monthly to a quarterly dividend. Daly West is the only company increasing its dividend, but Electric Point appears with its second disbursement and Vanadium Corporation makes its second quarterly payment. There are a number of changes in the list of companies outside the United States.

COMPANY REPORTS

St. John Del Rey Mining Co., Ltd.

Gold; Brazil

The eighty-ninth annual report of the directors of the St. John Del Rey Mining Co., Ltd., a British corporation operating the deepest mine in the world, states that 105,537.59 oz. of gold was produced during the year ending February, 1920, having a value of £447,028; silver was produced to the value of £7,549.

The average value of the ore milled per long ton was 54s. 9½d. Working costs for the year were £365,382; development costs, £12,207; London expenses, £14,160; a total of £391,749.

Total realization from ores and bullion, less government duties, was £500,354, giving a favorable balance of £108,605, to which was added the amount brought forward from the last account, £19,255, and an excess profits duty refund of £32,269, bringing the balance to £160,129. From this amount was paid £14,268 in the form of a 10 per cent preference share dividend and tax; £54,626 in ordinary share dividends and tax; £23,781 in the form of an income tax; and £500 to war funds; or a total £93,193, leaving a balance of £66,936. Of this amount £50,000 was transferred to capital works account and the balance, £16,936, was carried forward.

The decreased output for the year was due to the delay, caused by the war, in the delivery of the plant necessary for cooling the mine; the heat at the lower horizons seriously affecting the efficiency of the labor.

Indications as to the value of mineral in depth continue favorable. The assay value for the year was 59s. 3d., as compared with an average of 54s. 8d. for the two preceding years.

Howe Sound Co.

Copper; Silver; Lead—British Columbia and Mexico

The annual report of the Howe Sound Co. for the year 1919 states that its holding of all the outstanding stock of the Brittania Mining & Smelting Co., Ltd., remains unchanged. During the year there was shipped to the Tacoma smelter 70,009 tons of concentrate containing 4,349.85 oz. gold, 99,863.0 oz. silver, and 17,330,844.0 lb. copper from the British Columbia operations.

In Mexico the high cost of silver facilitated operations There were shipped during the year 159,060 dry tons of ore, classified as follows:

	Tons	Average Silver Oz	Average Lead Per Cent	Average Zinc Per Cent
Lead carbonates	108,784	13 75	5 15	
Lead sulphides	21,592	22 55	7 06	
Iron sulphides	26,329	32 35	0 85	
Zinc ore	2,355			27 78

Mining costs covering all operations were $1,915,034.04; milling, $479,550.63; smelting and marketing, $2,303,945.77; transportation, $237,667; taxes, $223,482.96; and other expenses totaled $85,329.38. Depreciation and depletion amounted to $1,583,605.25, and interest to $231,102.63. Deducting these expenses from the total smelter return of $6,936,069.42 plus a miscellaneous income of $143,011.75, a profit balance of $19,363.51 is obtained, which, when added to the balance of Dec. 31, 1918, of $3,597,847.88, and deducting therefrom four dividends totaling $396,830 00, gives a balance on hand Dec. 31, 1919, of $441,738.72.

Seoul Mining Co. Passes Dividend

Of mining companies working in Japan the report of the Seoul Mining Co. for the year 1919 states that for the first time in the history of the company the expenditures for the year will exceed the receipts and that it would therefore not be possible to distribute any dividends from the 1919 earnings.

The Oriental Consolidated Mining Co., an American company operating the Unsan mine, was able to declare a dividend of only 2½ per cent for the year, whereas the dividend for 1918 was 5 per cent.

MINING STOCKS

Week Ended July 24, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*65	*65	*65		
Ahmeek	Boston	59½	59	59	June '20, Q	50
Alaska-B.C.	N. Y. Curb	1	⅞	1		
Allouez	Boston			28½	Mar. '19,	1 00
Anaconda	N. Y.	56¼	55¼	55½	Feb. '20, Q	1 00
Ariz. Com'l.	Boston			10	Oct. '18,	.50
Big Ledge	N. Y. Curb					
Bingham Mines	Boston	9⅛	8½	8⅝	Sept. '19, Q	25
Calumet & Ariz.	Boston	58	57	58	June '20, Q	1 00
Calumet & Hecla	Boston	305	300	301	June '20, Q	5 00
Canada Copper	N. Y. Curb					
Centennial	Boston			11⅞	Dec. '18, SA	1 00
Cerro de Pasco	N. Y.	43⅜	43	43½	June '20, Q	1 00
Chief Consol.	Boston Curb	3½	3½	3½	Feb. '20, Q	10
Chile Cop	N. Y.	15⅜	14½	15½		
Chino	N. Y.	29⅛	28¼	29¼	June '20, Q	37½
Columbus Rexall	Salt Lake	46½	41½	41⅞		
Con. Ariz	N. Y. Curb				Dec. '18, Q	05
Con. Copper M	N. Y. Curb			2⅞		
Copper Range	Boston	39	37½	39	June '20, Q	50
Crystal Copper	Boston Curb	*30	*25	*28		
Davis-Daly	Boston	8⅜	8½	8⅜	Mar. '20, Q	25
East Butte	Boston	12½	12	12¼	Dec. '19, A	50
First Nat'l	Boston Curb	*98	*90	*90	Feb. '19, SA	15
Franklin	Boston	*90	*65	*90		
Gadsden Copper	N. Y. Curb			*71		
Granby Consol.	N. Y.	35½	35½	35½	May '19, Q	1 25
Greene Can.	N. Y.	30	30	30	Feb. '19, Q	1 50
Hancock	Boston	4½	4½	4½		
Houghton	Boston Curb			*60		
Howe Sound	N. Y. Curb			3½	July '20, Q	05
Inspiration Con.	N. Y.	50	49½	50	July '20, Q	1 00
Iron Cap	Boston			9	Feb. '19, M	25
Isle Royale	Boston	30	29½	30	Sept. '19, SA	.50
Kennecott	N. Y.	25⅝	25⅜	25⅝	June '20, Q	.50
Keweenaw	Boston			1⅜		
Lake Copper	Boston	3⅛	3	3		
La Salle	Boston	3	3	3		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb			30	Jan. '19, Q	.50
Majestic	Boston Curb	*17	*15	*15		
Mason Valley	N. Y. Curb			2⅜		
Mass. Con.	Boston			3½	Nov. '17, Q	1 00
Mayflower-O.C.	Boston	5⅜	4⅞	5⅝		
Miami	N. Y.	20⅝	20⅛	20⅛	May '20, Q	.50
Michigan	Boston	4¾	4⅛	4⅛		
Mohawk	Boston	64	60	64	Feb. '20, Q	1 50
Mother Lode (new)	N. Y. Curb	6	5⅞	5⅞		
Nevada Con.	N. Y.	12⅛	12	12⅛	June '20, Q	25
New Arcadian	Boston	2⅛	2⅛	2⅛		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17⅛	17	17⅛	May '20,	25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	16½	16	16½	Oct. '18, Q	25
North Lake	Boston			*60		
Ohio Copper	N. Y. Curb					
Onbway	Boston			1¼		
Old Dominion	Boston	25	25	25	Dec. '18, Q	1 00
Osceola	Boston	38⅝	38⅛	38½	June '20, Q	50
Phelps Dodge	Open Mar.	†195	†180		July '20, Q	2 50
Quincy	Boston	50	50	50	Mar. '20, Q	1 00
Ray Con.	N. Y.	16⅜	15⅞	15⅞	June '20, Q	25
Ray Hercules	Boston Curb	*60	*60	*60		
St. Mary's M. L.	Boston	42	42	42	June '20, K	2 00
Seneca	Boston	14⅛	13⅜	13⅞		
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	10	9⅞	9⅞	Jan. '20, J	.25
South Lake	Boston	2⅜	2⅜	2⅜		
South Utah	Boston	*24	*15	*15		
Superior	Boston			5	Apr '17,	1 00
Superior & Boston	Boston	3⅛	3	3⅛		
Tenn. C. & C.	N. Y.	9⅛	9⅛	9⅛	May '18, I	1 00
Tuolumne	Boston	*65	*58	*58	May '13,	10
United Verde Ex.	Boston Curb	31⅛	31⅛	31⅛	June '20, Q	1 50
Utah Con.	Boston	6⅛	6⅛	6⅛	Sept. '18,	.25
Utah Copper	N. Y.	68	66	67	June '20, Q	1 50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17,	.30
Victoria	Boston			2⅜		
Winona	Boston			*50		
Wolverine	Boston	15	14⅛	15	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	4⅛	4	4	June '20, QX	20
St. Joseph Lead	N. Y.	15⅝	15⅜	15⅜	June '20, QX	50
Stewart	Boston Curb			*16	Dec. '15,	05
Utah Apex	Boston	1⅛	1⅛	1⅛	Nov. '18,	25
ZINC						
Am. Z. L. & S.	N. Y.	14	12⅞	13	May '17,	1 00
Am. Z. L. & S. pf	N. Y.	47⅛	47⅛	47⅛	May '20, Q	1 50
Butte C. & Z.	N. Y.	8⅛	8	8⅛	July, '18, I	50
Butte & Superior	N. Y.	22⅛	22⅛	22⅜	Sept. '17,	1 25
Con. Interst. Cal.	N. Y.	12⅛	11	12	June '20, Q	50
New Jersey Z.	N. Y. Curb	196	192	192	May '20, SA	4 00
Success	N. Y. Curb	*4	*4	*4	July '16,	03
Yellow Pine	Los Angeles	1 02	1 00	1 01	June '20, Q	03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛		
Alaska Juneau	N. Y.	2	1⅝	1⅝		
Carson Hill	N. Y. Curb	26½	24	26½		
Crosson Consol. G	N. Y. Curb			1⅝	June '20, Q	10
Dome Ex.	Toronto	*29½	25	*25		
Dome Mines	Toronto	10½	9⅞	10⅛	July '20, Q	25
Golden Cycle	Colo. Sprgs.	†*25	†*68		May '20, Q	02
Goldfield Con.	N. Y. Curb	*11	*9	*9½	Dec. '19,	05
Hedley	Boston			4½	June '19,	10
Hollinger Con.	Toronto	5 70	5 55	5 55	June 20, BM	05
Homestake	N. Y.			55	Sept '19,	50
Kirkland Lake	Toronto	*49	*48½	*48½		
Lake Shore	Toronto	†1 20	†1 15		Oct. '19,	02½
McIntyre-Porcupine	Toronto	1 90	1 82	1 90	May '20, K	05
Porcupine Crown	Toronto	*27	*27	*27	July '17,	03
Portland	Colo. Sprgs.	†*62	†*59		July '20, Q	.01½
Reorgan. Booth	N. Y. Curb	*5½	*5	*5	May '19,	05
Silver Pick	N. Y. Curb	*6	*5	*5½		
Teck Hughes	Toronto	†*11	†*8½			
Tom Reed	Los Angeles	1 03	*98½	1 02	Dec. '19,	02
United Eastern	N. Y. Curb	2½	2⅝	2½	Apr. '20, Q	21
Vindicator Consol.	Colo. Sprgs.	†*24	†*20		Jan. '20, Q	01
West Dome	Toronto	*6½	*6½	*6½		
White Caps Min.	N. Y. Curb	*11	*9	*10		
Yukon Gold	Boston Curb			1	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*18	*13	*14	Apr. '20, M	.03
Beaver Con.	Toronto	*43	*43	*43	May '20, K	03
Cosiagas	Toronto	†3 50	†2 50		May '20, Q	25
Crown Reserve	Toronto	*25	*23½	*25	Jan. '17,	.05
Kerr Lake	Boston	3½	3½	3½	Sept. '19,	1 00
La Rose	Toronto	*40	*38		Apr. '18,	02
McKinley-Dar	N. Y. Curb			*50	July '20, Q	03
Mining Corp.	Toronto	1 95	1 95	1 95	June '20, Q	12½
Nipissing	N. Y. Curb	8⅛	8⅛	8⅛	July '20, Q	25
Ontario Silver	N. Y.	6	6	6	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	⅞	¾	1	Jan. '12,	.10
Peterson Lake	Toronto	*13½	*13	*13	Jan. '17,	.01½
Sil. King Ariz.	N. Y. Curb	*34	*30	*34		
Temiskaming	Toronto	*35	*35	*35	Jan. '20, K	04
Trethewey	Toronto	*30½	*29½	*29½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1	*1½		
Barnes-King	Butte			1 11	May. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb	*7½	*6	*7½		
El Salvador	N. Y. Curb	2	1¾	1¾		
Jim Butler	N. Y. Curb	*14	*13	*14	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*5	*4	*4	June '16,	.05
Louisiana Con.	N. Y. Curb	½	⅛	⅛		
MacNamara M	N. Y. Curb	½	⅜	½	May '10,	02½
N.Y. Hond. Rosar	Open Mar.	†13	†11		July '20, QX	50
Tonopah-Belmont	N. Y. Curb	1⅞	1⅞	1⅞	Jan. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1⅞	1⅞	1⅞		
Tonopah Ex.	N. Y. Curb	1⅛	1	1⅛	July '20, Q	05
Tonopah Mining	N. Y. Curb	1⅞	1⅞	1⅞	Oct. '19, SA	.15
West End Con.	N. Y. Curb	1 1/16	1⅛	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*23	*21	*22	July, '20, M	.01
Consol. M. & S.	Montreal	26	25	26	July '20, Q	.62½
Daly Mining	Salt Lake			2.60	July '20, Q	10
Daly-West	Boston	4	4	4	July '20, Q	.25
Eagle & Blue Bell	Boston Curb			2⅛	Apr. '20, Q	10
Electric Point	Spokane			30	May '20, SA	03
Fed. M. & S.	N. Y.	12⅞	12⅞	12⅞	Jan. '09,	1 50
Fed. M. & S. pf	N. Y.	36½	36½	36½	June, '20, Q	1.75
Florence Silver	Spokane			*45	Apr. '19,	01½
Iron Blossom	N. Y. Curb	1/16	⅛	⅛	Apr. '20, Q	02½
Judge M. & S.	Salt Lake	‡		3.90	July '20, Q	12½
Marsh Mines	N. Y. Curb	*12	*10	*12		
Prince Consol	N. Y. Curb	⅛	⅜	⅜	Nov. '17,	02½
Rambler-Cariboo	Spokane			*10	Feb. '19,	.01
Rex Con.	N. Y. Curb	*7	*6	*7		
South Heela	Salt Lake	‡		*96	Sept. '19, K	0 15
Stand. S. L.	N. Y. Curb	½	⅜	½	Oct. '17,	05
Tamarack-Custer	Spokane			2 42	Dec. '19, K	03
Tintic Standard	Salt Lake	3.37½	3.22½	3.35	June '20, Q	0 10
Wilbert	N. Y. Curb	*4½	*4	*4	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	18⅛	17⅛	18⅛	Mar. '19,	.50
Internat'l Nick.pf.	N. Y.			81	May '20, Q	1.50
QUICKSILVER						
New Idria	Boston			5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb			*10		
VANADIUM						
Vanadium Corp.	N. Y.	87½	83	83½	July '20, Q	1 50
ASBESTOS						
Asbestos Corp.	Montreal	87½	85⅝	86½	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	95	94	95	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	60½	58⅞	58⅞	June '20, Q	1 00
Am. S. & R. pf.	N. Y.	90½	89⅝	90½	June '20, Q	1 75
Am. Sm. pf. A	N. Y.	75	74	75	July '20, Q	1 50
U. S. Sm. R. & M.	N. Y.	58	57	57	July '20, Q	1 50
U.S.S.R.& M. pf.	Boston	45	43½	44½	July '20, Q	87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly
SA, Semi-annually BM, bimonthly K, Irregular. I, Initial. X, includes extra

INDUSTRIAL NEWS

Barglebaugh & Whitson, consulting engineers of El Paso, Texas, and elsewhere, announce the association with them of Arthur F. Barnes, formerly with New Mexico State College. Mr. Barnes will manage their New Mexico-Arizona district.

Westinghouse Electric & Manufacturing Co. stockholders, at the recent annual meeting, unanimously re-elected the following directors, to serve three years: Guy E. Tripp, chairman of the board; Joseph Marsh, of Pittsburgh, Pa.; H. H. Westinghouse, of the air brake company; A. H. Wiggin, of Chase National Bank; and George W. Davison, of the Central Union Trust.

Stephens-Adamson Manufacturing Co., Aurora, Ill., has opened a branch store, assembling shop and sales office at 412-414 E. Third St., Los Angeles, Cal. A large stock of S-A belt conveyors and other standard S-A transmission and screening machinery is carried there. R. C. Pierce, the Los Angeles district manager, is in charge.

Electric Furnace Co., Alliance, Ohio, has opened a Middle Western office at 301 Frisco Building, St. Louis, Mo., to accommodate the increasing demand for Baily electric furnaces in that region. W. E. Prosser is in charge of the St. Louis branch.

Wright Manufacturing Co., Lisbon, Ohio, maker of hoists and hoist-trolleys, is reaching out for oriental trade in a logical manner. In Japan the company distributes catalogues printed for it in Japanese by the General Commercial Co., Ltd., of Yakohama, Japan. Its catalogues appeal not only through the fact that they are in the vernacular, but also because they explain the principles embodied in the manufacture of the hoists.

Howard N. Eavenson has resigned as chief engineer of U. S. Coal & Coke Co., at Gary, W. Va., and Lynch, Ky., to open a private office as mining engineer at 230 Fifth Ave., Pittsburgh, Pa. (Telephone Court 559.)

Bessemer Gas Engine Co., of Grove City, Pa., announces the opening of a new sales office and service station at 615 Market St., Shreveport, La. A. K. De France will be in charge.

Ray T. Middleton, former general sales manager of the Standard Steel Castings Co., Cleveland, Ohio, has been elected vice-president and director of sales and advertising for Kelly Metals Co., Chicago, Ill., Detroit, Mich., and Los Angeles, Cal. Mr. Middleton's headquarters will be Chicago, where the Kelly Metals Co. is establishing its principal production plant.

Arthur D. Little, Inc., chemists and engineers, Cambridge, Mass., announce the recent addition of Earl Stafford to their engineering staff. Mr. Stafford is a graduate of Tufts College, 1908.

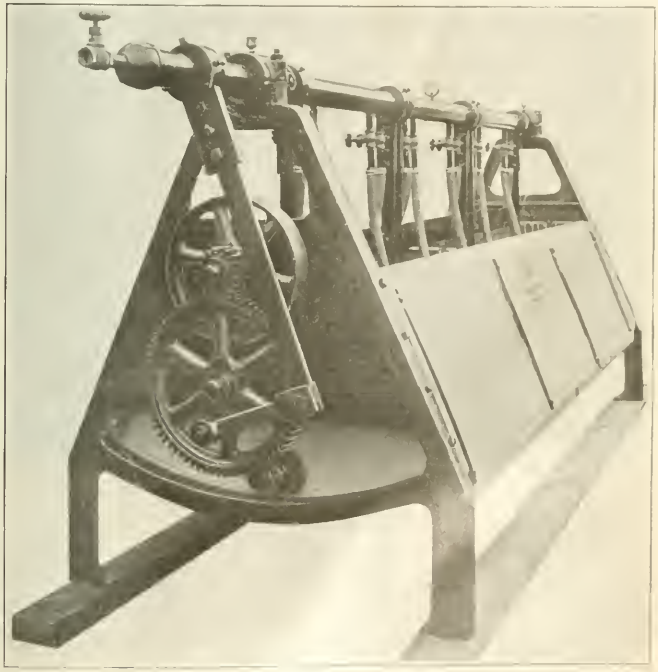
Oscillating Flotation Machine Cleans Mats

Sloping Sides Give Excellent Froth—Stirring Swing Yields Desired Uniform Pulp Depth

By E. I. MILLS

An oscillating cell type of flotation machine for the separation of minerals, has recently been made by John Allingham, of Los Angeles, Cal.

In this design all parts of the machine are subject to the control of the operator while the machine is in operation. Parts to be replaced are simple and may be found at any milling store house, and the horsepower required is much less per ton of ore treated than in any of the other standard machines, not exceeding ½ hp. for either the [illegible] 9 ft. size.



ALLINGHAM'S [illegible] FLOTATION MACHINE

The tank or container bottom is curved on an arc of the proper radius to accommodate the oscillation of the mat carriers from side to side. The sides of this tank converge slightly at the top, thus reducing the froth area, which results in a heavier and stronger froth of the proper mineral-carrying consistency.

The mats are hung from a manifold which is suspended from the ends of the tank, permitting a free movement sufficient for the oscillation of the mat carriers attached thereto. This oscillation is accomplished by a connection of the manifold to a spur gear by means of a connecting rod, this gear in turn connecting with a spur pinion attached to a pulley, thus reducing the speed sufficiently to allow the driving of the machine from a comparatively fast running line shaft. The number of oscillations per minute can be regulated absolutely to suit the amount and weight of minerals contained in the ore. The usual range is from 25 to 45 oscillations per minute. The air from a blower of the positive type is supplied through the manifold by hose pipes each arranged with a valve for close regulation. The quantity of air required is about 1 cu.ft. per minute per ton treated in twenty-four hours.

The oscillation cell produces a uniform, consistent froth. The passing of the cell from side to side through the pulp keeps the mats constantly clean and prevents banking of the sands, and at the same time keeps the channel of the rising bubbles broken and the ore in gentle suspension, thus making an ideal condition for the attachment of oil to the mineral and the raising of the mineral by the bubbles. These conditions are caused by the [illegible] ture of direction of travel of the mats. This travel of oscillation is at right angles to the flow of pulp.

It has long been the desire of flotation machine builders to get a machine having an equal depth of pulp throughout, as it is generally known that an equal hydrostatic pressure above the cells is conducive to the best results. This, I believe, is the first machine of this kind that embodies this feature.

New and Simple Tunneling Machine

What seems to be an efficient tunneling machine of simple construction and economical operation is shown in the cut below, which illustrates a device perfected and built by W. E. Dean, of the Dean Tunneling Machine Co., 1311 Ogden Ave., Superior, Wis.

As a close inspection would show, the machine consists of a gang of eight heads mounted in line on an oscillating cross-frame supported by a curved rack and the quadrangular I-beam frames filling the tunnel as cut.

The eight heads are nine inches in diameter, have a ten-inch stroke and each throws its 700-lb. weight 150 times per minute. The piston pressure for each stroke is 3,000 lb. and drives, in all, 420 tons of steel against the rock each minute. The motive power is compressed air used expansively on both strokes. The whole machine, operating and shifting, is controlled by one man riding on the iron seat which is attached to the drill cross-frame. With the aid of a second man mucking into the conveyor loader, the machine has been known to make a headway of one foot per hour. Those interested should write to the above address for further details.

DEAN TUNNELING MACHINE AT WORK

Complete Mill Unit on Exhibition

Negotiations have just been closed for the purchase of one of the units of the Hackberry Mines, in Arizona, by Rosenburg & Co., of Los Angeles, Cal. The complete unit purchased by the Los Angeles distributors has never been used, but was installed merely as a reserve plant. It is the intention of Rosenburg & Co. to transport the equipment of this unit to its Los Angeles warerooms for inspection by the mining trade.

The Los Angeles company also announces the opening of a new warehouse in Phoenix, Ariz. A lease has been taken for a large warehouse, 420 East Jefferson St., Phoenix, and it is the intention of the company to install a large stock of machinery at that place immediately. This is the third warehouse opened by Rosenburg & Co. Eighteen months ago a warehouse was established at Congress Junction, Ariz., being a branch of the Los Angeles warehouse. The new warehouse at Phoenix, which will open between June 20 and July 1, will carry a $500,000 stock of mining and milling machinery and equipment, and, in addition, will house a large quantity of electrical goods. The Allingham flotation machine, manufactured by Rosenburg & Co., will also be represented at the new Phoenix warehouse.

Pump Makers To Enter Marine Engine Field

The Worthington Pump & Machinery Corporation announces that it has completed preparations for the production of motor ship machinery and is now prepared to execute orders for complete engine-room equipment. Its entrance into this field is a natural result of the development of an old-established business of building auxiliary machinery of all kinds for steam plants, both stationary and marine, and of the company's parallel experience in the field of large internal-combustion engines. Already one type has been built at the Snow Works of this company—a 2,400-hp. six-cylinder, marine-Diesel engine, 26-in. bore, 46-in. stroke, 120 r.p.m.—and this type will be followed by such other sizes as may be required.

TRADE CATALOGS

Hoisting and Mining Machinery—The Wellman-Seaver-Morgan Co., Cleveland, Ohio, in Bulletin No. 44, shows reproductions of photographs, together with sectional drawings, of electric and steam hoisting equipment, cages and skips, revolving car tipples, mine car loaders, and Akron Chilean mills. The sectional drawings are novel, inasmuch as they give the effect of blueprints.

Mechanical Loading—The Lake Superior Loader Co., Duluth, Minn., has issued a recent bulletin which describes the construction and operation of the "Shuveloder." The increasing interest shown in mechanical loaders that are suitable for underground work is evidenced by the fact that an extensive field for this and similar types of loaders has developed during the past few years. Comparative performances of hand shoveling and the work done by the "Shuveloder" are tabulated in the bulletin and illustrate the excellent results that have been obtained by means of this machine.

Thermit Welding—The Metal & Thermit Corporation, 120 Broadway, New York, N. Y., has issued a third and revised edition of its pamphlet "Laboratory Experiments With the Thermit Process of Welding." This pamphlet is useful as a guide for acquainting students with the substance, characteristics, and results of the Thermit reaction. The pamphlet illustrates and describes experiments intended to show the speed of the reaction, the heat produced thereby, and the effects obtained by the superheated liquid slag and the superheated liquid steel.

A Combustion Recorder That Registers Both CO_2 and CO

The Mono Corporation of America, 48 Coal & Iron Exchange, Buffalo, N. Y., announces a recorder that enables the fireman constantly to see that no CO is present and that CO_2 is always maintained at a maximum.

Bonus systems based on percentages of CO_2 only have failed because the boiler-room force soon learns how to so manipulate the dampers that a high CO_2 reading is obtained. Yet combustion is incomplete and the object of the bonus system is defeated.

Now that both CO_2 and CO can be recorded, the fuel must be so burned that the percentage of CO_2 is as high as possible and at the same time there must be no CO. The device embraces two recorders, the Mono Monoxide recorder with records CO_2 and CO on the same chart, and "Monoxide Auxiliary Type K," which records CO on a second chart. Together the two records show combustion conditions. As the Mono Monoxide Recorder will also register SO_2, this device is valuable in pulp and paper mills.

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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W. N. P. REED
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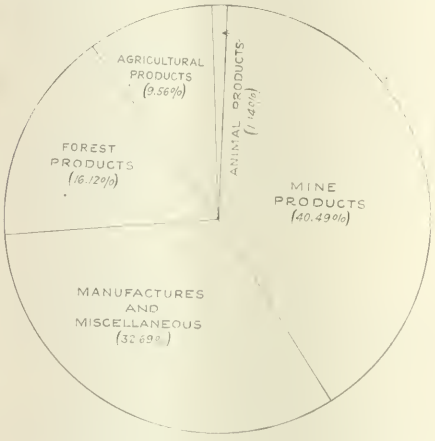
Assistant Editors

BENJAMIN L. MILLER
J. VOLNEY LEWIS
Special
Consulting Editors

Volume 110 New York, August 7, 1920 *Number* 6

The Mining Industry In the South

HOW important do you think the mining industry is in the South as compared with other industries? Off-hand, probably you would say that it was subordinate to agriculture and timber. Yet the figures of the tonnage hauled by the Southern Railway in 1918 show that



THE INDUSTRIES OF THE SOUTH

the products of the mines formed 40.49 per cent of the total. Next come manufactures and miscellaneous, with 32.69 per cent; then forest products, with 16.12 per cent; agricultural products make up only 9.56 per cent, and animal products, 1.14 per cent. Who would have thought it? King Cotton made up only 1.56 per cent of the grand total.

The Major Southern Mining Industries

ORDINARILY the South is not thought of as a mining section, the agricultural, timber and manufacturing industries of that region of the United States being so great as to obscure the industry of the mining of raw ores from the rock. Nevertheless, it is by no means poor in this respect. There are certain mining industries in the South that are of the first order of importance, and which are growing and prosperous.

Most people are familiar with the important Southern iron and coal industry, especially that which centers around Birmingham, Ala. The iron ores of the South constitute a vast reserve, according to Eckel, which will become increasingly important as the richer ores of the Lake Superior district are mined. Iron mining at Birmingham is treated in a special article in this issue.

The sulphur-mining industry is one of the most important among the mining industries of the Southern states. The development of sulphur mining has been phenomenal, and now this Gulf district is by far the most important and most productive in the world, eclipsing Sicily, which earlier held the predominance. The sulphur is one of the products of those remarkable humps or domes which rise like blisters from the Tertiary strata which fringe the coast of the Gulf of Mexico. From these domes not only sulphur but much petroleum has been obtained (although not from the same dome), and they contain as well vast quantities of gypsum. The extraction of the sulphur from them was made possible by the invention of the "Frasch process," by which superheated steam is pumped down through a pipe into the sulphur deposit (which is inaccessible for ordinary operations, on account of mining conditions), and the steam liquefies the sulphur so that it can be drawn off in liquid form. This process, and the consequent production, have given the United States not only a vast supply of sulphur, but, at will, the control of the world's sulphur market.

It is especially propitious that in an agricultural region another of the principal fertilizer minerals—phosphate rock—is found in vast quantity. The phosphate rock deposits of the South (especially those of Tennessee, South Carolina, and Florida) are very extensive, and with the vast deposits of our Northwestern states (such as Idaho, Utah, and the neighboring region) give the United States by far the largest reserves of rock phosphate possessed by any nation in the world. With sulphuric acid, the acid phosphate used as fertilizer is made, and recently it has been found that raw phosphate rock, ground fine, lends its needed phosphorus to assimilation by the soil, although more slowly; but the cheapness recommends the plan. The practically inexhaustible phosphate deposits of the Northwestern states are retarded in development by the relative remoteness from the main fertilizer markets, but those of the South are well situated.

Another mining industry, of less importance, but far from being unimportant—the barytes industry—is centered in the South. The chief barytes state is now Georgia, which recently wrested the leadership from the other important producer, Missouri. The deposits of Georgia are extensive, and the demand for use in various industries is steady and increasing. Like some others of the non-metallic minerals, the barytes-mining industry seems destined to increase, and when mines are located not too far from the manufacturing districts where the products are used (and this is the case with the barytes industry of the South), the future is excellent. Geographic location plays a much larger part with deposits of non-metallic minerals than with most deposits of metallic minerals.

The clay-mining industry is of great importance to a country. Clays are essential to many industries, and the manufactured products are varied. Especially are the higher-grade varieties of great importance. They

are used in pottery, tiles, glazing, electrical apparatus, as fillers for paper, and a multitude of every-day uses. High-grade clays formerly came mainly from England, and to a large extent still do. But American clay is being developed and graded so that it is being more and more extensively employed; and the industry centers in the South and the South-Middle states. The Northern part of the United States, particularly the glaciated area, is unfavorable to the geologic development of these valuable clays; but the geologic history and climate of the South have been favorable to their accumulation, as the result of saprolitic disintegration of pegmatitic and other favorable rocks.

The dominant aluminum industry of America, which is the largest in the world, owes its existence to the bauxite ores of the Southern states, which are extensive, as in Georgia, Arkansas, and Tennessee; and, as mined chiefly by the Aluminum Company of America and its subsidiaries, constitute an important industry. Though aluminum is one of the commonest elements of the earth's crust, it is recoverable easily only from its oxide, bauxite: the usual silicate is refractory.

Altogether, we are justified in regarding the South, from many angles, as a mining region of much past, present, and future importance, and one rich in those large deposits of minerals whose exploitation will probably outlive that of many more spectacular metal-mining districts in other parts of the world.

The Varied Lesser Southern Mining Industries

IN THE preceding editorial we have alluded briefly to those mining industries in which the Southern states excel the rest of the United States, and in the case of sulphur, at least, the rest of the world; and which, as a consequence, are of major present importance. Besides these outstanding examples, however, the mineral industries of the South are varied.

The gold-mining industry of North America had its first real beginning in the Appalachian gold belt, which runs from Virginia through North and South Carolina and Georgia into Alabama. In this region are gold-quartz veins in schist, associated with siliceous (granitic) intrusive rocks. Geologically, they are very similar to the gold-quartz veins of Canada, as seen, for example, in Ontario: and, like these, are often of uncertain persistence and spotty as to values. Nevertheless, the gold production of this region was in the first half of the nineteenth century very considerable; and a mint was in operation at Charlotte, N. C. The California rush of 1849 diverted the Eastern miners to richer fields, and they have never returned. Efforts to revive mining in this region have almost invariably proved disappointing; nevertheless, the region is not without hope. The "saprolitic ores," or the results of surface disintegration of the gold-bearing schist, frequently contain gold in considerable quantities from the point of view of the placer miner; but treatment has proved difficult on account of the clay in the ores, which coats the amalgam and obstructs amalgamation.

Copper is found in the same general geologic province as the gold in the southern Appalachians, just as copper occurs in California in the same general region as the gold-quartz veins, and for the same reason—namely, that there exists the same genetic connection between the two metals in each province. The copper deposits of Virginia, especially at Virgilina, have had considerable production, but are now deserted; and occasional attempts to reopen them have usually had the same discouraging results as the attempts to revive gold mining. Nevertheless, the success of the mines at Ducktown, Tenn., in the same geological province, is a well-known present-day exception. This ore is highly pyritic, and the sulphuric acid is now being extracted as a valuable byproduct.

There is a large quantity of similar pyritic ores in the South, consisting of pyrite or pyrrhotite, although usually the copper content is not a commercial factor or is wanting. Therefore, when the supply of cheap pyrite ores from Spain was interrupted by the shipping shortage during the war, many of these deposits, such as that at Chestatee, in Georgia, became hopeful sources of pyrite supply. The development of the pyrite deposits as sources of sulphuric acid was interrupted by the termination of the war, and by the rapid development of the more cheaply produced sulphur of Texas and Louisiana; but it was established that there exists in the southern Appalachian region an adequate reserve of this material.

There was a rapid development of the manganese of the southern Appalachians during the war, when shipment from Russia and India was cut off and the supply from Brazil was threatened with interruption by the lack of shipping and by the German submarine warfare. Ordinarily, the Appalachian deposits cannot compete with the more abundant and richer ores of these foreign fields, being smaller and often relatively inaccessible; but in the emergency it was found that they constituted a very important reserve, especially of the higher-grade manganese, in which this country is deficient. The subject of the Appalachian manganese ores is treated in a special article in this issue.

In the early part of the nineteenth century the chromite deposits of Maryland were the most productive in the world, till they were eclipsed by those of Turkey. During the Great War, the old mines were reopened and the fact was established that not all the ore had been extracted; but it was also established that these ores cannot now compete with cheaper ores from newer discoveries.

In the mountains of North Carolina and the adjoining territory are vast amounts of valuable abrasives—corundum, emery, and garnet. Only the relative inaccessibility militates against the extensive development of these deposits, and the consequent difficulty in competing with more accessible domestic deposits, with emery from Greece and corundum from India, and with the artificial abrasives being manufactured in increasing quantity, especially from bauxite, by electric treatment.

During the war it was found that the most available deposits of zircon, rutile, and monazite were in the South. Pablo Beach, Florida, contains these minerals in the sands, and although not in quantity to compete with the phenomenal deposits of Brazil and India, they form a reserve which may be of value to the nation. North Carolina formerly had a monazite industry, working the mineral by placer methods from the streams; but with the best of the deposits worked out, it became impossible to compete longer with the foreign deposits. Also, probably the most productive of the accessible American deposits of rutile exists in Virginia. Monazite, it will be remembered, is the source of thorium,

the luminous material in the Welsbach gas mantles, and recently, also, of mesothorium, a substitute for radium, both in its therapeutic and its luminescent qualities. Zircon was sought during the war, especially as an element for a special steel alloy; and also rutile as a source of titanium for a titanium steel alloy, as well as for chemical uses.

The Federated Engineering Societies

THE Federated Engineering Societies, which was organized in Washington some time ago, is a going concern. It is not a proposed movement—it has a constitution and bylaws, and several societies have already joined the federation.

The American Engineering Council has voted hearty endorsement of the plan of organization and authorized its executive committee to render any assistance possible. It also voted to invite to future meetings of Engineering Council, delegates of the societies represented at Washington when the Federated Societies were organized, and also editors of technical journals who were interested.

The next move will be for more engineering societies to join the Federated Societies. Local societies, we understand, should not stand back waiting for societies of larger geographic scope. It is entirely fitting and advisable that they should consider making application independently and promptly.

Airplanes for Alaskan Surveying

THE developments which will make the airplane an every-day practical factor in surveying, exploring, and preliminary exploiting of mineral lands are moving with perceptible speed. On July 15 four army airplanes left Long Island for Alaska and return, a trip of 9,000 miles. The trip has a double purpose—to establish an aerial route to Alaska, and to make a photographic survey of certain typically unknown portions of Alaska. Photographers will form part of the crews.

It has been reported that at least a preliminary photographic survey would be attempted of the Yukon Flats, an immense flat alluvial area at the great bend of the Yukon, where it desists from its course in the direction of the Arctic, turns an angle, and heads for the Bering Sea. The great area is of fertile river-built soil, and is wooded, and it is traversed by many river channels. Its survey, with the outlining of its waterways, would help to open it up for settlement and the raising of hardy crops, which grow with very great rapidity in the almost or quite incessant daylight of the Arctic summer. By the ordinary methods of ground surveying, a district like this will take a great length of time, much labor and expense, and much mathematics to check closed traverses. It is safe to say that in the ordinary course of events the work would be postponed for years. It is believed that an airplane can photograph it so as to make an accurate map in a few days, at a relatively small cost. The question of vertical angles does not enter here, it will be observed, as the region is quite flat; and the two dimensions as viewed from an airplane is all there is to it. The route follows:

Mitchel Field to Erie, 350 miles; Erie to Grand Rapids, 300 miles; Grand Rapids to Winona, Mich., 310 miles; Winona to Fargo, N. D., 320 miles; Fargo to Portal, N. D., 290 miles; Portal to Saskatoon, Sask., 280 miles; Saskatoon to Edmonton, Alta., 300 miles; Edmonton to Jaspar, Alta, 200 miles; Jaspar to Prince George, B. C., 200 miles; Prince George to Hazelton, B. C., 220 miles; Hazelton to Wrangell, Alaska, 210 miles; Wrangell to White Horse, 300 miles; White Horse to Dawson, 250 miles; Dawson to Fairbanks, 275 miles; Fairbanks to Ruby, 240 miles; Ruby to Nome, 300 miles.

Among the supplies carried are concentrated food, fishing tackle and firearms, and precautionary supplies in case of delay or accident. The machines are equipped with 400-horsepower Liberty motors.

Judging from developments, the reconnaissance plane survey by airplane photographs is destined within the next few years to become one of the most active departments of surveying.

We may expect that the detailed map of the United States, which the Geological Survey has on hand, and which under ordinary conditions will be completed in some future generation, may become complete as to the reconnaissance plane survey within a few years. There is no reason why such a map as this should not precede the topographic surveys and the more detailed surveys, which will also be rendered far simpler by the airplane, carrying the surveyor swiftly to this or that peak of observation, and bringing him supplies. It is to be expected—indeed it may with confidence be prophesied —that Arctic Canada will be very soon mapped similarly, and an intimate and accurate knowledge of the thousands of waterways—lakes and streams—of this great region will assist immensely in the forming of plans for its further exploration and development.

Altogether, surveyors have now an instrument that will shorten their work as the invention of the harvester shortened the work of farm hands and increased the crops. But there is no reason for the surveyor to go on strike against this labor-saving machine; for a new school of surveyors will result. Are our engineering schools keeping abreast of the times, and instituting courses and training men in aerial plane surveying?

The Major Metal Quotations

WE ARE publishing this week in "What Others Think" a valuable and suggestive letter from a representative of one of the large factors in the lead-mining industry, a man who is a recognized expert in metal prices. The mining public, as well as ourselves, will enjoy this technical discussion and possibly other experts may contribute to it, for in this department of human knowledge, as in all others, the experts do not always agree.

New Coinage

CERTAIN journals have recently printed statements to the effect that a new 2-cent copper coin was authorized by Congress, and that the U. S. Mint is now preparing to strike such a coin. This information is incorrect. The Senate bill providing for a "Roosevelt 2-cent piece" failed to receive action by the House before adjournment, and therefore did not become a law.

The Congress did authorize, and the President approved, limited issues of three memorial 50-cent silver coins. One is to commemorate the centennial of the admission of the State of Maine (1819), another will commemorate the centennial of the admission of Alabama (1820), and the third is in honor of the tercentennial of the landing of the Pilgrims on the shores of Massachusetts Bay.

WHAT OTHERS THINK

The Major Metal Quotations

I have read with interest the editorial entitled "The Major Metal Quotations" published in the July 10 issue of the *Engineering and Mining Journal*.

I sincerely trust that the *Journal* will continue to publish original metal quotations in spite of any criticisms that may be received from disappointed miners, custom smelters, producers, traders, or consumers[1]. The *Journal* renders a great service for which I believe it derives no direct benefit.

As my interest is solely in lead I would like to enumerate the reasons why I hope the *Engineering and Mining Journal* will continue to quote lead prices, and also some of the difficulties in ascertaining the average price.

First, I believe that producers and consumers derive a great benefit from selling and buying lead at a monthly average price. The proof of this is the very large quantity of lead sold at the average price, and the large quantity of lead products sold, based on the average price of pig lead. To my mind the American business man does not adhere to a system year after year unless a decided benefit is derived from the operation of that system.

Second, the average market price of pig lead should be determined by some agent or agency situated in the city of New York. New York City has become the market place for non-ferrous metals: the sellers of over 90 per cent of the pig lead made in the United States and Mexico have their main sales offices in New York, and by far the largest tonnage of lead bought is bought by buyers with offices in that city. During the last ten years many large corporations have moved their purchasing departments to New York, and many others obtain lead quotations through their New York sales offices.

Third, the average price of lead should be determined by some agency that is not controlled or influenced by either producers, consumers, traders, or brokers.

Fourth, the daily price of lead should be determined on some day following the day under consideration, as quotations are usually not made until the noon hour, and acceptances seldom received before 4 or 5 p.m., and often, when by wire, not until the following morning.

Fifth, the price should be made by an agency determined to arrive as closely as possible at the truth; an agency that is willing to devote time, thought, work, and expense unsparingly, and that will go to the extent of calling on producers and consumers personally, and if necessary asking to see their sales books or contracts.

The staff of the *Engineering and Mining Journal* has its principal office in New York City, and it is neither controlled nor influenced by any group of producers, traders, or consumers. Its policy is to determine the price for one week on the last day of said week, and in my opinion it has spared neither time, thought, nor expense in determining the price by personal visits to producers, traders, and consumers.

From the standpoint of the trade I therefore consider that the *Journal* is the best-fitted agency to determine the average price of lead, and I sincerely hope that from the standpoint of the *Journal* you will decide that the high ideals and reputation of the paper make it the logical medium for determining this information.

The difficulties of ascertaining the average price of lead are numerous. In the first place there is the spot price, the price for the current and succeeding month, the future price, calling for shipment from two to six months ahead, the price of the A. S. & R. Co., the outside price for all domestic lead, the prices for duty-paid lead from Mexico, Australia, London and Spain, and the prices of special brands, all of which should receive a certain amount of consideration. The situation is further complicated by the necessity of having the two basing points, namely, St. Louis and New York.

Taking these prices in order: The spot price is the price that must be paid for lead already at the point of delivery. This price recently has been much higher than shipment lead, although there have been times in the last eighteen months when spot lead sold at a considerable discount. Small consideration should be given to spot prices, as when spot sells at a premium it is obviously unfair to penalize a consumer, which in October, 1919, for instance, contracted for its entire 1920 requirements at the *Journal's* monthly averages, by making this forehanded consumer pay the premium that must be paid by the consumer that waited too long for the price to go down before ordering its requirements.

The price for shipment lead, thirty to sixty days, I believe should be the main basis for the average, as the majority of consumers who buy at a fixed price buy lead for shipment in the current month or that following.

The future price should be given little consideration, as the average for July is the price that the producers are to receive, and that consumers are to pay, for the lead that is actually shipped in July. If September-October shipment lead is selling at a discount I do not think that that fact should reduce the price that the producer is receiving for daily shipments in July. It might be well to follow London's custom, quoting two daily prices, prompt and future shipment.

The price of the A. S. & R. Co. is a price that should receive consideration, especially if this company is selling lead for prompt to sixty-day shipment at this price. Some of the daily trade papers, as you know, quote two prices, one referring to the A. S. & R. Co. price, and one to the "outside price." As your price is the average price, and is not given as a daily market guide to buyer and seller, but as a record of actual sales over a period that has passed, it seems impossible to dodge the issue by quoting two prices for delivery at the same point.

The "outside price" should receive consideration depending on the tonnage sold, in comparison with the total sales. The price for duty-paid lead is very important, as at present large tonanges of it are sold for domestic consumption. The price of special brands should figure in the average after deducting the usual premium.

The temptation of the daily trade papers, I think, is to overquote the market, as it pleases the buyer to think he has bought below the market, and a seller never seems to object to seeing high prices quoted by the daily press. This tendency, of course, is likely to bring criticism of your prices from the mining fraternity.

My suggestion to you would be to quote the market on Wednesday only up to the Tuesday preceding, and my advice to producers, sellers, and consumers is to give you all the information they have concerning sales and purchases, including all the conditions of same, and to assist you in every way to do the valuable and thankless task that you have undertaken. X.

New York.

[1]Or mudslinging editors?—EDITOR.

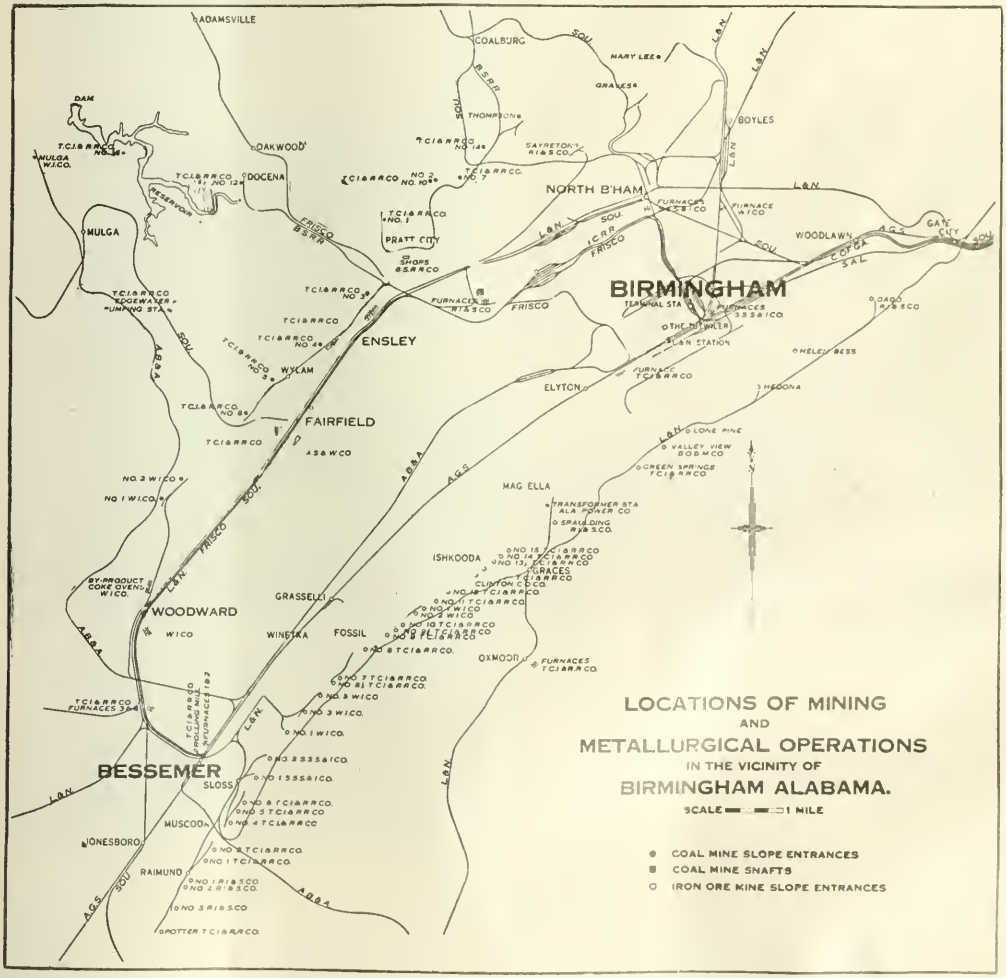
Iron Mining in the Birmingham District

Region Is a Raw-Mineral Producing and Manufacturing Center—Products Are of Varied Nature And Include Pig Iron, Coke, Coal, and Dolomite—Mining Methods Undergoing Changes

By George J. Young
Written for *Engineering and Mining Journal*

THE region in and about Birmingham, Ala., is attractive. The relief is low, wide valleys and ridges of moderate height predominating. The country is well wooded, and to a mining engineer accustomed to the more accentuated and scantily clothed topography of the West a visit to the district leaves the impression that the region is an ideal one both in the beauty of the surroundings and the ease of living.

Few mineral regions are as self-contained as is the mineral-bearing area of Alabama. A methodical chemist before undertaking a campaign of work surveys his field, determines what reagents and apparatus he must use, and then assembles them as close as convenient to his work bench. He is then ready to turn out his results with a minimum of footsteps and a maximum of celerity. In the vicinity of Birmingham there are extensive workable beds of iron ore, the edges of which outcrop on Red Mountain; thick beds of dolomite and limestone, which reach the surface at convenient places; and extensive coal fields which supply an excellent



metallurgical coke. All four of these fundamental reagents occur within an area which can be and is readily served by railroad transportation. The remaining two necessary reagents, enterprise and a population sufficient to yield the required labor, are also present.

Pig Iron and Steel Principal Products

The output is pig iron and steel. Industrial development has reached a point where a considerable part of the raw iron and steel production is placed upon the freight car in the form of manufactured products. It is an industrial principle to advance a basic raw product as far as practicable on its course into finished or salable products as close to the point of production as possible. Birmingham places pig iron and steel of various grades upon the freight cars, but each year increasing quantities of iron are placed on these same cars in the form of cast-iron pipe, structural steel shapes, fabricated steel, stoves, radiators, bolts, nails, wire and wire products, machinery and many other manufactured articles. There are 348 manufacturing firms in the Birmingham district, and the list of manufactured articles issued by the Birmingham Traffic Association is a formidable one.

History of the Birmingham Iron District

The iron industry of Birmingham is an old one and is passing into its second childhood; and a vigorous, youthful growth it is, in the form of new establishments, greater mechanicalization of existing works, manufacturing plants, and improved facilities of all kinds. In 1818 the first blast furnace in Alabama was blown in at Russellville; in 1827 the first coal was mined in the Warrior coal field; in 1854 the first coke was made from Alabama coal for foundry use; in 1858 the first rolling mill was built at Shelby; in 1864 red hematite from Red Mountain was first used; in 1871 Birmingham was founded; in 1878 the first coke pig iron was made at Oxmoor, on the south side of Red Mountain, eight miles from Birmingham; in 1879 the first rolling mill was built in Birmingham; in 1888 the first steel was made in Birmingham, and in 1895 basic iron was first made. The present decade is marked by the conspicuous introduction of byproduct coke ovens and numerous manufacturing plants as well as the material improvement and modernizing of those in operation.

Two important sources of information on this district are to be found in Bulletin 400, U. S. Geological Survey, written by Ernest F. Burchard, Charles Butts, and Edwin C. Eckel, and Geological Folio No. 175, written by Charles Butts. Both were published in 1910, and are exhaustive in their respective fields. In *Mineral Resources* production statistics can be found for different periods.

The hard and semi-hard ore mined in the Birmingham district is of non-bessemer grade and shows the following range in composition: Iron, 32 to 35 per cent; lime, 5 to 20 per cent; silica, 2 to 25 per cent; alumina, 3 to 5 per cent; magnesia, 1 to 3 per cent; phosphorus, 0.25 to 1.25 per cent, and sulphur, from a trace to 0.5 per cent. According to the U. S. Geological Survey Bulletin 400 "the ore beds are usually overlain and underlain by comparatively impervious shales. Near the surface the calcium carbonate has been leached out, leaving a richer ore. Below water level the ores carry a higher per cent of calcium carbonate. The Clinton (Rockwood) formation, in which red ores occur, consists, within the Birmingham district, principally of overlapping lenticular beds of sandstone and shale, with four well-marked horizons of iron ore, generally in the middle one-third of the formation." The following description covers the two more important "seams" and is taken from the bulletin just mentioned:

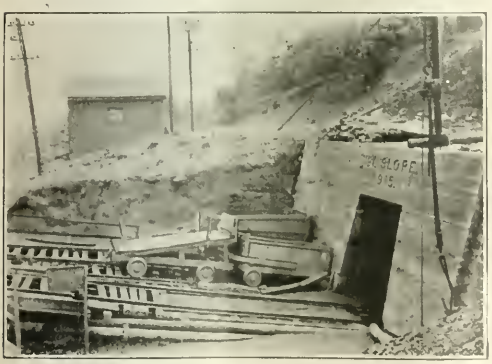
OPEN-PIT WORKINGS IN THE BIRMINGHAM DISTRICT

The Big and Irondale seams are considered together. The ore, however, is different in quality, and the beds are

so sharply separated by sandstone or shale that they may be mined independently. The thickness of the Big seam varies from 16 to 30 ft. It exists on Red Mountain for practically the whole length of the mining district; notwithstanding the great thickness there are rarely more than 10 or 12 ft. of good ore in a single bench, and at most places only from 7 to 10 ft. are mined. From northeast to southwest the total thickness of the ore-bearing sediment gradually decreases, without, however, altering greatly the thickness of the workable portion. About the middle of

TYPES OF UNDERGROUND ORE CARS

the district the bed becomes separated into two benches, either by a well-defined parting along the bedding plane or by a shale bed, thin at first but thickening gradually to the southwest. The middle of the Big seam is the workable part in the northeast end of the district, but the upper bench is of the most importance throughout the rest of the area. In the southwest portion of the district the lower bench, which farther northeast is composed of ore that may be eventually mined, becomes a series of thin strata of lean ore and shale, and is consequently of no possible value; and, finally, the upper bench itself becomes shaly



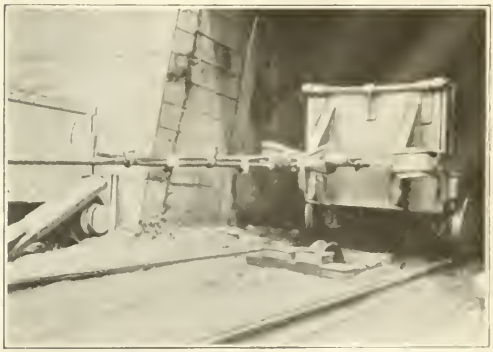
ENTRY TO RAIMUND NO. 1 SLOPE

and carries only a very low-grade ore. The Irondale seam is of most value along Red Mountain between Pilot Knob on the northeast and Lone Pine Gap on the southwest.

The merchantable ore seam averages ten feet in thickness and dips to the southeast at angles varying from 12 to 45 deg. Red Mountain lies southeast of Birmingham and Bessemer and extends northeasterly and southwesterly. Mining extends from a short distance southwest of Raimund to a point east of Birmingham. This distance is approximately fifteen miles. The Clinton formation occurs at other points in the state, and iron ore is mined where the ore beds reach a mineable thickness.

Bulletin 400 presents an estimate of the iron ore available. Of ore of a minimum workable thickness, or within a maximum distance from the outcrop practicable for mining, there is 458,470,700 long tons. In this estimate the distance measured along the dip for purposes of estimation ranged from 3,100 to 6,000 ft. The estimated red-ore reserves in the lower bench of the Big Seam in Red Mountain and Shades Valley is 146,024,700 long tons. The distance on the dip used in this estimate ranges from 5,200 to 6,000 ft. The estimated red-ore reserves, not at present available, in the eastern part of Shades Valley is 292,401,400 long tons. The distance on the dip used in this estimate ranged from 3,500 to 20,000 ft. The computed length of outcrop in all three classes of ore reserves measured respectively 167,200, 60,900, and 161,900 ft. The grand total is 796,896,800 long tons. A more recent compilation would probably enhance this total.

There are three coal fields, the Warrior-Plateau, the Cahaba, and Coosa. The Warrior field is the most



THE SKIP COMING UP THE INCLINE

important and covers an area of 7,845 square miles. This field supplies the coking coals. The Pratt and Blue Creek seams, which range from three to six feet in thickness, are the important producing seams. The coal is washed to obtain a low-ash coke. Analyses are as follows:

	Ash, Per Cent	Volatile, Per Cent	Sulphur, Per Cent	Fixed Carbon, Per Cent
UNWASHED COAL				
Pratt	8 27	30 10	1 53	61 60
Blue Creek	15 76	23 97	0 86	60 27
WASHED COAL				
Pratt	5 29	30 80	1 28	63 90
Blue Creek	7 03	25 61	0 79	66 46

The Cahaba and Coosa fields are of less importance. According to the annual report of coal mines of Alabama for 1918 there were 7,269 coke ovens, both beehive and byproduct. Of these over 847 were byproduct, and in that year 2,611,215 tons of coke was produced by byproduct ovens and 1,733,511 by beehive ovens.

Both dolomite and limestone occur in beds of minable thickness. Dolomite is used largely as a flux. A representative analysis is as follows: Silica, 0.55 per cent; alumina, 0.41 per cent; lime, 31.48 per cent; magnesia, 20.11 per cent; iron, 0.10 per cent. At Ketona and Dolcito, seven miles north of Birmingham, are large quar-

TIMBER PROPS IN ROOMS

ries. The quarry work is on a large scale, and the deposits are such that high benches are broken and little stripping is necessary.

Production of iron, steel, and coke is given in Table I.

TABLE I. IRON, STEEL AND COKE PRODUCTION OF THE BIRMINGHAM DISTRICT

	Tons Produced		
	Iron	Steel	Coke
1913	2,025,378	778,390	3,526,624
1914	1,826,929	525,770	3,092,771
1915	2,049,453	715,485	2,780,976
1916	2,762,895	1,099,649	4,298,589
1917	2,953,705	1,188,074	4,892,589
1918	2,587,852	1,074,324	4,344,726
1919	2,130,092	1,045,115	4,000,000

The total iron ore mined in Alabama (U. S. Geological Survey) in 1917 was 7,101,586 long tons, of a value of $13,049,535. In 1918 the tonnage dropped to 6,121,087, but the value reached $15,334,561. Of the total ore mined in 1918, a total of 4,985,557 long tons was hematite and 769,067 long tons was brown ore. The Birmingham district supplied 5,728,862 long tons of hematite ore in 1917 and 4,763,057 long tons in 1918. In the U. S. Geological Survey's list of iron-ore mines in the United States that produced more than 50,000 gross tons each in 1918 the following mines in Alabama are recorded:

IRON MINES IN ALABAMA IN 1918

Rank	Name of Mine	Nearest Town	Quantity Mined, Long Tons
2	Red Mountain Group	Bessemer	2,376,974
21	Woodward 1, 2 and 3	Lipscomb	718,237
32	Sloss Nos. 1 and 2	Bessemer	502,069
68	Songo	Songo	242,549
77	Russellville (a)	Russellville	516,611
96	Spaulding	Birmingham	168,195
118	Raimund No. 1	Bessemer	128,379
133	Hammond	Hammond	118,464
138	Greeley (a)	Greeley	113,203
142	Steiman	Steiman	109,222
148	Attala No. 1	Attala	102,938
158	Raimund No. 2	Bessemer	94,347
189	Ironaton (a)	Ironaton	57,530

(a) Brown ore.

At present twenty-six blast furnaces are in operation in Alabama, and during May the blast furnaces in the Birmingham district reached a production of 18,000 tons of pig iron per month. The largest company is the Tennessee Coal, Iron & R.R. Co., which had in May five blast furnaces producing basic iron at Ensley, one on basic at Alice, and one on foundry pig at Alice. The Sloss-Sheffield has five active blast furnaces, one each at North Birmingham, Sheffield, and Florence, and two in Birmingham. The Woodward Iron Co. has four active blast furnaces, one on basic and three on foundry pig. The Alamaba Co. is operating two blast furnaces at Gadsden. The Central Iron & Coal Co. at Holt, the Jenifer Coal & Iron Co. at Jenifer, and the Woodstock Iron & Steel Corporation at Anniston are each operating single blast furnaces at the respective points named. The Republic Iron & Steel Co. has three blast furnaces at Thomas. The Woodward Iron Co. has three blast furnaces at Woodward and two at Vanderbilt. All of these companies operate iron mines and practically all work coal mines also.

Mining in Birmingham District

Mining in the Birmingham district involves the winning of a deposit of comparatively uniform thickness ranging from eight to ten feet, dipping at an angle varying from 15 to 45 deg., averaging between 18 and 30 deg. The ore is of medium hardness. The roof and floor conditions are usually good. Faults occur at different places, interfere with the regular system of mine layout, and necessitate auxiliary hoisting and rehandling of ore. Drainage and ventilation involve no special problems.

Mining methods fall into four groups, the sequential order of which represents their development in point of time. The first method, stripping overburden and mining the ore by open-pit, is practiced to some extent, but is relatively unimportant now. The second method, consisting of a combined open-cut and underground operation, is taken advantage of where topographical conditions admit of the construction of an incline tramway in conjunction with entries or drifts extended along the strike of the ore bed. The third method is systematic underground mining, in which entries or drifts are

HEADFRAME AT NO. 1 RAIMUND MINE

turned off at intervals of sixty feet from a slope. The drifts are driven narrow for a distance of 75 ft. and then widened out to 30 ft. In the more recent examples of this method the slope is sunk in the foot wall, ten feet below the ore seam, as a single-track skipway, a manway being provided alongside or in a parallel slope. In this arrangement the cars used for transportation on the entries are dumped directly into the skip. The skips are from ten- to twelve-ton capacity. In still more

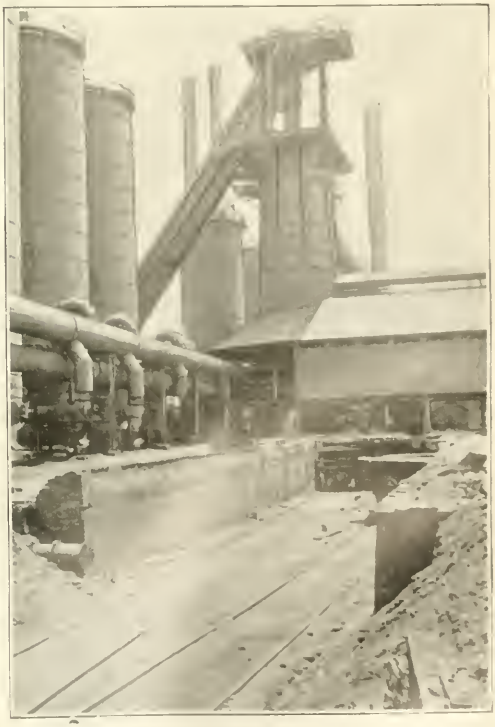
COKE AND IRON ORE AT SKIPWAY OF FURNACE

recent slope installations pockets are put in at slope loading points and skips are loaded from chutes. The fourth method, which utilizes a vertical shaft for working purposes, is just coming into vogue. The Woodward Iron Co. has recently constructed a vertical shaft.

T. C. I. & R.R. Co. Has Standardized Plants

The Tennessee Coal, Iron & R.R. Co. has fourteen active mines and has standardized both its equipment on surface and underground and its mining methods. A brief description of the surface plant of No. 4 mine will indicate the most advanced plant practice in the district. The output of this mine is 3,000 to 4,000 tons per day, about 1,300 men being employed. Power is supplied by the Alabama Power Co. at a line voltage of 44,000 volts reduced to 2,200 volts. Two Nordberg steam-driven air compressors have been converted to electrically-driven compressors by disconnecting the steam cylinders and placing a 700-hp. synchronous motor on the flywheel shaft. The hoist is single-drum (single hoisting rope), steam-driven, and direct-connected. The steam cylinders have been disconnected and a motor connected up by a single reduction Wuest gear to the crank pin of the drum by means of a short drag-link. This method of converting a steam-driven into an electrically-driven hoist involves the minimum change in the mechanism of the unit. The acceleration period is eleven seconds and the full rope speed is 2,700 ft. per minute. Only sufficient boiler capacity to supply steam for heating and that required in the change house has been retained. A change house, one section for blacks and one for whites, is provided close to the shaft mouth.

The shaft is timbered and divided into a footway on the left and a hoisting compartment on the right. The skip track is of five-foot gage. The skips are twelve-ton capacity (this size is used in all mines of the T. C. I. & R.R. Co.). The skip has a wire safety rope arranged as a bridle around the body of the skip. Hoisting ropes are $1\frac{3}{8}$ in. in diameter. Men are handled to and from their work in the skip. Electrical haulage is not used underground. Small 100-gal. pumps are electrically-driven triplex, but the standard 1,500-gal. pump is an electrically-driven horizontal duplex plunger machine. In ten of the mines of the company the pumping has



BLAST FURNACE AND HOT BLAST STOVES

been electrified, but in only one has the surface plant been electrified, all of the others being steam driven and provided with the necessary boiler plants.

At the Muscoda No. 2 two shafts are served by a single boiler plant, which is placed midway between the two outlets. Both hoists are placed at the boiler plant, and the hoisting ropes are conducted on sheaves to the respective headframes.

The handling of the ore at the surface is done by

dumping into a chute leading to a No. 8 gyratory crusher, which discharges directly into railroad cars. Jackhammers, piston, and hammer drills are used underground. The company rolls its own drill steel, which is solid. Blasting is done at the end of the shift, and 35 per cent gelatine dynamite is used.

At the Raimund No. 1 and No. 2 mines, operated by the Republic Iron & Steel Co., both of the surface plants are steam driven. First-motion hoists, single-drum and single-rope operated, are used. At the Raimund No. 1 the headframe is of steel construction. A ten-ton skip is used, and eight tons is hoisted at a load. At a station the cars are dumped by means of a cradle dump, which discharges into a pocket, from which the skip is loaded by means of a measuring pocket. The trackage arrangement is similar to that used in a coal mine. The loaded cars approach the dump on a down grade and are shunted back over a switch and short curved track on a down grade to the empty track, from which they are hauled back into the workings by mules. From the main drifts the cars are lowered and raised on auxiliary slopes to the working levels by electrical or air hoists. Grades to the main shaft station vary from 2 to 3 per cent in favor of the load. Wooden cars of a type similar to those found in coal mines are used.

Mining Method at Raimund Mine

Rooms are run parallel with the strike and are 30 ft. wide, 60 per cent of the ore being removed on the first working and 40 per cent being left as pillars. The roof breaks clean. Two lines of props without headboards

A LITTER OF PIGS IN THE BIRMINGHAM DISTRICT

BREAKING PIGS AND SOWS APART

are used in the rooms. The roof does not show pressure. The ore thickness mined is eight feet. Tripods are used for the support of the machines in all room work. Leyner-Ingersoll, Dreadnaughts, and Turbos are used for drilling. Jackhammers are used for blockholing and drifting. At this mine preparations were being made for underground trolley transportation. Only one mine, the Spaulding, owned by the same company, is equipped with trolley-wire transportation underground. At the Raimund mine a number of faults have made the workings more irregular than at other properties. Repeated handling of the ore is frequently the outcome of the necessity for working isolated lengths of ore bed, elevated out of the normal dip line by a fault.

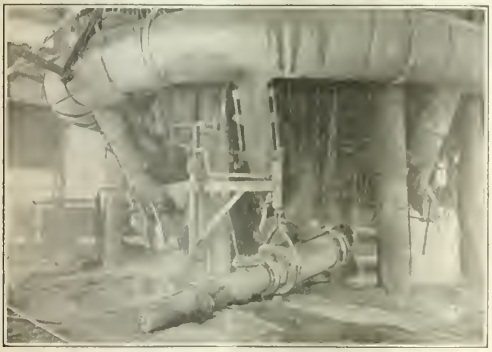
Opportunity for Use of Power Appliances Underground

The mining methods in the Birmingham district are noteworthy, from the viewpoint of the metal-mining engineer, for their simplicity and close relationship to methods used in coal mining. Only in breaking and skip haulage is there any considerable departure from coal-mining methods. The necessity for the use of negro labor and proximity to coal-mining areas greatly influenced present methods. Undoubtedly the succession of changes will lead to greater introduction of power appliances underground, with a reduction in the proportion of hand labor. This will throw upon the companies the necessity for training their raw labor in the use of such appliances.

Mucking machines and underground electrical haulage will be introduced to expedite underground handling of

ore. The use of chutes from intermediate levels and the concentration of hoisting from main-level pockets instead of from all working levels will increase hoisting capacity. The introduction of two-compartment skip hoisting will increase shaft capaicty, and in conjunction with underground electrical haulage will enable a greater area of bed to be served by one shaft.

Complete electrification of surface plant and underground haulage and pumping will obviate the necessity of the individual steam plants which are largely used at present. A central power plant to serve the area should prove economical. Vertical shafts will be used to a greater extent in this district. At present development and mining proceed from the slope or shaft outward. The future mining will be be to push broad-scale development to the limits of the individual mining unit and to adopt a retreating system of mining in which all of the minable ore will be removed instead of leaving pillars, representing 40 per cent of the ore, to be subsequently won. The foregoing are features which



IRON TAP BLAST FURNACE, SLOSS-SHEFFIELD PLANT

appear to me to represent the improvements which higher wages and increasing costs will necessitate. The great limitation to the introduction of systematic mining of the kind indicated is the employment of negro labor, and improvement in practice will depend in large measure upon its ability to respond to the more highly specialized demand that will of necessity be put upon it.

The Gulf Sulphur Region*

Until 1904, the production of sulphur in the United States was considerably less than 10,000 tons per year, and the bulk of our requirements had to be imported from Sicily. From 1904 to 1914 the United States produced enough for its own use, and at the end of this period was supplying Canada, had begun actively to enter the French and German market, and, in addition, had accumulated a reserve stock, in the hands of the producers, of approximately one million long tons. Figures recently made public in connection with litigation over patent rights show that half of this stock was accumulated in a single year, 1912, when production reached 790,000 long tons, of which only 300,000 tons was marketed and the balance of 490,000 tons went into storage. The United States production has exceeded that of Italy since 1912, although the sales have been less, because sulphur was being withdrawn from stocks in Italy while stocks in the United States were being increased. The net effect of the war was a four-fold increase in the amount of sulphur sold in the United States, without any reduction in stocks, while in Italy production fell off 50 per cent, and stocks on hand were reduced by the same percentage.

From 98 to 99 per cent of the United States production has come from the Gulf coast region of the states of Louisiana and Texas. A number of other localities in west Texas, Colorado, Wyoming, Idaho, and Nevada have surface deposits, usually of limited extent, which have been worked on a small scale, but have declined in importance with the development of the better-grade and more accessible deposits of the Gulf Coastal region.

The occurrence of sulphur in the Gulf Coast region is in connection with a peculiar formation known as "saline domes" or "mounds." Over twenty of these domes have been located, scattered in an area 200 miles long, extending through western Louisiana and eastern Texas, and generally within fifty miles of the Gulf of Mexico. Commercial deposits of petroleum, sulphur, and salt have been developed in connection with the domes, but so far not more than one of the minerals has been developed to commercial degree in a single dome. Sulphur was discovered when drilling was being carried on for oil. So far, three domes have been developed for sulphur, namely that owned by the Union Sulphur Co., at Sulphur, La. (1903), that owned by the Freeport Sulphur Co., at Freeport, Tex. (1912), and that of the Texas-Gulf Sulphur Co., near Matagordo, Tex. (1919). Two other domes are under exploration and a number of others may possibly contain sulphur.

The sulphur occurs at a depth of 300 to 1,200 ft., and is associated with limestone and underlain by gypsum. The surface area of the producing domes varies from 200 to 1,500 acres. Exploration is done by drilling at a cost of $200,000 to $300,000, and the cost of a complete plant is several million dollars. The sulphur cannot be mined by shafts, owing to the quicksands and the poisonous gases encountered. The deposit at Sulphur, La., remained unworked for almost forty years after its discovery before a satisfactory process was developed to mine it. This is known as the "Frasch process" and consists of the sinking of wells to the sulphur deposit, each well being lined with a 10- to 12-in. pipe. Smaller pipes are placed inside, so that superheated water can be brought in contact with the sulphur ore, which is melted and forced to the surface by compressed air. The sulphur on cooling is ready for market and is over 99 per cent pure.

Each of the three plants in operation is equipped with a boiler capacity of over 20,000 hp. for superheating the water, and requires about a million and a quarter barrels of fuel oil per year. The origin of these domes is believed to be due to deep-seated igneous intrusions resulting in the alteration of gypsum and the crystallization of salt and sulphur which has caused an upbowing of the strata. Because of the nature of the formation and the irregularity of the deposits it is impossible accurately to estimate the reserves of sulphur.

With the addition of two new plants since 1912, the United States now has a sulphur-producing capacity of about 1¼ million tons per year, or four times the normal sales before the war.

*A. G. White, in "Political and Commercial Geology." McGraw-Hill Book Co., 1920.

(Photo by Crane)

POLK SOUTHARD MINE, OPERATED BY STEAM SHOVEL, IN RESIDUAL CLAY OF FERNVALE LIMESTONE. BATESVILLE DISTRICT, ARKANSAS

Manganese Ores of the Southern States

Their Combined Output Greater Than Half Total Production of This Country—Character of the Deposits and Mode of Occurrence of Ores in Southern Appalachian and Arkansas Districts

BY GEORGE W. STOSE*
Written for *Engineering and Mining Journal*

DEPOSITS of manganese ore in commercial quantities occur in several of the Southern states, chiefly in Virginia, Georgia, Tennessee, and Arkansas. A small quantity of manganese ore was mined as early as 1840, but it was not until 1866 or 1867 that production in any of the Southern states was appreciable. Deposits in Virginia, Georgia, and Arkansas were early exploited, and up to 1914 their combined output was 94 per cent of the total manganese ore produced in the United States, with the bulk of it coming from Virginia. From 1903 to 1914, 90 per cent of the production of the United States came from Virginia alone.

Since 1914 the increased demand for domestic ore due to the World War gave renewed stimulus to the industry and excited the search for manganese ore deposits throughout the United States, which resulted in the development of mines in many other states, particularly those in the West. A market was also created by the war for low-grade manganese and manganiferous iron ores, and such ores were mined in considerable quantity also in the Southern states. Table I shows the production of manganese ore in the Southern states as compared with the total production of the United States.

The prices of ores which obtained during the war rose to between $35 and $55 a ton for the general run of ore of this region, and some of the highest grade of metallurgical ore commanded as high as $75 a ton. At the close of the war, the steel manufacturers and dealers in ferromanganese refused to buy domestic manganese ore at any price, and the domestic manganese industry thereupon practically collapsed. Considerable mining was continued until July 1, 1919, in Virginia and some in Arkansas under war contracts. Since the first collapse of the market the price of ore has increased, and at the present rate of 80 to 90c. a unit for high-grade ore, manganese mining has been revived in many parts of the Appalachian states and in Arkansas, whereas few of the Western mines have been able to operate profitably. So, Virginia and others of the Southern states will probably again become the chief producers of manganese ore in the United States.

Practically all the commercially developed manganese deposits in the Southern states are oxide. A few deposits in Arkansas and Tennessee are in part carbon ores, and several small silicate deposits are known in the Appalachian Mountains or Piedmont Plateau. Most of the manganese oxide deposits are mined by open-cut methods, underground working being limited to a few mines. In most plants the only machinery employed is a log washer, although a few are equipped with jigs and tables. Practically all of the mining rights are acquired

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by lease. The royalty paid generally ranges from 25c. to $1 per ton, but as much as $4 a ton was paid during the war for some high-grade lump ore in Bradley and Monroe counties, Tenn.

ganese carbonate ores which resemble rhodochrosite but contain also calcium and magnesium carbonates, and some manganese silicate minerals.

The manganese deposits occur chiefly in the eastern

TABLE I. PRODUCTION OF MANGANESE ORE IN THE SOUTHERN STATES, 1838-1918

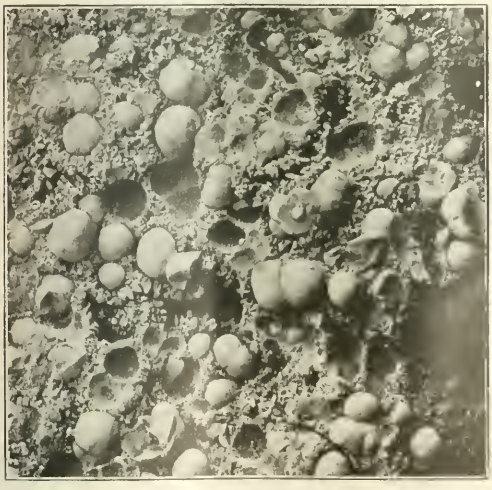
In Long Tons

Year	Alabama	Arkansas	Georgia	North Carolina	South Carolina	Tennessee	Virginia	West Virginia	Other States	Total
1838-1879		610	(*a*) 19,950	. .	.		(*b*) 18,000		(*b*) 5,500	44,060
1880			1,800	.	.		3,661		300	5 761
1881		100	1,200	. .	. .		3,295		300	4,895
1882		175	1,000				2,982		375	4,532
1883		400	(*c*) 400	(*c*)			5,355			6 155
1884		800	(*c*) 400	(*c*)	.		8,980			10 180
1885		1,483	2,580		.		18,745		450	23,258
1886	75	3,316	6,041	14		50	20,567		130	30 193
1887		5,651	9,024	14			19,835			34 524
1888		4,312	5,568	(*d*)		(*d*)	17,646		1,672	29 198
1889		2,528	5,208	47	124	30	14,616		1,644	24,197
1890		5,339	749	14			12,699		486	19,287
1891		1,650	3,575				16,248		979	22,452
1892		6,708	826				6,079			13,613
1893		2,020	724			482	4,092		400	7 718
1894		1,934	1,277			922	1,797	100	278	6 308
1895		2,991	3,856				1,715		985	9,547
1896		3,421	4,085	2			2,018	13	549	10,088
1897		3,240	3,332		.	11	3,650		875	11 108
1898	22	2,662	6,689		.	381	5,662		541	15,957
1899		356	3,089	90	. .	19	6,228	10	143	9,935
1900		145	3,447			30	7,881		268	11 771
1901	17	91	4,074		.	400	4,275		3,138	11,995
1902		82	3,500		8		3,041		846	7 477
1903			500		25		1,801		499	2,825
1904							3,054		92	3,146
1905			150			20	3,947		1	4,118
1906		62				30	6,028		801	6,921
1907					800	100	4,604		100	5,604
1908							6,144			6,144
1909						(*e*)	(*e*) 1,544			1,544
1910 (*f*)		500					1,758			2,258
1911							(*e*) 2,457			2,457
1912					(*h*)		(*h*) 1,664			1,664
1913							4,048			4,048
1914					410		1,724		501	2,635
1915	200	1,288	3,168				1,620		3,132	9,408
1916	(*i*)	6,318	(*i*)			212	4,388		16,266	27,184
1917	264	10,140	3,614	102	405	1,996	12,360		100,524	129,405
1918	709	7,731	6,679	315	100	4,162	10,928		275,245	305,869
Totals	1,287	76,053	106,505	598	1,872	8,845	277,136	123	417,020	889,439

(*a*) Production began in 1866. (*b*) Production began in 1867. (*c*) Georgia includes North Carolina. (*d*) Included in "Other States." (*e*) Virginia includes Tennessee and other states. (*f*) 1910 to 1918, marketed production is recorded. (*g*) Virginia includes other states. (*h*) Virginia includes South Carolina and other states. (*i*) Included in "Other States."

The manganese minerals are chiefly oxides, four of which—psilomelane, manganite, pyrolusite, and wad—are commonly present, and two others—hausmannite

part of the southern Appalachians and in Arkansas. I am personally familiar with only the deposits of the Appalachian region, and so have drawn on the reports



SPHEROIDAL NODULES OF PSILOMELANE, INCLOSED IN CRYSTALLINE MANGANITE. FROM ORISKANY SANDSTONE, POWELLS FORT MINE, MASSANUTTEN MOUNTAIN, VA.

CONCENTRICALLY BANDED DENSE PSILOMELANE AND COARSELY CRYSTALLINE MANGANITE FILLING CAVITIES FROM CLAY OF FORT PAYNE CHERT, COOK MINE, WALNUT GROVE, ALA.

and braunite—occur in certain districts. Some ores are mixtures of manganese and iron oxides which are not definite minerals. There are also present certain man-

by Miser for Arkansas for much of the data secured.

The manganese deposits of the southern Appalachians may be divided into oxide ores, carbonate ores, and

silicate ores. The oxide ores predominate and are the only ones that have been extensively mined. They occur almost exclusively in residual clay or clayey sand derived from the weathering of sedimentary rocks. Most of them lie on the east side of the Appalachian Valley, but some occur within the open part of the valley and others among the ridges on the western side. Nearly all may be classed as secondary replacement deposits, but there have been recognized by geologists, who have recently studied the deposits, ten different modes of occurrences of oxide deposits, depending chiefly on the geologic formations with which the ore is associated.

DRY RUN MINE, NEAR BUTLER, TENN.

The rocks of the southern Appalachian region comprise a thick series of sedimentary origin, chiefly limestone, shale, and sandstone, overlying older crystalline rocks. In general the crystalline rocks occur only in the Piedmont Plateau, including the Blue Ridge and Appalachian Mountains, and the sedimentary rocks chiefly in the Appalachian Valley and Appalachian Plateaus. The oldest sedimentary rocks lie nearer the Appalachian Mountains, and successively younger beds appear toward the northwest, the youngest forming the Appalachian Plateau, but this order is varied greatly by folds and faults which locally reverse and repeat the order many times. The sequence of these rock formations is shown in Table II.

As previously stated, ten different modes of occurrences of manganese oxide deposits in the southern Appalachians have been recognized. Eight of these are directly associated with beds in the geologic formations. The modes of occurrences thus recognized, arranged in the order of their stratigraphic occurrence, with the oldest rocks at the bottom, are as follows:

Deposits along fault planes (in any formation); in terraced stream gravel (Tertiary or Quaternary); in Fort Payne chert (Carboniferous); in Oriskany sandstone (Devonian); in Tellico sandstone and Holston marble (Ordovician); in Knox dolomite (Ordovician and Cambrian); in Watauga shale (Cambrian); in residual clays of the Shady dolomite (Cambrian); in Erwin quartzite (Cambrian), and in old sedimentary schists (probably Paleozoic). The general distribution of areas in which manganese ore occurs in the formation above mentioned is shown in the accompanying map.

The Piedmont Plateau, which lies at the east foot of the Appalachian Mountains, is composed largely of crystalline rocks which inclose narrow belts of sedimentary schists, probably of Paleozoic age, that are manganese bearing. Manganese has been mined along a narrow belt of such schists in Nelson, Buckingham, Amherst, Appomattox, Campbell, and Pittsylvania counties, Va., and to a less degree along similar belts in North Carolina, South Carolina, and Georgia.

At the Piedmont mine recently described by Hewett,[1] the ore is largely pyrolusite, with some psilomelane and wad, lies between a hanging wall of schist and a foot wall of limestone, and has replaced parts of the schist. Large lenses of high-grade ore have been mined to a depth of 170 ft. below water level.

Deposits in Erwin Quartzite

A few deposits occur in the Erwin quartzite, which generally forms the westernmost ridges of the Blue Ridge. (See map, p. 259.) This quartzite dips under the Shady dolomite of the Appalachian Valley to the west, and in places where the rocks are nearly vertical the

[1]Hewett, D. F., "Some Manganese Mines in Virginia and Maryland," U. S. Geological Survey Bull. 640, pp. 49-54, 1916.

TABLE II. COMPOSITE TABLE OF GEOLOGIC FORMATIONS IN AREAS WHERE MANGANESE DEPOSITS OCCUR IN THE SOUTHERN APPALACHIANS

	System	Formation	Character of Rocks
This pertains to South Tennessee, Northeast Ala. and Northwest Georgia	Carboniferous	Fort Payne chert	Thin bedded chert or cherty limestone. Manganese-bearing in places.
	Devonian or carboniferous	Chattanooga shale	Black carbonaceous shale.
	Silurian	"Rockwood" formation	Sandstone and shale of Medina and Clinton age.
		Sevier shale (*a*)	Yellow argillaceous shale, shaly limestone, and oolitic marble.
		Tellico sandstone (*b*)	Red sandstone and sandy granular limestone. Manganese bearing in southern part.
	Ordovician	Athens shale (not present in southern part)	Fissile shale, absent where Tellico is ore bearing.
		Holston marble (in Chickamauga limestone)	Pinkish and white marble. Ore bearing where Tellico overlaps upon it.
		Chickamauga limestone	Light blue to light gray limestone and shaly argillaceous limestone.
		Knox dolomite	Massive dolomite and limestone containing chert, which carried manganese ore in places.
This part of section pertains chiefly to East Tennessee and south-central Virginia.		Nolichucky shale	Shaly and platy limestone with thin argillaceous layers.
		Honaker limestone: Maryville limestone; Rogersville shale; Rutledge limestone	Limestone, dolomite, and shales.
		Watauga shale	Purple sandy shale, impure limestone, and calcareous sandstone. In places impregnated with ore.
		Shady dolomite	Massive light gray dolomite, and impure argillaceous beds at base. Carries manganese ores in most places.
	Cambrian	Erwin quartzite ..... Hesse quartzite	Hard quartzite and some shale. Brecciated quartzite carries ore in places.
		Hampton shale: Murray slate; Nebo quartzite; Nichols slate	Dark shale, slate, and quartzite.
		Unicoi formation: Cochran conglomerate; Hiwasee slate; Snowbird formation	Coarse arkosic sandstone, quartzite, conglomerate, slate, and a little limestone. Manganese carbonate ore associated with the limestone at one place.
	Pre-Cambrian	Granite and schist	Chiefly granite and schist.

(*a*) In western Virginia a thick series of Devonian rocks is present and the Oriskany formation, composed of sandstone, chert, and limestone, rests on limestone of Helderberg age, or unconformably on sandstone and limestone of Cayuga age. It carries manganese ore in places. (*b*) The so-called Tellico sandstone of Bradley County, Tenn., and adjacent part of Georgia is apparantly a thin bed of sandy ferruginous limestone at the base of the Sevier shale.

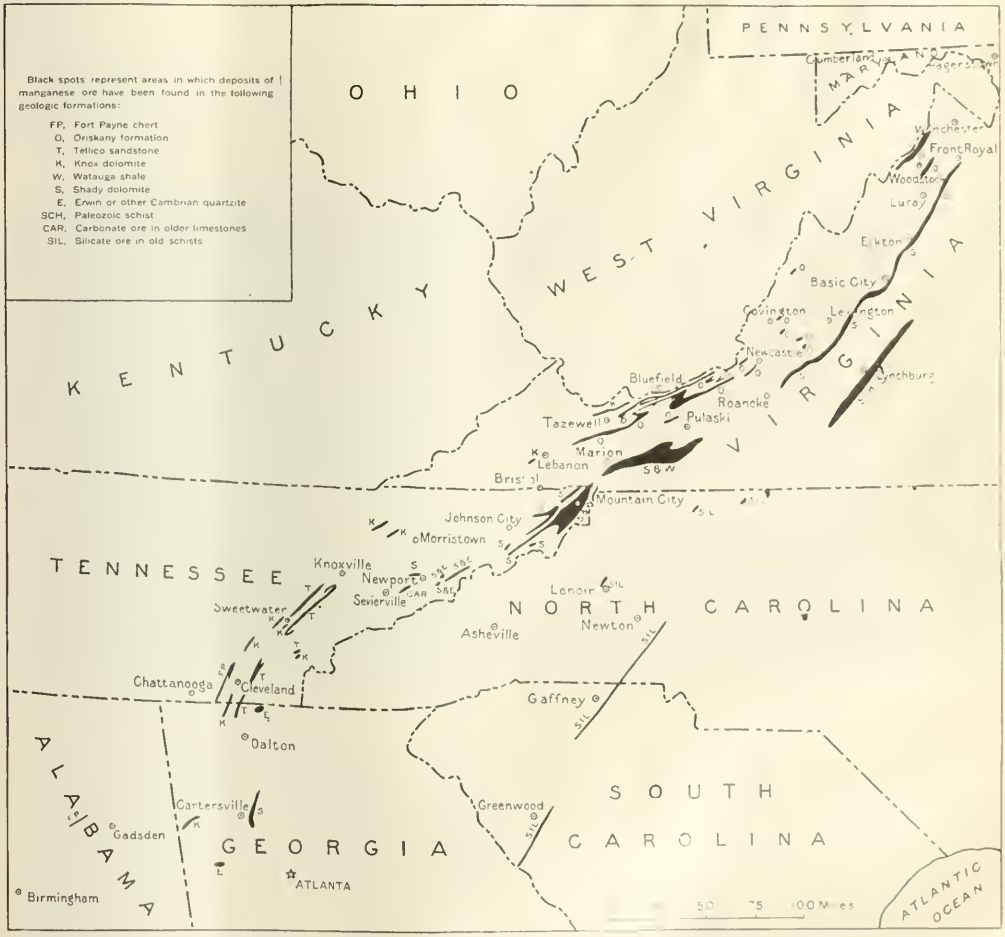
quartzite beds are broken into a coarse breccia by the intense folding and are healed by manganese oxide. The mineral is believed to have been derived from manganese-bearing beds near the base of the Shady dolomite.

Few deposits of this type are workable. At the Dry Run mine, near Compton, Va., seams up to three inches thick of psilomelane concentrically banded with manganite occupy a fractured zone about twenty feet wide. In east Tennessee, east of Newport, several mines were formerly operated in the quartzite.

Throughout the Appalachian Valley in Virginia, in parts of east Tennessee, and in northwest Georgia manganese ores occur in the clays that are residual from impure limestone beds near the base of the Shady dolomite, and these have been the most important source of manganese in the region. Deposits of this kind have been described in detail in several recent reports.[2]

The manganese ore is composed largely of separate small pieces of psilomelane, largely nodular in form, and some manganite and pyrolusite. Nearly all the ore in the Shady dolomite clay must be washed to free it from adhering sticky clay.

The manganese is believed to have been originally in a soluble form, probably the carbonate, in porous transition beds at the base of the formation, from which it was dissolved by meteoric waters and concentrated as oxide in adjacent, less pervious, residual clays which they have partly replaced. In most cases the ore accumulated on the bevelled edges of outcropping inclined beds of the Shady dolomite at the foot of the Erwin quartzite ridges, but where the rocks are gently folded at the surface the deposits are more highly concentrated at the bottoms of synclines. Manganese deposits



SKETCH MAP OF THE SOUTHERN APPALACHIAN REGION, SHOWING DISTRIBUTION OF AREAS IN WHICH MANGANESE DEPOSITS OCCUR IN CERTAIN GEOLOGIC FORMATIONS

[2]Hewett, D. F., *op. cit.*, pp. 37-71, 1916; Hewett, D. F., Stose, G. W., Katz, F. J., and Miser, H. D., "Possibilities for Manganese Ore on Certain Undeveloped Tracts in Shenandoah Valley, Va.," U. S. Geological Survey Bull. 660, pp. 271-296, 1918; the same authors, "The Manganese Deposits Along the West Foot of the Blue Ridge in Virginia," Geological Survey of Virginia, Bull. XVII, 1919; Stose, G. W., and Schrader, F. C., "Manganese Deposits of East Tennessee," Res. of Tenn., Vol. VIII, Nos. 3 and 4, 1918; Hull, J. P. D., La Forge, Lawrence, and Crane, W. R., "Manganese Deposits of Georgia," Geological Survey of Georgia, Bull. 55, 1919.

in the Shady dolomite clay occur at many places along the west foot of the Appalachian Mountains in Virginia, east Tennessee, and northwestern Georgia, where the Shady dolomite lies at the foot of the steep slope of the Erwin quartzite ridges and on both sides of limestone coves and re-entrant valleys within the mountains where the Shady has been infolded in minor plunging synclines.

The principal mine of the Shady dolomite type is the noted Crimora mine, Virginia. The ore here occurs in a minor southward plunging syncline between the mountain front and a low outlying quartzite spur in which the Shady dolomite is inclosed. The mine has produced over 200,000 tons of ore.

In the Cartersville district, Georgia, manganese deposits in the Shady are of large size, and over 100,000 tons of manganese ore have been mined. The manganese ore is here generally associated with iron ore and barite.

In northeastern Tennessee and in the adjoining part of Virginia workable deposits of manganese ore in Watauga shale have been prospected and mined. The ore is largely psilomelane, but in part dense compact wad, which occurs in pockets and seams in disintegrated yellow sandstone, which it has partly replaced, forming a breccia cemented by manganese oxide.

Deposits in Knox Dolomite

Chert in the Knox dolomite is in places impregnated with manganese oxide to such an extent as to form an ore, but none of the deposits have been profitably worked. Brittle chert layers have apparently been broken into small fragments by the rock folding, and in favorable situations have been cemented and partly replaced by manganese oxide. The chert and ore are set free by the weathering of the dolomite and are found in the residual soil on the slopes of chert hills.

Several prospects of this type have been opened in Tazewell and Bland counties, Va., and at many places in the valley of east Tennessee. Deposits near Rutledge, Tenn., and in Tazewell County, Va., which have been mined on a small scale, did not prove profitable.

Deposits in Tellico Sandstone and Holston Marble

Some of the best manganese ore in the region is found at the contact of the Tellico sandstone and Holston marble in southeastern Tennessee. The ore has been concentrated by solution of disseminated iron and manganese carbonates from red calcareous sandstone of the Tellico where it rests unconformably on the Holston. Some of the beds replaced by the ore preserve impressions of the fossils that were in the original rock. Most of the ore occurs in loose masses in the residual sandy clay which fills depressions in the surface of the unweathered marble. The ore is an intimate mixture of psilomelane and hausmannite, and averages over 50 per cent manganese. Productive mines are in the Sweetwater and Cleveland districts, southern Tennessee, and in the adjoining part of Georgia.

Deposits in Oriskany Sandstone

In the western part of Virginia workable deposits of manganese occur in the Oriskany sandstone. In Bland and Giles counties, where the Oriskany lies unconformably on sandstone of Cayuga age, large deposits of moderate-grade ore occur. The two principal properties are the Round Mountain and Flat Top mines, both of which are at the fractured crests of broad anticlines on the tops of high mountains. Deposits along the outcrop of the Oriskany sandstone have been prospected and mined northeastward to Allegheny and Bath counties, Va., but the ore is generally of medium grade and associated with iron ores.

In Shenandoah and Frederick counties, Va., deposits of high-grade ore occur and have been mined chiefly at Powells Fort mine, on Massanutten Mountain, where large quantities of pyrolusite used in dry batteries has been obtained. Here the purest ore replaces sandstone blocks in a breccia that fills a solution cavern.

Most of the ore in Oriskany sandstone is believed to have been derived from beds at the base of the sandstone that originally contained disseminated manganese associated with glauconite, phosphate nodules, and rounded quartz grains.

Deposits in Fort Payne Chert

The Fort Payne chert of Carboniferous age carries some high-grade manganese ore in the southeastern part of Tennessee and adjacent part of Alabama. The chert was apparently broken during folding and impregnated with manganese oxide derived from the weathering of interbedded limestone. The ore fills cracks and crevices in the cherts and replaces some of it, but the high-grade chemical ore is a soft powdery pyrolusite, containing 82 per cent MnO_2, in surficial clay and sand on an old peneplain surface. This high-grade ore is mined only around Walnut Grove, Ala., where the ore-bearing layer is two to three feet thick and lies between fifteen to twenty feet of barren surficial sandy clay.

Only a few mined deposits fall strictly into this class, although nearly all manganese deposits in residual clays of the Shady dolomite on the valley floor bench include in their upper part surficial clay and mountain wash, in which ore occurs. The only known manganese ores deposited primarily in stream gravel in this region are those at the Midvale and Kennedy mines, in Virginia, and at Silver Lake mine, northeast of Mountain City, Tenn.

Although many workable bodies of iron ore are known to occur along fault planes, only a few such deposits of manganese ore have been discovered in this region. One of these is at the Taylor Valley mine, northeast of Mountain City, Tenn., which is on a fault between pre-Cambrian schist and Shady dolomite. A fault breccia filling a zone about twenty feet wide is partly replaced by ore. The manganese-bearing solutions probably came from basal beds in the Shady dolomite cut by the fault. The only other manganese mine in the region known to be located on a fault is the Dargan mine, on the Potomac River, in Maryland, described by Hewett.[3] This deposit is also in a fault breccia adjacent to a limestone of the same age as the Shady dolomite.

Résumé of Southern Appalachian Deposits

Summing up the results of the study of the manganese oxide deposits in the southern Appalachians, the following conclusions have been reached:

1. Most of the oxide ores were derived from certain sedimentary layers which were originally richer in manganese than sediments in general, but which in no sense were concentrated deposits.

2. The original mineral was probably a carbonate of calcium, magnesium, iron, and possibly manganese.

[3]Hewett, D. F., *op. cit.*, pp. 69-71, 1916.

3. The beds that originally contained the disseminated manganese mineral occur at definite horizons, and several of these are associated with unconformities at the base of a sedimentary series or with marked changes in character of sediments, as those at the base of Shady dolomite, the Oriskany sandstone, and the Tellico sandstone. The manganese in these occurrences is believed to have been derived, with other unusual materials, such as glauconite, phosphate, iron, and rounded glassy quartz grains, from the disintegration of rocks on an old land surface.

4. The oxide ores were in nearly every instance concentrated by the solution of the disseminated manganese and its redeposition in the form of oxide in adjacent disintegrating rock or in overlying wash. In porous sandy layers, which afforded good channels for circulation, the sand grains were replaced by manganese oxide, and in impervious quartzites and clays the oxide was deposited on joints and in fractures and also more or less replaced the rock.

5. The purity of the ore is controlled largely by the purity of the rock replaced. The purest ore is formed by the replacement of a pure quartzite, chert, or limestone, whereas an argillaceous quartzite or limestone gives rise to argillaceous ore.

6. The concentration of ore into deposits took place most extensively on the surface of old peneplains where weathering had gone on for a long time and the rocks were deeply disintegrated. Meteoric waters containing the minerals dissolved from the weathering rocks migrated slowly downward through the disintegrated rock and met conditions which caused the precipitation of the ore near the base of the weathered zone.

Manganiferous carbonate ore occurs at several places in the partly metamorphosed sedimentary rocks of the Appalachian Mountains, but has been mined at only one place, near East Fork, Sevier County, Tenn. The ore occurs in lenticular layers in a zone three to ten feet wide along the contact of dolomite and slate of probable Cambrian age. The ore is in part a crystalline mineral composed of calcium, magnesium, and manganese carbonates crystallized in rhombic form, and in part a secondary enrichment of banded dark-brown uncrystalline manganiferous carbonate and thin intercallated laminæ of manganese oxide. The ore-bearing zone has been prospected for a length of about 4,000 ft., and has been opened up by a tunnel and a shaft 50 ft. deep. The ore is said to be self-fluxing.

Manganese Silicate Deposits

Many manganese-bearing silicate minerals occur in the rocks of this region, but seldom in sufficient quantity or concentration to constitute an ore of manganese. Manganese oxide deposits derived from silicate minerals, chiefly manganese-bearing garnet, in schist have been prospected at several places in the Piedmont Plateau of North Carolina and South Carolina, chiefly in a narrow northeast-southwest belt near Kings Mountain, N. C. and Blacksburg, S. C. None, however, appear to be of workable size. Veins of rhodonite of considerable size have been reported in the region, and were seriously considered as a source of manganese during the war, but the high cost of its reduction is prohibitive under normal conditions.

MAIN OPEN CUT FOLLOWING ORE BED, HAMBRIGHT MINE, SWEETWATER DISTRICT, TENN.

The manganese deposits of Arkansas lie in two districts, the Batesville and the West-Central. Those of the latter district are of little or no commercial value, and practically all of the production in the state has come from the Batesville[1] district.

High-grade manganese ore has been mined in the Batesville region since 1849, but mainly during two periods, 1885 to 1898 and 1915 to 1919. The total production of high-grade manganese ore from 1849 to 1918 inclusive was about 76,000 long tons, and in the same period about 70,000 long tons of ferruginous manganese ore was marketed. The manganese deposits lie in an east-west belt twenty miles long and four to

[1] Description is abstracted from a report by H. D. Miser, "Preliminary Report on the Deposits of Manganese Ore in the Batesville District, Ark." U. S. Geological Survey, Bull. 715, in manuscript.

eight miles wide, mainly in Independence County, but also in Sharp, Izard, and Stone counties, in the north-central part of the state.

The rocks of the Batesville district are all sedimentary, ranging from Ordovician to Carboniferous age, which dip gently southward, so that successively older rocks appear to the northward. The manganese ore is associated nearly everywhere with the uppermost Ordovician formation, the Cason shale, or the immediately subjacent Fernvale limestone. The shale is absent in many places, and the overlying St. Clair limestone, of Silurian age, or more generally the still higher Boone chert, of Carboniferous age, rests unconformably on the Fernvale limestone. The unconformable relations have an important bearing on the ore deposits, for manganese and phosphate were apparently partly concentrated in the residual materials on the old land surface represented by the plane of unconformity.

Although the deposits occur at all elevations, most of them are found on or near the tops of even-crested ridges which are remnants of an old peneplain. Most of the ore was probably concentrated in deeply disintegrated rock on this old peneplain when it formed the general surface of the land.

OPEN CUT OF McGUIRE MINE BEFORE TUNNEL WAS DRIVEN. SWEETWATER DISTRICT, TENN.

The deposits may be grouped into four types, depending partly on their mode of origin and partly on the rock formations with which they are associated, as follows:

Replacement deposits in Cason shale; replacement deposits in Fernvale limestone and residual deposits therefrom; replacement deposits in clay, and transported deposits in stream gravel.

The ore in the Cason shale is largely ferruginous manganese, composed of a mixture of psilomelane, braunite and red and brown iron oxides, which occurs as "buttons," layers, and irregular masses in the shale or its residual clay. The "buttons" are replacements of calcareous nodules of organic origin, and are so numerous in places that the shale which contains them forms a low-grade ore. Most of the buttons are composed of manganese oxide, but some are manganese-bearing carbonate. At the Cason mine, which has produced the largest quantity of low-grade ore in the district, the residual clay, and even some of the solid shale, with inclosed buttons, are mined and shipped without treatment, such ore averaging 20 per cent Mn and from 6 to 10 per cent Fe. The manganese is believed to have been derived from the manganese-bearing carbonate in the Cason shale by rock weathering, and then concentrated by redeposition as oxide.

Manganese oxides occur in irregular masses and lenticular bodies parallel to the bedding of the Fernvale limestone, especially in its upper part. The oxides are superficial and pass downward into manganese-bearing carbonate in the limestone. Manganese-bearing limestone has been mined at only a few places, most of the ore in this formation coming from concentrations as residual deposits.

Residual deposits derived from the weathering of the manganiferous Fernvale limestone have yielded the greater part of the high-grade manganese ore obtained in the Batesville area. The Southern mine alone has produced 36,500 tons of ore. The ore is chiefly psilomelane, hausmannite, and braunite inclosed in residual clay. This manganese-bearing clay fills deep solution depressions in the underlying formations.

Clay, derived from the weathering of any of the limestones or shales in the region, may be replaced by manganese oxide derived from the manganiferous Cason shale or Fernvale limestone. The replacement of the clay is generally not complete, resulting in a low-grade ferruginous ore. Only a few such deposits have been mined on a small scale.

Transported Deposits in Stream Gravel

Some hard masses of psilomelane and hausmannite set free by the decomposition of the Fernvale limestone and Cason shale have been transported by streams and deposited in stream gravel on terraces and in alluvial cones. The deposits are of small size, but contain high-grade ore.

The deposits of the west-central district, which extends from Pulaski County, in the center of the state, westward to Polk County, at the west border, have been mined only on a small scale. Except for recent revival, the mining was done chiefly between 1885 and 1889. Recent work beginning in 1915 has been confined largely to the mountainous area in the western part of the district, and has been in part described by H. D. Miser,[5] from whose report the following is abstracted.

The mountainous area is part of the Ouachita Mountains. The rocks range from Cambrian to Carboniferous. The manganese deposits are all associated with the Arkansas novaculite, of Devonian and possibly in part Carboniferous age. Because of its hardness the novaculite forms the ridges, and numerous repetitions of these hard beds at the surface by tightly compressed folds have produced many nearly parallel east-trending straight ridges separated by narrow valleys.

Manganese deposits occur chiefly at two horizons, near the base and near the top, so that the ore-bearing belts are repeated many times in the area. The manganese originally disseminated throughout the novaculite probably occurred in somewhat greater quantity at these two horizons and was dissolved as the rock weathered and was redeposited along joints and cracks, and in crevices of brecciated beds below. The ore is psilomelane, pyrolusite, manganite, and wad. Although the ore averages about 45 per cent manganese it is so scattered that no deposits have been worked with profit.

[5] Miser, H. D., "Manganese Deposits of the Caddo Gap and De Queen Quadrangles, Ark.," U. S. Geological Survey Bull. 660, pp. 59-112, 1918.

The Copper and Pyrites Industries in the South

SURFACE PLANT, SHAFT "A," COPPER PYRITES CORPORATION, DUCKTOWN BASIN, TENN. PHOTOGRAPH TAKEN DURING JUNE, 1919

PLANT OF CHESTATEE PYRITES AND CHEMICAL CORPORATION, CHESTATEE, GA. MINE ADIT AT RIGHT

The Virginia Gold Belt

Previous to the Civil War, Gold Production in the State Had Reached an Appreciable Figure for That Period— Geology of the District.

By Marshall Haney
Written for *Engineering and Mining Journal*

GOLD was discovered in Virginia in the year 1782. Thomas Jefferson described a lump of ore, weighing four pounds and yielding seventeen pennyweight of gold, which was taken from the north side of the Rappahannock River about four miles below the falls. This evidently was a piece of float, for Jefferson states that he heard of no other indication of gold in that section. The first deposit discovered was in the year of 1830 in Orange County.

The first gold-mining company in Virginia was incorporated on March 10, 1832, under the name of the Virginia Mining Co. and was backed by New York people. They purchased a one-half interest in a lease on a five-acre tract, for which they paid $30,000. About 1836 much prospecting and mining was being carried on in this belt. The production was steady from 1831 to 1850 and increased until 1860, when the Civil War stopped mining operations in the South.

During this period of activity the annual production ranged from $50,000 to $100,000 per year, which was considered a heavy production at that stage of gold mining. Immediately after the close of the war considerable activity was manifested in this section, several milling and reduction plants being erected at various points. Many of these attempts turned out to be failures, and in most instances they were abandoned.

The principal gold belt in the state begins in Montgomery County, Md., and crosses Virginia in a southwesterly direction to the North Carolina line. The belt varies in width from 20 to 30 miles and is 200 miles long. The area covered is about 4,000 square miles, with the best developed portion in Fauquier, Stafford, Culpeper, Orange, Spottsylvania, Louisa, Fluvanna, Goochland and Buckingham Counties.

PART OF A MILL BUILT ONE STORY OF STONE

OPEN-CUT PROSPECT TRENCH, SHOWING WIDTH OF VEIN

Micaceous schists and gneisses are the principal rocks of the belt, which also includes altered sediments and igneous masses. The strike is north 20 to 30 deg. east and the dip is toward the east and southeast at varying angles, generally very steep and in places practically vertical. Masses of granite and dikes of basic igneous rocks frequently occur in the region.

The gold-bearing veins are quartz and vary from large crystalline masses to very fine grains. The principal metallic content is auriferous pyrite.

Early mining was confined to the oxidized portions of the veins, in which the ore was free milling, and below the ground-water level the gold occurs as sulphurets. The quartz gold-bearing veins, which vary in width from a few inches to ten feet, conform to the strike and dip of the inclosing rock. Some of the veins are remarkable for their persistence and continuity; for example, the Fisher vein, in Louisa County, has been opened along its strike for a distance of five miles and to a depth of 250 ft.

Mining in Georgia

The largest producers of barytes in Georgia are Thompson, Weinman & Co. They are both miners and finishers, and are situated at Cartersville, where are also established W. C. Satterfield and W. S. Peebles, other important producers.

The largest producer of bauxite in Georgia is the General Bauxite Corporation, which has a large quarry at Toomsboro.

Gold in McDuffie County, Ga.

Old District First Opened Early in the Nineteenth Century Now Making Irregular Production — Local Interest Dormant

By Paul T. Bruhl
Written for *Engineering and Mining Journal*

ALMOST a century ago attention was directed to the possibilities of McDuffie County, Ga., as a gold producer, by the presence of rich pieces of float. Even now, after the cream has been skimmed, the practised eye is afforded an occasional opportunity to select a piece of float that would revive in the most disillusioned prospector his early belief in the existence of bonanzas. One rich specimen, however, does not make a gold mine. Conversely, a rich specimen need not occasion an acute fit of depression. Float lies in a belt about two miles wide, and can be seen scattered over the cotton fields and patches of corn. It consists of lumps of quartz, as big as a man's fist on an average, stained brown and traversed by cracks.

Mining in McDuffie County has had many vicissitudes. It has been affected by the lack of experienced labor, by undue optimism accompanied by a lean purse, by the failure to "come back" after temporary depression, and by the fact that the "native" looks with more favor on cotton crops, which represent tangible wealth, than he does on a mine, which he regards with suspicion because he does not understand it. Local capital can be so profitably invested in farming that the lure of gold mining is not strong. Hence, the industry, lacking local support, is at a disadvantage[1].

The Georgia gold output has totaled approximately $18,000,000. Auriferous veins at or near the surface proved profitable, but successive operators, finding that the oxidized zone did not extend indefinitely, became discouraged. No systematic work has been attempted, and, as each lessee has endeavored to pick out the highest-grade deposit, the average value of the ore has diminished. Continuous development would have given better results. Milling practice has passed successively through amalgamation and the amalgamation plus concentration stages, until a counter-current decantation flow sheet now represents the point to which local metallurgy has progressed.

Of the mines in McDuffie County, the most productive have been the Columbia and the Parks. The former was a small but profitable venture, worked as long ago as 1833, and is reputed to have yielded $1,500,000 from the oxidized portions of the veins. The topography about the mine is one of gently rolling hills, the average elevation being about 500 ft. The rainfall averages thirty inches. The roads are in fair condition, though in the wet months they become (at times) impassable for trucks. Hence a fuel supply sufficient for several weeks is necessary. It has been estimated that water power equivalent to 300 hp. could be developed from Little River by means of a dam 15 ft. high.

The ore is auriferous quartz occurring in a succession of pinches and swells, with an occasional layer of gouge between the vein and walls. About half of the gold is free-milling, the remainder being associated with iron pyrites, galena, and, here and there, with chalcopyrite. Some pyromorphite has been found in the zone of oxidation, which extends to a depth of 100 ft. from the surface and is 50 ft. below ground-water level.

The galena is rich in gold, though its value varies within wide limits in different portions of the same vein. The pyrite is much poorer in gold. Associated with each ounce of gold is approximately one-fifth of an ounce of silver. The vein walls are well defined, and the gold contents are scattered somewhat irregularly along the line of strike. In the oxidized portions, the country rock contains a little gold, the foot wall being usually appreciably richer than the hanging wall. Panning adjacent rock yields a small amount of sulphides, with an occasional speck of free gold.

The McDuffie belt forms part of the South Appalachian gold district, which extends northeasterly and southwesterly. The veins occur in Pre-Cambrian formations, which have been subjected to considerable shearing stresses, as is evidenced by the structure of the gneisses and sericitic mica-schists of which the country rock is largely composed. It is considered probable that the vein material was derived from hot solutions rising from great depths and that most of the gold was deposited, according to G. F. Becker, "at the close of the great volcanic era or during the Algonkian."

Bearing in mind the enormous erosion to which the formations have been subjected, it is assumed that the veins, when originally formed, must have extended to considerable depth. Secondary enrichment is inconspicuous. The McDuffie deposits are only a short distance north of the line separating the crystalline belt of rocks from the Cretaceous and Tertiary rocks on the south. They extend through the northern part of the county and are most valuable in the vicinity of Little River, about twelve miles north of Thomson.

In the opinion of S. P. Jones, the country rocks "show evidence of having been derived from rather basic porphyritic granites or from granodiorites." He is of the opinion that part of the gold was derived from granite magmas and that a specially rich deposit was favorably influenced by a contact zone "where basic rocks at present containing large amounts of hornblende, were associated with more acid rocks."

[1]NOTE—To give all sides to the question we quote from a letter recently received from a mining engineer:
"One of the old niggers came to me after we had shut down, and said, 'Say, boss, we niggers has seen mining here fo' a long time, and when the stamp mill starts the mine shuts down.' This is true in McDuffie County, Ga. A great many mines have started up here and then shut down. If you ever hear of any one trying to invest money here, warn them. There are as many abandoned mines and mills around here as in a boom camp after the boom is over."—EDITOR.

Bauxite in the South

The bauxite industry is one of the principal of mining industries in the Southern states, the principal sources of supply being central Arkansas, northwestern and central Georgia, northeastern Alabama, and southeastern Tennessee. From these fields there was produced in 1917 a total of 568,690 long tons of ore.

The principal use of bauxite is in the manufacture of metallic aluminum. It is also used to a large extent in the manufacture of a refractory brick for surface linings, as well as in the manufacture of artificial abrasives. In 1917 nearly 65 per cent of the domestic output of bauxite went into aluminum; 13 per cent into the manufacture of alumina salts, such as alum, for use in water purification, dyeing, and tanning; 19 per cent was consumed in the manufacture of abrasives; and 3 per cent in the manufacture of refractories.

The bauxite deposits of the United States have resulted from the alteration of kaolin, which is residual from the weathering of rocks.

Prominent Mining Geologists

Joseph Hyde Pratt

THE Engineer Corps of the Army, during the Great War, performed so brilliantly that its record is bound to stand out notably in the pages of American military history. The work of the engineers took them into the most dangerous areas, and in case of attack they were often called upon to handle a gun on the same footing as the infantry. But little time was allowed for training, or, rather, it was allowed, but was rarely obtained. Colonel J. H. Pratt, commanding officer of the 105th Engineering Regiment, was allowed just eight days in France before word came that the British forces in Flanders needed help. Three days of marching took the regiment to Terdeghem, where, under shellfire, the men went to work tangling up barbed wire to the best of their ability. This was in August, 1918. On the last day of that month the first advance in the Canal sector, since the big push of the Germans, was made by the Thirtieth Division, of which Colonel Pratt had been made Division Engineer. This was the beginning of the end for the Germans. More important work, however, soon developed elsewhere. On Sept. 5, the 105th Engineers, together with other units of the Thirtieth Division, started for France, and on Sept. 24 became a part of the Second American Corps attached to the Fourth British Army in front of the Hindenburg line between St. Quentin and Cambrai. Five days later Colonel Pratt's engineers were in the thick of the fight which resulted in the capture of Bellicourt and Nauroy. Later, in the battle of the Selle River, they were called on to build three bridges, which is not the pleasantest job in the world with the business end of several thousand guns pointed your way. Each time the division was withdrawn from the front line for rest and reorganization the Engineers were kept in the forward areas building roads and railways.

At the time, Colonel Pratt wrote: "I had several narrow escapes and never did get used to the shelling. I would shy a good deal, but I was always able to make my legs take me where I wanted to go." He doesn't say which way that was, but those who know him can make an intelligent guess, and the general direction wasn't west.

Colonel Pratt is just the kind of a man most any one would have picked for the difficult work in France, for he already had the habit of doing things on this side.

JOSEPH HYDE PRATT

Born fifty years ago, his life has been a full one. After being graduated from Yale, he was instructor in mineralogy there for two years, after which he went to North Carolina. There he has been prominently identified with most of the mineralogical and geological activities of the state. After being mineralogist of North Carolina for nine years, he was made State Geologist, and since 1904 has been professor of economic geology at the University of North Carolina. His exhibit of North Carolina gems and gem minerals will be remembered by many who attended the Pan American and Charleston exhibitions. Like some other engineers whom we might mention, Colonel Pratt's activities have not been confined to his profession. He has been greatly interested in good roads, in swamp drainage, and in the conservation of the forests and water powers of his state. He is responsible for the creation of the State Highway Commission and prison reform legislation. He was even president of the National Association of Shell Fish Commissioners!

Colonel Pratt belongs to a Congregational church of New Haven, Conn., and the Episcopal church of Chapel Hill, N. C. What stronger evidence could be adduced that he is catholic in his tastes? The list of societies and clubs to which he belongs is a long one. Included are the A. I. M. E., the Mining and Metallurgical Society of America, the Yale Club of New York City, the Cosmos Club of Washington, D. C., the Capitol Club of Raleigh, N. C., the A. T. O. fraternity, and the Sigma Xi.

Joseph H. Pratt is not a southerner by birth but by adoption. The southern spirit was no doubt bequeathed to him by his father, who was captain of a Louisiana regiment in the Civil War. Perhaps this is where he acquired those qualities that have distinguished his most creditable military career.

By The Way

The One Thing Needful

All's well that ends well. The Tonoph-Divide mine has the complete endorsement of George Graham Rice, according to a Tonopah paper. Mr. Rice recently visited the property, after an absence of fully ten years from southern Nevada, and is quoted as saying:

If one thing was more apparent to me than another, after going through thousands of feet of underground workings, it was that one of the biggest and most promising silver mines in the whole state has been "black-jacked" and besmirched as no other great property ever was before.

My impression from the reports I read prior to entering the property was that the mine had been bottomed at the 585-ft. level, and yet, on the 585-ft. level, I was shown 15 ft. of ore extending for 75 ft. on the strike of the vein that the company officials say averages better than 30 oz. of silver per ton; *and assuredly I did not need the word of anybody that it was rich silver ore, because it had the aspect of a strong silver orebody which could not possibly be mistaken.* I had some of the rock assayed, and the returns I obtained were better than 100 oz. to the ton. . .

It is quite true that on this level there are lean spots, and that for a considerable distance in the drift the values are low, but the significance can hardly be that the orebody has pinched out at the 585-ft. level. *It is certainly a truism that every bonanza mine has its lean spots, and it follows very logically that the bigger the mine the bigger the lean spots will be wherever they are encountered.*

It follows with equal logic that the biggest mine of all will be the one where the ore is entirely lean. Doubtless, a proposition even more attractive to Mr. Rice would be a mine where there was no ore at all.

On Raising Chickens

It is not often that an engineer goes outside his chosen profession to seek renown in poultry raising. H. F. Wierum, general manager of the American Mineral Production Co., one of the large magnesite companies of Washington, has started the farmers of eastern Washington guessing. He tried an experiment of feeding his hens ground magnesite instead of lime, and is now out with the claim that the resultant egg shell has far superior insulating and wearing qualities than does the common variety.

But who wants an insulated egg? we ask Mr. Wierum. We would rather have them fresh, and, next to this, less fragile. Mr. Wierum should try feeding his hens a little cement along with the sand and gravel that they normally swallow and see if he cannot produce an egg with a concrete shell. This would stand shipment anywhere without crates, and thus lower the price by a fraction to the consumer. Some experimenting would, of course, be necessary, as cement ordinarily will give a chicken hardening of the arteries or the like. But engineers have overcome greater obstacles than this.

Surface Tension

An English correspondent sends us the following abstract from a paper presented before the Academy of Sciences, Paris:

The authors have found that anæsthetics and analgesics possess the well-marked property of diminishing the surface tension of serum. On the other hand, it has been proved that all the substances used for the prevention of anaphylactic phenomena, such as lecithin, the alkalis, and soaps, also have the property of lowering the surface tension. Experiments are given on the suppression of anaphylactic shock by anæsthetics. The results obtained confirm the view that it is not the nervous system which is mainly affected by the anaphylactic shock, but a reaction of colloidal flocculation leading to asphyxia from the obstruction of the capillary networks.

We don't understand the exact meaning of all this, in our medical ignorance, but it would seem that anyone thinking of having a leg off had better take out a license from Minerals Separation to be on the safe side, or on as safe a side as possible.

Vulture's Exit

The original camp of Vulture, Ariz., disappeared long ago under remarkable circumstances. W. A. Farish had a lease on the old bonanza. This lease was abandoned as the ledge matter proved too lean for profit, but not until Farish had run through the mill the walls of the camp cabins. They had been built of rock from the mine outcrops.

Geologists We Do Not Recommend; L. H. Colyer Submits a "Geilogical Report"

The report of another Texas representative of the tribe of Metalliferous Murphy has been sent to us. It states:

The general typography and glossary of horizon stone will be taken up first. Character of stone in this district is of sand, the greater portion being of the sand carbonate family, however much carbonate carboniferous standstone is exposed. I note limestone magnesia on surface and deep lental exposures. Sandstone folds in this zone are in perfect place.

So far, all correct. It is a relief at least to know that the character of the stone is what it ought to be and that it comes of good family. Later it appears that the stone is of Permian age; moreover:

The cretitious action and disintegrated matter that exist here shows every necessary element to land petroleum oil may be expected at this point. There being much carbon in all stone and likewise sulphur, and carbonate of sodas are contained in substances. Saline products are also much in evidence.

Apparently, there is a little too much soda-water in this ancient stone, of good character and family.

We feel confident that when this great eruption that caused this wonderful fold to be placed in the position that it now lies, there existed a great southern drift of decomposed matter which was carried from the surface of this structure by the Devonian waters and left bare the form of this beautiful body in such a way that one cannot be misled as to the exact and correct contours as they exist.

Oh fie now, Mr. Geologist. What do you call character anyway? And to make matters worse you report:

A large pool of water just below the riffle, which is very deep, and while our party was exploring this place we noted the water kept a continuous blubbering in many places in this pool, and upon inquiry from Mr. ——— —— and others, we were informed that this blubbering was continuous and had been noticed ever since the settling of the country.

Was this a nice thing for your respectable stone to do to the water? It is all very perplexing to be sure, but now come the fireworks:

Small lental spherical bodies, surface gashes, that have been caused by the many ages of waterfall, all show a correct affinity, and a great nucleus of evidence that petroleum oil and a natural gas exist in this zone.

We shall not proceed. We are not quite sure that this is just what our readers should have. The *Engineering and Mining Journal* goes into the most refined homes.

CONSULTATION

Dollar Silver Perplexities

"In recent issues of the *Engineering and Mining Journal*, New York quotations for silver have been given separately for silver of domestic origin and for silver of foreign origin and a statement has been appended to the effect that 'on the authority of the Secretary of the Treasury we quote 100c. per oz. for silver, 1,000 fine, etc.' Smelters have been making settlement on the basis of a quotation of 99⅝c. per oz. and we presume that the deduction of ⅝c. is to give the equivalent price for silver 999 fine instead of 1,000 fine. Is this correct?

"The appended statement also recites that the quotation is retroactive on silver of domestic origin to May 13. On page 1292 of the *Engineering and Mining Journal* the average price of silver for the month of May is given as 102.585c. per oz. Will you please advise me whether this average is for silver of domestic origin, and whether in making settlement for domestic ores shipped to the smelter to be paid for on the basis of the average monthly quotation for May, such settlement should be based upon a price of 102.585c. or upon some other figure? I presume that since the lowest quotation for silver during the month of May was 99⅝c. there would be no change in the average for this month.

"On pages 43 and 46 of the *Engineering and Mining Journal* for July 3, the monthly average price of silver is stated to be 90.957c. per oz. Inasmuch as many smelter settlements are being based upon the average monthly price of silver as quoted by the *Engineering and Mining Journal*, and in order to prevent disputes over technicalities, I would suggest that your journal should quote the monthly average prices for silver of domestic origin, independently of the price for silver of foreign origin. Such averages can be obtained by taking the arithmetical average of the daily quotations, which I believe would show 99½c. for the month of June, but nevertheless in order to make this important matter clear I would suggest that you should define these prices with exactitude, and upon the usual basis of silver, 999 fine."

Under the Pittman Act, the United States Government is now purchasing all silver offered, at $1 per oz., 1,000 fine, provided it can be proved to have been mined, smelted and refined in this country. This is equivalent to 99.9c. per oz., 999 fine, which is the purity heretofore quoted in the *Engineering and Mining Journal*. Delivery charges must be paid by the refiner, so that in making settlement, something must be allowed for them. Handy & Harman, who do a large part of the silver marketing in this country, about noon of each day decide on an official price based upon actual sales or bid and asked quotations during the morning. They have agreed that 0.4c. per oz. is a fair price for delivery to the mint, and have, therefore, established 99.9 minus 0.4, or 99.5c., as a fair price for domestic silver in New York, 999 fine.

Some American smelters have decided to make settlements on the basis of 99⅝c. per oz., thus allowing only 0.275c. per oz. for delivery charges. They may be so situated that this figure is a fairer one. However, as already explained, the 99½c. figure is the one quoted by Handy & Harman, whose price has generally been accepted as official.

The price of silver in New York did not drop below 99½c. until June 3, so that our average of 102,585c. as given for May is correct for either domestic or foreign silver. Our June average, 90.957c., of course represents foreign silver, the average price of domestic silver for that month being 99½c. To avoid confusion we shall quote the average monthly price of domestic silver hereafter, in addition to that for the foreign article, even though the former remains constant at 99½c., as is altogether likely as long as the Pittman Act is in force.

Oil Shale Machinery

"Our office is desirous of obtaining prices and full particulars of an apparatus for extracting oil from shale in large quantities. They state the shale contains about 10 per cent oil.

"Will you be good enough to advise us of the names of manufacturers of this equipment."

We do not know of any company manufacturing retorts for the distillation of oil shale in this country. The industry is so embryonic that there is considerable doubt as to whether any attempt has been made to manufacture this sort of machinery in the United States. Much experimentation has been made upon the distillation of oil shales, and processes devised which investigators have assiduously acclaimed as being eminently practicable for the purpose, but no demonstration, so far as we know, has been made upon a large enough commercial scale.

Estimates of the cost of a 1,000-ton retorting plant vary widely from $300,000 to $2,500,000 and up. The higher estimates include machinery for recovering by-products such as sulphuric acid and ammonium sulphate from the distillation. Last year a 1,200-ton plant in Colorado of the regulation continuous vertical type was figured at $1,200 per ton.

It is our impression that until the oil shale industry has become a commercial success in the United States and further large scale experimentation performed, no regular manufacturers of the distillation machinery will be available in the United States, and any apparatus ordered will be made from special designs.

No United States Cryolite Production

"Is any appreciable amount of cryolite produced in the United States?"

Cryolite, the double salt of sodium fluoride and aluminum fluoride ($3\,NaF.\,Al\,F_3$) is not commercially produced in the United States. It has been reported as a mineral discovered in certain parts of the United States, notably near Pike's Peak, Col., but not in sufficient quantities to warrant profitable exploitation. All of the cryolite used in this country comes from Greenland, and in 1917, 4,383 tons of this material were imported, the greatest amount since 1898. In 1918 imports dropped to 1,950 tons, having a value of $50 per ton. There is no import duty on cryolite.

THE PETROLEUM INDUSTRY

Graphic Representation of Oil-Well Decline

Use of Curves To Express Increased or Decreased Production From Oil Wells—More Consideration Should Be Given to Production Records of Individual Wells and an Attempt Made To Obtain an Estimate of Total Recoverable Oil

By S. S. LANGLEY
Written for *Engineering and Mining Journal*

GRAPHIC representation of the production of an oil property by periods, daily, monthly or yearly, will show only whether the production has increased or decreased. Fig. 1 is such a curve, computed from actual records, and an analysis of this curve will draw attention to the addition of thirty-three wells and eight hundred barrels' daily production on Oct. 1, 1919. On Sept. 30, 422 wells produced 10,500 bbl., and the influence of the new wells is seen in the production curve until Oct. 10, when it is apparent that the daily production decreased to a point little, if any, higher than it was during September. These are significant facts and raise the question as to their cause. The curve does not present a solution. The relation between the new and old wells could be shown by a graphic presentation of a per-well per-day production, but this would add nothing to the information as to why production decreased so rapidly after Oct. 10.

There is evidence that the decrease has been rapid, and the first impression is that the rate of decline has been abnormal. The production shown in Fig. 1 is a total of many leases in several fields, and a study of the production of each lease will disclose the source of the decline. It is then necessary to learn the cause, and this cannot be determined accurately until it is known whether or not the decline is normal.

Wells in different fields may not and probably will not follow similar rates of decline. This is also true of wells in different parts of the same field, and even of adjacent wells, but those in the same field of like initial production will have similar rates of decline. To determine the normal rate of decline, it is therefore necessary to divide the wells of each lease into groups of like initial production. A curve can then be computed for each group, and the comparison of any well with its group will show whether or not that well has followed a normal rate of decline.

TYPES OF CURVES

Fig. 2 is a comparison of "Production Decline Curve" (*A*) and "Per Cent Production Decline Curve" (*B*) for a group of wells whose initial production was between 3,000 and 3,500 bbl. per month. "*A*" represents the average production per month of this group, and "*B*" indicates the percentage of production for any month, up to the 20th, with respect to the maximum production. Each curve serves a distinct purpose. "*A*" can be used to forecast the production per month of a new well of this group, and "*B*" will serve as a means of comparison between per cent rates of the decline of different groups. The following is an example of the use of "*B*":

During a unit period, the total production of a group falls from 11,000 bbl. per day to 9,250 bbl., indicating a decline of 15.9 per cent, while during the same unit period another group declines from 1,000 bbl. to 750 bbl., or a decrease of 25 per cent. Such figures would cause one to examine the smaller group, as the lower the initial production the slower the per cent of decline anticipated. If desired, the per cent rate of decline of all the groups can be merged into a total property per cent decline curve, but to do so is of little or no value as an indicator of the cause of decline. It can lead to the failure to notice important changes. Had the figures of the previous examples been presented only as a combined per cent decline for the two groups, it would have appeared that 17.1 per cent was the average of the two groups, and there would have been nothing to indicate that the smaller had declined 25 per cent.

METHOD OF COMPUTING CURVES

Fig. 3 shows two curves of the same group. "*A*" was made up by introducing the wells of the group in the months in which they were completed. "*B*" represents all wells of this group as completed in the same month, with the result that each month is a true representation of the group decline. "*A*" shows an increase in production during the second month because there was but one well of this group producing, and it did not reach its maximum production until the second month. It is impossible to know from "*A*" what causes an increase of production, whereas it is known that any increase in "*B*" is due to an actual greater average production of the group. The method of computing "*B*" may appear objectionable, as the curve must be re-calculated each time another well of its group is completed. The accuracy of any curve depends upon the number of units making up its average, and the value depends upon the accuracy.

In Fig. 4 and Fig. 5 are presented the per cent decline curves of all groups of a lease. Those wells which would reach a maximum of between 4,000 and 3,500 bbl. per month were placed in the 3,500 group, and, following this method of division, all of the wells of the property were assigned to their respective groups. The average monthly production was then separated into successive periods of four months each, and an average found for the four months of each period. This average was referred to the maximum monthly average, to compute the per cent of production.

The comparative per cent decline of the groups is, perhaps, shown more clearly by Table 1, in which the amounts of the per cent decline below 100 are shown

rather than the per cent of 100. This table presents some unexpected facts. At the end of the first four months only the 500 group had declined less than the 3,500 group. At the close of the second period, the condition is more nearly what would be expected, although the 500 group. At the close of the fifth period, the groups approached the relative positions expected; that is, the groups of greatest initial production show the greatest per cent decline. The 500 group cannot be taken as a fair indicator after the sixteenth month, as

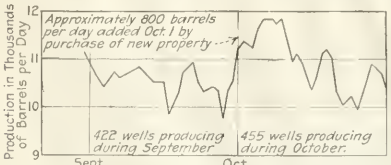


FIG. 1

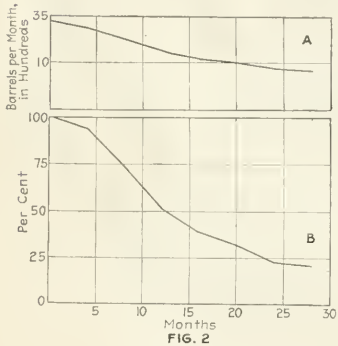
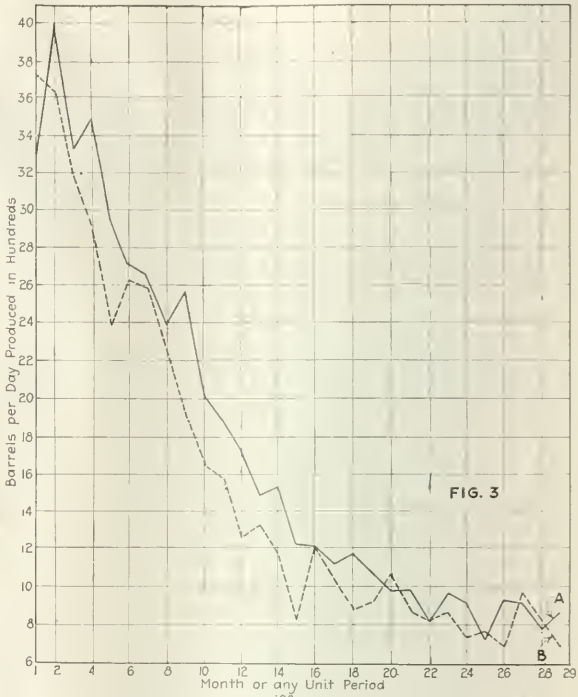


FIG. 2



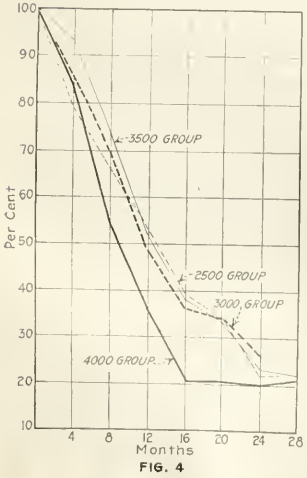


FIG. 4

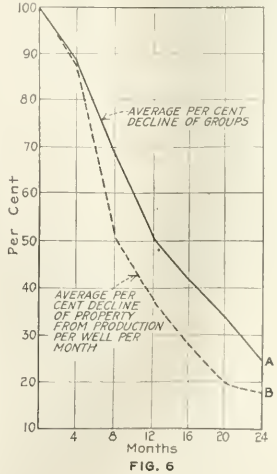


FIG. 6

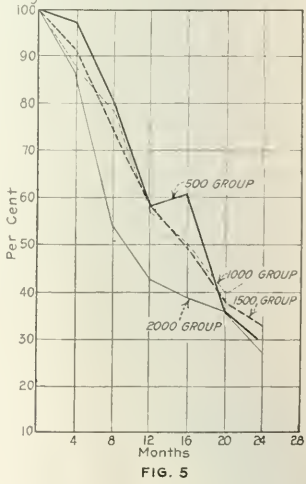


FIG. 5

CURVES SHOWING INCREASE AND DECLINE IN OIL-WELL PRODUCTION

the 2,000 group shows a greater per cent decline than any other. At the end of the third period, the 4,000, 3,000 and 2,000 groups had declined more than one-half of their maximum production, and by the end of the fourth period (sixteenth month) this is true of all but there was only one well producing after that period. Attention is drawn to the fact that the four larger groups require only two years in which to decline 75 per cent of their maximum production as indicated by the curves in Fig. 5.

In Fig. 6 is shown a comparison between the average per cent decline of the groups *"A"* and an average per cent decline of the production per well per month *"B."* *"A"* is a curve made up from the averages of the groups, as shown in Table I, and *"B"* is computed from the monthly production of the property. The comparison serves to show the error encountered in a curve such as "B." Due to the fact that wells of low initial production are completed and brought into the average while those of greater production are still in their early months, the average per well per month is low, although the total production has increased. As a further illustration of the inaccuracy of *"B,"* suppose a well of the 3,500 group is abandoned at the end of its eighth month of

TABLE I. COMPARATIVE PER CENT DECLINE OF OIL WELLS

End of Group	4th Mo.	8th Mo.	12th Mo.	16th Mo.	20th Mo.	24th Mo.	
4,000	16	45	64	79	79	80	
3,500	7	26	48	62	67	77	
3,000	14	30	51	64	66	74	
2,500	21	34	47	61	66	76 6	
2,000	14	46	57	61	64	73	
1,500	9	26	42	51	62	67	
1,000	13	22	43	50	60		
500	3	20	42	39	64		
	12	31	49	58	66	75	Average group per cent decline
	13	49	62	72	80	82	Average per well per month per cent decline

production. The per cent decline as shown by the curve of the 3,500 group (Table I) is twenty-six, whereas the per cent decline as represented by *"B"* Fig. 6, is forty-nine.

A great many of the large operators do not give sufficient consideration to the production records of the individual wells. It seems to be considered that the total production of the company, or, at most, the total production of individual leases, is all that is necessary. As each well is of importance in accordance with its possible maximum production, and the investment represented by it, corresponding attention is warranted. An investment of $50,000 on the payroll would most certainly be watched.

The per cent decline, or the production decline, represents depreciation of resources, just as production of ore represents depreciation of reserves.

Although it is not possible to predict with absolute accuracy the total recoverable oil, this is not sufficient reason for making no attempt to reach as trustworthy an estimate as possible.

The Osage-Newcastle Oil Field Of Wyoming*

OWING to the comparatively recent discovery of oil in commercial quantities near Osage, Wyo., many inquiries have been made of the State Geologist's office in regard to the oil possibilities of the area, and this article is issued for the purpose of giving a general idea of the conditions existing in the Osage-Newcastle region and is not the result of a detailed and comprehensive survey.

The Osage-Newcastle area lies southwest of the C. B. & Q. Ry., between Osage and Newcastle, and practically parallels the railroad. Prospecting and development are also extending to the northwest of Osage as far as Upton and Thornton and the southeast of Newcastle as far as Ardmore, S. D.

Structurally this district is a portion of the southwesterly dipping monocline which lies on the southwestern flank of the Black Hills uplift, which in itself is a huge, elongated dome containing a core of granite and metamorphic rocks and representing a vertical displacement of about 9,000 ft. The normal dip of the monocline is 4 or 5 deg., but in a number of places the dip is greatly increased, as, for instance, from two to four miles west of Newcastle, where it ranges from 50 to 60 deg. Also to the southeast of Newcastle very steep dips have been recorded.

It was noted that an outcrop of Greenhorn limestone marked a zone of steeply dipping rocks south and southeast of Osage and that the strata flattened both to the northeast and southwest of this zone. This change in dip, or terracing, probably is one of the controlling influences in the accumulation of oil, especially in the Osage portion of the area. Other structural changes were also noted, such as slight folding, especially northwest of Osage, and there is also the probability of considerable faulting in a zone of almost vertical outcrops near Newcastle.

Oil-Bearing Sands in Lower Benton Formation

The commercially oil-bearing sands in the district are confined, as far as is known, to the Graneros, or lower Benton, formation. The principal sand is from 25 to 40 ft. thick and lies near the base of the Granderos. Above this sand there are about 110 ft. of sandy shales overlain by another but much thinner oil-bearing sand. The lower sandstone outcrop lies northeast of the railroad and parellels it from Osage to Newcastle, and the same is true of the Dakota sandstone which comes to the surface a little farther to the northeast. At several points, notably a short distance west of Newcastle, there are occurrences of oil springs in the Graneros oil-sand outcrop. For many years oil has been obtained at these seeps for local use as lubricants.

It is believed that many of the shallow wells near Osage are obtaining the oil from the thin upper sand and the sandy shales, and that the deeper wells, especially the gushers in Sec. 19, T. 46 N., R. 63 W., have tapped the lower sand. It is not believed that any of the wells are producing from the Dakota or Lakota sandstones. It is probable that the Dakota sandstone will be found to be water bearing in this area. However, there is a possibility that the Lakota and lower sands may be oil bearing in places, and if so the oil will undoubtedly be a heavy black oil with an asphaltum base.

At first the field was largely prospected by the smaller wildcat companies and individual operators, but recently many of the larger companies have taken holdings and are rapidly putting down test wells. Among these are the Midwest Refining Co., the Carter Oil Co., the Ohio Oil Co., the Union Oil Co., the Producers and Refiners Corporation, the Sinclair Oil Co., and other companies and individuals.

The end of this season should see the limits of production fairly well defined in this particular district. A large territory is thus being tested out, and there are possibilities of other pools being developed in addition to the one near Osage. It is more reasonable to assume that there are several oil-bearing areas paralleling the outcrop of the formations and contiguous thereto than that the country will be one solid or continuous oil field, and it is not improbable that many of the deeper wells to the southwest will be outside of the limits of production.

*Abstract of Press Bulletin No. 6 of Wyoming Geological Survey.

NEWS FROM THE OIL FIELDS

Many Applications for Permits Sought Under Leasing Law

Land Classification Staff Busy Defining Geological Structures — Many Existing Maps Incomplete

From Our Washington Correspondent

Applications for prospecting permits and for leases are reaching the U. S. Geological Survey in such numbers as to make it extremely difficult for W. C. Mendenhall and the land classification staff to keep pace in the matter of defining geological structures. The new mineral leasing law provides that prospecting permits may not be granted to cover lands within the known geological structure of a promising field.

While the Survey has geological maps covering a large portion of the public lands, these often are not in sufficient detail. In addition, prospectors for oil are very active just at this time and are appearing frequently in just those spots which have not been mapped geologically. This necessitates prompt dispatch of a geologist to make a survey in the region covered by the application.

The law provides that one applicant may have as many as three leases in a state, but only one lease on a structure. If one person has applied for two leases in the same general region, it must be determined that they are on separate structures. A similar distinction is made with regard to prospecting permits. It is highly important, so far as operation is concerned, to have the line drawn sharply between the territory which is open for permit and that on which permits may not be had and only leases considered. With a permit, it is possible to prospect two years over 2,560 acres. When the permit expires, the holder has a preferential right to lease one-fourth of that area, with the royalty on a five per cent basis. To secure a lease within the structure of a proven field requires compliance with much less liberal conditions. The applicant has no preferential right. The department puts the land up for bids and the highest bidder gets the tract. He must pay a royalty of not less than 12½ per cent and must bid against everyone on the bonus basis.

The Survey already has defined the structures in twelve fields in Wyoming and Montana and six in California. Work is now in progress on six other California fields. The fields where the demand is the greatest are being taken up first. A great many prospecting applications are coming in from New Mexico. As yet, the situation is not intricate in that state, since it has no producing fields. The moment production comes in, however, the urgency of action on the part of the Geological Survey to indicate the boundaries of the structure is apparent.

Kentucky Shows Steady Production Increase

From Our Special Correspondent

Oil production in Kentucky during May reached 667,000 bbl., a new high record, according to figures recently announced by the State Geological Survey. March production was 610,000 and April 635,000 bbl., showing a steady growth. The increased production is due to the numerous wells being brought in in Western Kentucky, and, more recently, to development in Magoffin, Johnson, and Morgan counties.

The Armour Oil & Refining Co., of Pittsburgh, is unloading a heavy rig at Olmstead, in Logan County, for a deep test. A well, it is said, was drilled near Beachland to 700 ft., and the oil ran down the creek several days.

With the completion of pipe lines now under construction in Warren County, it is predicted by oil men that the county will rank first in oil production in Kentucky this month. It was second last month, with Allen County first.

Stein well No. 2 on the Tarrant lease, in the Davenport pool of Warren County, was shot and is reported to be making 50 bbl. per day. Leighty Brothers brought in a well at 450 ft. in 20 ft. of pay sand on the Clint Rigsby farm, a half mile from the Nashville Pike. It is rated at 25 bbl.

A report from Scottsville, Allen County, is that No. 3 on the Cooper lease has been completed at 310 ft. and is rated at 150 bbl. a day.

Oil and Gas in Dover Township, Ont.

From Our Special Correspondent

Further important progress is reported from the Dover oil field, in Western Ontario. The Petrol Oil & Gas Co. has let contracts for five wells, the completion of which will probably require eighteen months. Two of these are under way, one being down about 400 ft. The Vacuum Gas & Oil Co. has its first Dover well down about 1,300 ft. and reports favorable geological conditions. The Ajax Oil & Gas Co. is sinking its first well, and has secured additional leases on 130 acres, increasing its holdings to 160 acres. The Eureka and Inland companies are expected to begin sinking soon.

California crude-oil stocks were reduced 1,165,945 bbl. during June, 1920, according to statistics compiled by the Independent Oil Producers' Agency at Los Angeles, Cal. This daily shortage of 38,865 bbl. shows an increase of over twice the shortage of the previous month, which shows 16,698 bbl. per day.

Texas Well Shows Unexpected Big Flow

Exploration in New Territory Proves Extention of Gulf Coast Field— Other Texas News

From Our Special Correspondent

During the week ended July 24 several important wells were completed in the Gulf Coast fields. On July 20, No. 1 Abrams well of the Texas Co. came in unexpectedly at a depth of 2,780 ft., flowing 15,000 bbl. per day at the start, and increasing to 20,000 bbl., without a sign of water. The great importance of this well, aside from its big flow, is its location, about one mile northwest of the proved field, in practically wildcat territory. This is probably the most important completion of the week in Texas. In the same field No. 26 Japhet of the Humble Oil & Refining Co. was completed during the week, making an initial production of 8,000 bbl. daily. This well is on the west side of the field, and is about 3,300 ft. deep.

Other important completions in the Gulf Coast fields recently were: Humble field, No. 31 Koehler, Texas Co., 3,500 bbl.; Goose Creek field, No. 33 Ashland, Simms Co., showing of oil, now being tested; at Hull field, Empire Gas & Fuel Co., No. 3 Barngrover, 6,000 bbl. at start, but rapidly sanded; No. 33 Dolbear, Republic Production Co., 1500 bbl., No. 35 Dolbear, same company, 500 bbl., No. 19 Dolbear, same company, 400 bbl.; No. 13 Phoenix Gulf Production Co., 400 bbl.

Fire at Desdemona, Eastland County, on July 24 destroyed three business blocks in the center of town, including a bank, three hotels, three cafés, two drug stores and thirteen other stores. Total loss is estimated at $500,000. Desdemona is an oil town, formerly known as Hog Town, and has no fire protection. Dynamite was used to check the spread of the flames. In the Hog Creek field the Harris No. 2 well is flowing 300 bbl. daily, and No. 3 Harris is expected to be completed soon.

The Breckenridge district, Stephens County, production continues to increase. The Plateau well on the Ward tract is flowing stronger, making nearly 7,000 bbl. daily; The Buchanan well on the Gulf Production lease, three and one-half miles east of Breckenridge, is flowing 1,000 bbl. from 2,430 ft.; No. 2 well of Fensland Oil Co., on the Walker-Caldwell tract, was shot and is now making a good flow, not yet gaged.

In Coleman County, the No. 1 well of the Santa Anna Chief Oil Co., seven miles south east of Santa Anna, opened a gas flow of 4,000,000 cu.ft. daily at a depth of 1,540 ft. Deeper drilling may be done. Oil was found in the Pippin-Burke No. 2 well after a second shot.

ECHOES FROM THE FRATERNITY

Plant Devised for Recovering Gems at Burma Ruby Mine

Large Rubies Recovered and Many Small Ones—Test Stones Found in Concentrates Without Loss

Bernard Rance, the chief engineer of the Burma Ruby Mines, has in his annual report an interesting account of an experimental hydraulic sluicing plant, which has been tried on one of the company's properties, the Redhill, according to the London *Finaneial Times*. This plant was built to his design in the workshops, and made a fair start in August last year. Its object was to try a cheaper method of treating the gem deposits, but at the same time to produce the precious stones. Mr. Rance describes his plant as follows:

"We followed the usual practice, breaking down the bank with jets under moderate pressure, the water being taken from Pamadeik Channel about 500 ft. above the valley, and elevating the material to the top of the sluice by means of an hydraulic elevator under a working pressure of 400 lb. to the square inch, supplied from Redhill Channel. Although the pressure was ample for these duties the volume was restricted to the capacity of 6-in. mains only. The plant consisted of a vertical wooden frame, about 18 ft. in height and 9 ft. square, built immediately over the first bay of the sluice, which carried the screens that prevented the larger stones and pieces of rock from entering the boxes. These screens delivered their stuff on to extension tables, where it was hosed clean and sorted by the sorter in charge. All other sized gravel up to ¾-in. diameter passed through the screens and commenced its journey down the sluice, 100 ft. in length by 9 ft. wide, with riffles placed across at intervals.

"It was at once apparent to me that the methods used for catching gold and tin were of no use when applied to gems, their specific gravity being so much lower than the above metals. With gold having a specific gravity of about 19 it is a fairly easy matter to collect the large coarse grains in riffles and to wash away all sand, quartz pebbles and other undesirable material by using a large volume and rapid flow of water. With our deposit the riffles either packed solid with sand or were washed clean out, according to the flow and volume of water experimented with, owing to the closeness in the values of the specific gravity of corundum, quartz and limestone. After much consideration I then tried a series of boxes, arranging them to take the place of riffles, with rows of 2-in. pipes at the bottom and sides, drilled with numerous small holes to allow rising currents of water under variable regulated pressure to assist in the concentration of the gravel brought in by the sluice water. The results were better than anticipated, and quantities of sand-sized rubies were retained in addition to the larger ones, which tiny things we were prepared to lose altogether. Exactly the same procedure and care as in the sorting sheds was carried out in sorting the deposit, which was drawn out from the boxes by means of sliding doors at regular intervals. The deposit after several hours run was in appearance and character somewhat like that recovered from our pans, but there was certainly sand in excess, which cannot be got rid of without introducing revolving screens, and I particularly wished to bar all running machinery. Marked test stones thrown into the elevator sump were recovered every time. The plant could only deal with about 300 to 500 trucks per shift of ten hours, being limited to the water supply, and the labor required was one sluice man and fifteen to twenty coolies and one European sorter by day.

"The actual figures for the first month's run were: Stones mined valued at Rs9,100 and cost of labor and upkeep Rs1,000. As the total cost of erecting the plant and all materials used in so doing was only Rs6,000, this was a very fair start. . . . Of far more importance than devising a means of extracting the smaller stones is the fact that the plant will retain the large ones, which, after all, are the ones that really matter and decide the paying of dividends."

Will Teach Mineralogy and Blowpipe Analysis

The extension division of the University of California announces that its technical department has a new correspondence course in determinative mineralogy and blowpipe analysis by Arthur S. Eakle, professor of mineralogy. It is equivalent to the course given in the regular session of the university. Each of the ten assignments given in the course is based on portions of a text book which is sent out with the preliminary announcement sheets. The text is entitled "Determinative Mineralogy and Blowpipe Analysis," by Brush, revised by Penfield, 16th edition. The approximate cost is $3.50. With the assignment sheets are sent 100 different kinds of powders and minerals in sets of ten each for experimentation or determination.

The fee for this course is $12, payable in advance. Necessary apparatus for the course must be provided and will be furnished by the Associated Students' Store, Berkeley, Cal., on receipt of a check or money-order for $20.

The Engineer's Part in Industry's Evolution

The mining and metallurgical industry, says the *Écho des Mines et de la Métallurgie*, is evolving an amalgamation of enterprises of singular importance, financial, administrative, and industrial, whose direction had become burdensome and difficult. A single man at the head of a large corporation does not usually suffice for efficient administration.

The direction of these giant enterprises, that have but recently been created, is a large problem.

The head of a great metallurgical or mining company may no longer pretend to see everything and know all about everything connected therewith.

To attempt this would lead him straight to cerebral congestion or cerebral anaemia, and his company to paralysis, for the matters waiting their turn would go months without attention.

Today a chief should in a manner hover above the great business, leaving the cares of its effective direction to his various aides. Here the engineers find their special place, and their role assumes special importance as enterprises evolve toward great concentration.

The actual chief, from his upper plane, should arbitrate the conflicts between his lieutenants; but should leave to them the effective direction of the different branches in order that they acquire the habit and the taste for responsibilities. Without those qualities they will be incapable of successfully filling their own parts in the work.

It is thus incumbent on the head to give careful attention when choosing the chief engineers who are to become his immediate collaborators. Having made this choice, he should leave them to execute, command, and evolve.

Gold Question Discussed Before Salt Lake Club

A meeting in the interests of gold production was held July 23 at the Commercial Club in Salt Lake City by the Utah chapter of the American Mining Congress, which had as its guest at luncheon H. N. Lawrie, economist of the American Mining Congress. Mr. Lawrie discussed the plan for the encouragement of gold production of which he is the originator, according to which it is proposed to offer a premium of $10 per ounce on newly mined gold, and which is embodied in House Bill 13,201, introduced by Representative McFadden of Pennsylvania and now pending before Congress. Mr. Lawrie explained the working of the measure, and answered questions in regard to the various phases of its application.

Book Reviews

Popular Oil Geology. By Victor Ziegler. Composition leather; 5 x 7½; pp. 171; second edition; John Wiley & Sons, New York. Price $3.

The intention of the author in this little volume is to present a number of general facts for the benefit of the layman who may be interested in the subject, but in this he goes further and includes material that is well within the field of those who have gone more deeply into the subject. As stated in his preface, Prof. Zeigler has drawn liberally on existing petroleum literature, but his selection is excellent and the arrangement of the text is to be commended. It is questionable if the two chapters, "Petroleum Fallacies in Oil Geology" and "Oil Investments," will prove "popular" in certain quarters, as many of the "oily arguments" presented by unscrupulous oil-stock promoters are beautifully exploded. The chapter on "Oil Shales and Their Utilization" constitutes a valuable résumé on this subject, which just now is receiving considerable attention. D. E. A. C.

Exporter's Gazetteer of Foreign Markets. By Lloyd R. Morris. Cloth, 6 x 9, pp. 766. 1920-1921 Edition. Published by American Exporter, New York. Price, $10.

Detailed statistical information regarding foreign markets has been hard to procure heretofore, in compact form. This book has a separate chapter for each foreign country and gives just the data which experience has shown to be most needed by the international trader. Included are data on commerce, production and consumption, language, money, weights and measures, shipping routes, customs, tariff, cable rates, and mail time from New York. The book is up to date and contains chapters on the new states formed as a result of the war. A good index is essential in a work of this kind, and in this instance this feature seems particularly complete.

Technical Papers

Mineral Statistics — The following separate papers have recently been issued by the U. S. Geological Survey. They will later be incorporated in the annual volumes of "Mineral Resources of the United States": "Cadmium in 1919"; "Barytes and Barium Products in 1918"; "Cobalt, Molybdenum, Tantalum, Titanium, Radium, Uranium and Vanadium in 1918"; "Nickel in 1918"; "Feldspar in 1918"; "Lime in 1918"; and "Introduction and Summary of Mineral Production in the United States in 1917."

Sampling—The State School of Mines at Butte, Mont., has recently issued a seventy-one-page bulletin entitled "Mechanical Ore Sampling in Montana," which may be obtained on request. Montana has several large sampling mills, and in this report are described those of the Anaconda company at Butte and Anaconda, that of the East Butte company at Butte, and those of the American Smelting & Refining Co. at East Helena. Several test lots were run through the different mills, the samples checking remarkably well and proving the machinery and general procedure to be all that could be desired. The bulletin does not discuss sampling from the mathematical standpoint, but merely analyzes the sampling methods in use in Montana and suggests the most fertile fields for improvement. Many illustrations add to the reader's interest.

Molybdenum — The Climax Molybdenum Co., 61 Broadway, New York, has recently published an artistic and informative book entitled "Molybdenum Commercial Steel." Alloy steels in which molybdenum is used were developed largely under war conditions when other alloying materials were scarce, but they seem to have proved satisfactory for many purposes for which other types of steel were formerly used. This book will be of interest to molybdenum producers as suggesting outlets for their product, as well as to steel users who may profit by the use of this modern alloy.

Manganese—A report on the manganese deposits of the Australian Manganese Co. is contained in the Mining Review No. 31 of the South Australia Department of Mines, Adelaide. A large number of analyses and a detailed description of the workings are given. Some general information and data are also appended on the manganese deposits and industry in other parts of the world.

Economics of Gold—A discussion of "The Gold Premium" occupies about twenty pages of the May *Journal of the Chemical, Metallurgical and Mining Society of South Africa* (Johannesburg, price 3s.). Any one interested in the currency systems of the world should find it worth perusing.

Commercial Terms—In the May and June issues of *Anglo-American Trade* (8 Waterloo Place, Pall Mall, London, S.W.1, price 1s. each) are published articles discussing and defining the terms f.o.b., f.a.s., c.&f., c.i.f., and l.c.l. The English interpretation of these terms is sometimes different from the one to which we are accustomed and exporters and importers not already familiar with this matter should give the subject attention.

Missouri War Records—The School of Mines and Metallurgy of the University of Missouri, Rolla, Mo., has issued a bulletin containing the war records of all of its members.

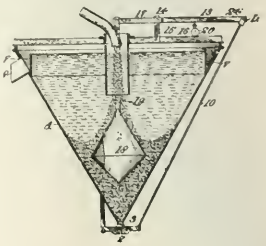
Recent Patents

1,346,642. Process for the Extraction of Lead and Zinc From Their Ores. Frank Edward Elmore, Boxmoor, England. Filed April 1, 1919.

Process for separating lead compounds from zinc compounds in lead-zinc sulphide ores, concentrates or the like, consisting in heating the pulverized ore with a sufficient quantity of strong hydrochloric acid until substantially the whole of the lead has been converted into lead chloride while the zinc remains substantially unattacked, cooling the heated mixture, washing the mass with a limited quantity of cold water to remove excess of acid and soluble impurities, then separating the lead chloride from the zinc by extraction of the former with a hot solution of lead chloride in water or in strong brine, separating the solution from the undissolved matter and cooling it to crystallize lead chloride, separating the mother liquid from the crystals and using it when reheated to leach a further batch of lead chloride from zinc sulphide, the process being repeated so that the same quantity of solvent serves repeatedly to convey purified lead chloride to the crystallizing vessel, while leaving zinc sulphide in a condition suitable for metallurgical treatment, heating the crystallized lead chloride with sulphuric acid, dissolving the evolved hydrochloric acid in water and using the solution for treating a further batch of the ore.

1,344,370. Automatic Density - Indicator for Slime-Pulp Separators. Charles Allen, El Paso, Tex. Filed April 3, 1919.

In a device for separating a feed stream into two products, each of a different density, a receptacle having a separate outlet for each of the products, a valve for controlling the outlet for the heavier product, means automatically responsive to the variations in the density of the heavier product to control the discharge valve, an indicator



operatively connected to the control means for indicating the density of the discharge material, and means in connection with the indicator to set the control means so that the discharge will occur only when a predetermined density is reached.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

COLORADO

Right To Redeem Declared A Personal Privilege

Camp Bird Mining Co. Not Permitted To Acquire Mining Properties of the Brant Independent Mining Co.

The United States Circuit Court of Appeals, Eighth Circuit, has reversed the District Court for Colorado, which had issued an order allowing the Camp Bird Mining, Leasing & Power Co. to redeem from the foreclosure sale of the Brant Independent Mining Co. The trial court had no authority or evidence upon which to base a decision that the redemption of the Camp Bird Mining Co. was in the interest of the Brandt company, the mortgagor, whose properties, consisting of real estate, mining claims, mining locations, water rights, mill site, office building and furniture, assay offices and instruments, houses, stables, teams and mining and milling machinery, had been sold under foreclosure proceedings.

The only right or authority under which the Camp Bird company claimed a right to redeem the property was an agreement made in May, 1914, between the Brant company, as lessor, and T. R. L. Daughtrey & Co., as lessee. In this agreement the lessor leased to the lessee for the purposes of development and mining the following mining claims: Paonia, Morning Glory, London, Copper Sulphide, Protection, Option No. 1, Option No. 2, Option No. 3, Option Fraction, and Contec Lode, or Winnie Fraction, together with certain real estate and improvements and the ten-stamp mill at Bowerman. The lease was for ten years from Aug. 10, 1914. The lease was assigned to the Camp Bird company.

This agreement was an ordinary mining lease for the purpose of development, the consideration therefor being a royalty of the net profit. There was no conveyance of any interest in the property leased to the lessee. The Camp Bird company was owner of $44,100 of the bonds of the Brant mining company secured by the mortgage which was foreclosed. The total amount of the bonds issued under the mortgage was $87,000. The Camp Bird company was therefore holder of a majority of the bonds, and as such holder demanded foreclosure of the mortgage.

George Hetherington, as trustee, bid the property in for the minority stockholders and bondholders. The Camp Bird company was also a bidder at the sale. It attempted to redeem the properties from the trustee, claiming the right, under its lease, to treat the redemption as having been made by it for the Brant mining company.

The Court of Appeals said there was no evidence that the Brant company ever requested the Camp Bird company to redeem from the sale, and as the right to redeem was a personal privilege, the Brant mining company could not be compelled to exercise it by its lessee. The redemption of the Camp Bird company was in its own interest, and it had no authority under the Colorado statute to act. The trial court was, therefore, directed to enter a decree cancelling the pretended certificate of redemption.

SOUTH DAKOTA

Contract Need Not Be Reciprocal

Transcontinental Petroleum Co. Granted New Trial in Suit Against Inter-Ocean Oil Co.

Judgment for the Interocean Oil Co. in the action brought against it by the Transcontinental Petroleum Co. in the District Court of South Dakota has been reversed and new trial ordered by the Court of Appeals, Eighth Circuit, and a new hearing has been denied the parties.

The action arose out of contract between the parties for the sale by the Transcontinental company of the Republic of Mexico, to the Interocean company, of 1,200,000 bbl. of Mexican crude oil produced in the Panuco oil fields, near Tampico, Mexico. The contract provided that deliveries in any quantity were limited to the actual production of the oil wells owned or controlled by the seller, and that deliveries were to be at the rate of 50,000 bbl. per month from Jan. 1, 1914, to Dec. 31, 1915. The breach of contract claimed was the failure of the buyer and its assignee to take a large part of the oil contracted for. On trial the court gave judgment for the buyer, defendant, who sought to avoid the full obligations of the contract, claiming lack of mutuality in its terms.

The Court of Appeals, in reversing the judgment, said that a sale, where the quantity to be delivered or received is measured by the output or requirements of an established plant or business during a limited time, does not lack mutual obligation. Farther, it held a contract, by a corporation operating twenty oil wells, to sell a stated quantity of crude oil, to be delivered during two years, not invalid for lack of mutual obligation of the parties, because of a provision limiting its obligation to deliver to the production of its wells then owned or afterward acquired during the time. This provision also limits the buyer's obligation to receive such production.

WASHINGTON

Statutes Not Applicable to Exploitation Risks

Josevig-Kennecott Forced To Transfer Stock—Contracts Involving Uncertain Contingency Not Usurious

The United States Court of Appeals has affirmed the decree of the District Court for the Northern Division of the Eastern District of Washington, requiring the Josevig-Kennecott Copper Co. to transfer to the James F. Howarth Co. 260,000 shares of the Copper company's treasury stock.

The controversy arose out of a contract in writing entered into between the Howarth company and George Francis Rowe, therein represented to be the sales manager and fiscal agent of the Copper company, with power to sell 1,000,000 shares of its treasury stock. The Copper company asserted in the suit that it was not informed of this contract until several months after it was executed. Nevertheless, on July 17, 1916, the date of the contract, the Copper company, by its president, wrote to the Scandinavian American Bank, informing it that 1,000,000 shares of the Copper company's treasury stock were deposited with it, and that the bank was authorized to issue to the Howarth company 260,000 shares thereof, and on July 18, 1916, the latter company, together with all the stockholders of the Copper company, entered into a pooling agreement, in which the Howarth company was represented as holding 260,000 shares of the Copper company's stock.

The contract provided that the Howarth company should advance to the Copper company $10,000, "to be used in the exploitation of said copper company," that out of the proceeds of the sale of stock of the company 25c. per share should be set apart for the repayment of the Howarth company, that as additional compensation for services rendered the latter should receive 260,000 shares of the promotion stock, and that if the stock-selling campaign should prove unsuccessful the Copper company should not be obligated to repay the Howarth company the money so advanced.

The Copper company contended that this contract was usurious. But the court said the usury statutes "have no application to those uncertain transactions in which the person who furnishes the money needed incurs risk of losing in whole or in part the principal sum loaned." (39 Cyc. 943.) Here the money was loaned for the exploitation of undeveloped mining property, with the understanding that its repayment depended upon the venture's success.

MEN YOU SHOULD KNOW ABOUT

E. F. Hall is the new superintendent of the mine and mill at Leadville, Nev.

A. W. Newberry has returned to New York on the "S. S. Olympic" after an absence of two months abroad.

Arthur Keith has recovered from his recent illness and has gone to Greenfield, N. H., to do geologic work.

M. J. Gavin, who is in charge of oil shale work for the Bureau of Mines, is in Washington on official business.

Prof. H. H. Stoek is in Washington compiling figures pertaining to accidents in mines.

Charles Butts is studying Mississippian formations in the Frankfort, Ky., area.

E. E. Carpenter, for a number of years manager of the Nevada Wonder, is now in charge of active operations for the Candelaria Mines company.

Raymond Guyer, of New York, recently inspected mines at Ely, Battle Mountain, and Goldfield, Nev., for which he is consulting engineer.

G. B. Richardson will spend a month in Kentucky for the U. S. Geological Survey, collecting statistics on oil production.

John Edwin sailed July 27 for Dutch Guiana, where he will engage in exploration work for the Surinaamsche Bauxite Maatschapij.

F. H. Skeels has been appointed superintendent of the Ramshorn Mine of the Ramshorn Mines Company. The mine is at Bayhorse, Idaho.

H. W. Hardinge sailed for London and the Continent on business matters on the "S. S. Aquitania" July 31. He will return to this country about Oct. 15.

S. K. Bradford, for some time a field man for the West End Consolidated Mining Co., of Tonopah, Nev., is now located in Virginia City, Nev.

H. A. Linke, mining engineer of Salt Lake City, Utah, and **A. G. Burritt** are examining the fossil oil fields of Lincoln County, Wyo., and mapping the district.

H. H. Stoek, professor and head of the department of mining engineering at the University of Illinois, recently received the honorary degree of D.Sc., from the University of Pittsburgh.

Roy H. Elliott, chief engineer for Bulkeley Wells' syndicate, recently made an inspection of his client's Comstock properties, as well as the dredging operation near Dayton.

Arthur Crowfoot, superintendent of concentrators for the Arizona Copper Co., has returned to Morenci, Ariz., from a business visit to Chicago and New York.

Col. M. G. Baker, vice president of the Vanadium Corporation of America, sailed from New York on July 28th for the company's properties in Peru. He may be gone for several months.

Frederick B. Tough, of the U. S. Bureau of Mines, has been appointed supervisor, with headquarters at Denver, to look after matters pertaining to the regulations issued under the Mineral Leasing law.

Walter K. Mallette, a metallurgical engineer who has been in the service of the U. S. Bureau of Mines, has resigned to accept employment in the Cia. Carbonifera de Sabinas, Rosita, Chihuahua, Mex.

James Colquhoun, who some years ago was general manager for the Arizona Copper Co., and who when war broke out in Europe in 1914 was in charge of important mines in Russia for an English company, has just concluded a lengthy visit to Clifton, Ariz.

GEORGE S. RICE

George S. Rice, chief mining engineer of U. S. Bureau of Mines, is visiting the Western experiment stations of that Bureau. His itinerary includes Denver, Col.; Butte, Mont.; Salt Lake City, Utah; Berkeley, Cal., and Seattle, Wash. Mr. Rice will stop at Houghton, Mich., to attend the meeting of the American Institute of Mining Engineers.

T. H. Arnold, who has been in charge of the electrical department at the Arizona Copper Co.'s mines in Clifton-Morenci district, Arizona, has resigned to accept a position with a cement manufacturing company of El Paso, Tex.

Prof. Charles H. Fulton has resigned as professor of metallurgy at the Case School of Applied Science to become head of the mining department at the Missouri School of Mines at Rolla, Mo. Within the last few years Professor Fulton has perfected an electrical resistance furnace for smelting zinc ores.

D. H. Newland, formerly with the New York Geological Survey, has resigned to accept a professional position with Beaver Board Companies, Buffalo, N. Y. Mr. Newland recently examined the properties of the American Cement Plaster Co. taken over by the Beaver Board Companies.

G. E. Goodspeed has rejoined the staff of the Oregon Bureau of Mines for summer field work as mining geologist. He is at present completing a geologic report on the Blue Ledge mine in southern Oregon and will then make ar extensive study of the gold mines in the Cornucopia district of northeastern Oregon.

Robert N. Bell, state mine inspector of Idaho, has formally announced that he will not be a candidate for re-election, and that he will retire to give his attention to the practice of mining geology and engineering. He will maintain an office in Boise. With the close of his present term Mr. Bell will have served as mine inspector sixteen years, continuous with the exception of two years.

T. Nelson Dale, geologist, is the only member of the scientific staff of the U. S. Geological Survey who will retire at an early date under the recent Act for Retirement of Government Employees. Mr. Dale has been for a long period on the geological staff of the Survey, engaged particularly in economic geology studies of building stones. **F. W. Clarke**, chief chemist, and **William H. Dall**, geologist and paleontologist, are both of retirement age, but under the provisions of the act will be retained in active service for an additional period. No members of the scientific staff of the Bureau of Mines is affected by the act of retirement.

H. A. C. Jenison, the geologist who has just taken charge of copper statistics for the U. S. Geological Survey, was born at Roxborough, Ireland. His early education was obtained at the Blackwater preparatory school and at Harrow, England, where he was graduated in 1904. He continued his technical work at both the Universities of California and of Washington. He completed his work at the University of California in 1907, and left immediately for South America, where he entered the services of the Central Chile Copper Co., Ltd. Later he was sent to Ecuador to do copper exploratory work. Late in 1910, he returned to California and was engaged for a year in the copper mines in the northern part of that state. The next year he spent in British Columbia, after which he was engaged for a year at Santa Rosalia, in Lower California, and in the State of Sinaloa, Mexico. The copper industry of Alaska claimed his attention until the war broke out, when he entered the U. S. Army as a second lieutenant. He served in France until retired by severe injuries received in action. He was in the hospital until October, 1919, when he entered the service of the U. S. Geological Survey as an associate mineral geographer. His experience in copper led to his recent appointment.

THE MINING NEWS

LEADING EVENTS

Wide-Spread Strike in Mexico Settled by President

Over 30,000 Men in Mining Camps and Oil Fields Return—40 Per Cent Wage Increase Granted

What promised to be the most disastrous and wide-spread strike in the history of Mexico was settled at least temporarily on July 27 by the intervention of the President of the Republic, who asked the strikers to return at once and abide by the decision of a joint committee to be appointed to go over the whole situation involved. Ten thousand men were out in the oil regions of Tampico; 6,000 men of the A. S. & R. and the Cia de Minerales y Metales at Monterrey; 1,800 of the Mazapil Copper Co.; 5,000 at the Matehuala mines; and about 10,000 in various small mining camps throughout Durango and Chihuahua. As the strike had effected the fuel oil supply another five days would have thrown 300,000 men out of employment in the various mining regions of the country. Upon receipt of a telegraphic request by the President the miners' committees and representatives of the mines got together and a temporary advance of 40 per cent on the average was granted the workers.

The companies still refuse to recognize the unions and are standing out for the open shop. It is understood that the government will bring strong pressure to bear on the companies for a general recognition of the unions. The men are apparently satisfied for the present with the scale of wages that is being paid.

Federal Co.'s Shaft on Russell Claim One-Fourth Completed

Shaft sinking on the Russell claim to prove that the Hecla Mining Co.'s "east" vein apexes within its boundaries is progressing rapidly under the direction of the Federal Mining & Smelting Co., which took over the work from the Marsh Mines Consolidated. The work has reached a depth of 240 ft., the total distance to be sunk on the dip of the vein in following the latter into Hecla ground being about 1,000 ft. A new hoist has been installed by the Federal company, the shaft has been placed in a more workable condition and perfect ventilating facilities have been provided, the necessity for the latter having been tragically demonstrated by the death of three men in the shaft about two months ago through the presence of monoxide gas. The Federal company is the owner of the Russell claim and plaintiff in the case against Hecla.

WEEKLY RÉSUMÉ

A strike in the oil fields and mining camps of Mexico that threatened to become general was settled on July 27, the companies agreeing to a temporary wage increase of 40 per cent. The Democrata Mining Co. at Cananea has shut down owing to high costs. The Vanadium Corporation of America is further increasing its transportation facilities at its mines in Peru and has contracted for another railroad link. The Alaska-Treadwell's first shipment of ore from its claims at Nixon's Fork in the Kuskokwim Valley has reached Tacoma. The Federal Court has decided against the Chicagoff Mining Co. in the suit brought by John Tuppola. Canada Copper is to be reorganized.

In California, mine owners of Amador County have protested against the act of the Pacific Gas & Electric Co. in curtailing its power service. In Montana, Anaconda is reported to be planning to double the capacity of its rod and wire plant. In Utah, a sampling mill of the A. S. & R. Co. was burned at Murray.

Chicagoff Mining Co. Loses Suit in Federal Court

The U. S. Circuit Court of Appeals in Alaska handed down its decision recently awarding John Tuppola two mining claims valued at $500,000 and ordering an accounting for all profits made by the Chicagoff Mining Co., of Alaska, since 1914.

Fraud was charged against the Chicagoff company by Tuppola. He maintained that to gain complete possession of the four claims in which he was joint owner with the company, he was charged with insanity, tried and sentenced to an asylum and that subsequently the claims were sold by a guardian for $1,000. Tuppola was liberated from the asylum in December, 1917, and brought suit in the Alaska court to recover his holdings but was defeated. His victory in the Federal Court gives him possession of two claims near Sitka and one-half interest in the claims held by the defendant.

Judge Ellis, who handled the case for the mining company, states that a rehearing will be asked for. He asserts that the court found no evidence of fraud but that it was simply a matter of law as to the validity of a guardian's sale. W. R. Rust, Hugh C. Wallace, both of Tacoma, are among the principal owners of the company.

Copper Refinery Rumored for Miami District

A story has been given circulation in the Miami district of Arizona to the effect that a copper refinery and an acid plant are to be added to the International Smelting Co.'s plant there. The story was denied at the company's New York office.

Vanadium Corporation To Build Second Railroad Link

Will Supplant Motor Haulage—Construction of Small Power Plant Started—New Ore Located

A contract has been placed by the Vanadium Corporation of America with the Foundation Company for a railroad in Peru over the 25-kilometer stretch between Casa Laguna on Lake Pun Run and the Cerro de Pasco railroad at Ricran. Only recently a motor highway was completed between these points, making the use of llamas for transporting ore unnecessary. It is expected that the saving made by employing rail transportation instead of motor haulage from the lake to Ricran will be considerable. The new line, to be ready early in 1921, will give the company rail or water transportation all the way from its mines to this country. A narrow-gage road between the mines at Minas Ragra and the bluff overlooking Jumasha on the shore of the lake was completed a few months ago.

Construction of a 500-hp. hydro-electric plant on the Jumasha River between the mines and Lake Pun Run has been started. This will supply power for the mines and for diamond drilling. Recent drilling operations indicate the existence of another extensive body of vanadium ore lying some distance below the one already known.

At present the mine waters are carrying considerable vanadium ore into the lake where a deposit is building up at the point of discharge. Steps will be taken to recover this, though the method to be employed has not been announced. It is believed that the saving from this item alone will amount to about a quarter million dollars a year.

Ore from Alaska-Treadwell Co.'s Nixon Claims Reaches Tacoma

The motor schooner "Ozmo" arrived recently at the A. S. & R. smelter at Tacoma, Wash., with the first shipment of gold ore from the Alaska Treadwell's property near Nixon, Alaska, 60 miles from McGrath on the Kuskokwim River district. The ore was carried down the Kuskokwim River in small boats and loaded abroad the motor schooner at Bethel. It is stated that development work on this group of mining claims is proving decidedly encouraging and additional equipment is being ordered to supplement mining work. These are the claims on which an option was secured for the company last summer by Livingston Wernecke, geologist for the Alaska-Treadwell, while he was on a scouting trip.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Claims for War Minerals Relief Often Obviously Unjustified

In analyzing the claims disallowed by the War Minerals Relief Commission, it is surprising to note the number of claims made where it should have been obvious that the claimant had no case. For example, one claimant admits, in his questionnaire, that he had made a profit of over $70,000 in mining and shipping ore from his property but nevertheless he put in a claim of $1,700 for ore which remained in his hands unsold at the time of the armistice. Since he suffered no net loss, the claim naturally was disallowed upon examination by the commission.

In the accompanying illustrations is shown the plant of the Chestatee Pyrite & Chemical Corporation, at Chestatee, Ga., discussion of whose claim for a large sum occupied so much of the time of the House Committee on Mines and Mining during the last session of Congress. The Chestatee company was awarded a fraction of its claim, which it accepted under protest.

Awards were recommended by the War Minerals Relief Commission during the week ended July 24, as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): P. H. Bray, manganese, $1,404.03, 14 per cent; Western Rock Properties Co., manganese, $14,-106.80, 24 per cent; Liberty Chrome Mines, chrome, $778,46, 34 per cent; Lydia Blakemore, manganese, $639.30, 36 per cent; Pacific Tungsten Co., tungsten, $92,590.01, 21 per cent; Butte Central Mining & Milling Co., manganese, $42,457.50, 24 per cent; Mrs. Ruth A. Scurlock, manganese and chrome, $1,456.77, 60 per cent.

Increased Freight Rates Hit Low-Grade Ores

Commission Holds Exceptions to General Percentage Increase Not Warranted Now

No exceptions were made of low-grade ores by the Interstate Commerce Commission in ordering its general percentage increases of freight rates. In that connection, the commission said in handing down its opinion:

"In some of the western states there is a considerable movement of low-grade ores, some of which are valued at $5 per ton or less. Shippers of these low-grade ores contend that further increases in the rates thereon will result in curtailing or destroying their movement. The evidence before us in this proceeding, however, does not warrant exceptions to the general percentage increases at this time."

NO CLAIM FOR RELIEF UNDER THE WAR MINERALS ACT HAS ATTRACTED SO MUCH ATTENTION AS THAT MADE BY THE CHESTATEE PYRITE & CHEMICAL CORPORATION, OF CHESTATEE, GA., VIEWS OF WHOSE PROPERTY ARE SHOWN HERE. 1. GENERAL VIEW OF MILL. 2. ADIT AT NO. 1 LEVEL. 3. RACEWAY, LOOKING TOWARD POWER HOUSE. 4. FORGE AND MACHINE SHOPS, LOOKING WEST

With regard to iron ore, the commission's opinion reads:

"A considerable proportion of the iron ore consumed in the United States originates on ranges in Minnesota and Michigan near the head of Lake Superior. This ore moves to furnaces on Lake Michigan and Lake Superior; to furnaces on Lake Erie and in Pennsylvania, Ohio, and other states. The movement is by rail to the upper lake ports, and when destined beyond, by lake vessels to the lower lake ports.

"Because of the keenly competitive situation between the respective furnaces, the Director General adopted a specific increase of 30c. per ton upon iron ore in lieu of a percentage, which was applied to the movement from the Michigan and Minnesota ranges to the upper lake ports, but not from lower lake ports to eastern destinations, thus resulting in an equal increase in cents per ton for the rail transportation to each of the competing furnaces. Under this plan the rates of the western carriers up to the lake ports were increased approximately 57 per cent, whereas the rates of the eastern carriers from the lower lake ports were not increased.

"In this proceeding the eastern carriers propose first to apply an increase of 22c. per ton and then impose thereon the general percentage increase. The testimony of ore shippers is conflicting, some proposing no further increases from the ranges to the lake ports, some favoring double increase in the rates from the lower lake ports, others proposing no exceptions to the general percentage increases proposed on traffic generally.

"The returns made by the principal ore-carrying roads from the Minnesota ranges to Lake Superior ports indicate that such lines are in a much more prosperous condition than the western carriers generally.

"It is concluded that at this time no increases should be made in the rates on iron ore from the Minnesota or Michigan ranges to Lake Superior or upper Lake Michigan ports. Other rates on iron ore may be increased according to the percentages herein approved."

Survey Defines Meaning of "Ore"

With a considerable portion of the gold ore extracted at the present time resulting in a loss to the operators, special significance attaches to the definition of "ore." The generally accepted definition implies that ore is a mineral or an aggregate of minerals from which one or more metals can be extracted at a profit. So far as the U. S. Geological Survey's statistical reports are concerned, the term "ore" will be held to mean minerals or aggregates of minerals containing one or more metals which have been shipped to treatment plants and for which the miner has received payment regardless as to whether or not the receipts cover the cost of mining and reduction. This applies to placer gold as well.

The Survey's records show that there are numerous cases where minerals have been extracted during the last year at a loss, but the operators have found it more economical in the long run to keep their properties in operation.

Federal Reserve Board Summarizes Industrial Conditions

Commenting on metal mining conditions during July, the Federal Reserve Board's summary of business conditions says:

"Metal mining conditions during the month have not been uniform. In District No. 10 (Kansas City) the half-year period ending June 30 shows an increase in the value of lead and zinc shipments over 1919 in spite of adverse productive conditions. Shipments of zinc ores declined during June and there was a tendency to decline both in price and volume of shipments of zinc. Metal mining in Colorado has suffered from a shortage of labor."

Nevada Gold Mining Continuing in Spite of Conditions

F. S. Schrader, of Geological Survey, Reports on Activity of Jarbidge and Other Districts

Gold mining operations are far from being at a standstill in Nevada, according to F. C. Schrader, of the U. S. Geological Survey, who just has completed a visit to several of the camps in that state. He is particularly impressed with the activity being displayed in the Jarbidge district. This district produced more gold in 1919 than did any other camp in Nevada and has produced more of the metal thus far in 1920 than it did during the corresponding months in 1919.

One of the distinct assets of the district, Mr. Schrader reports, is its cheap power, which is secured from the Thousand Springs Power Co., near Buhl, Idaho. Ample power is available at the Idaho state rate. A new power line has just been run into the district. Much development work is being done and a number of new veins are being opened. The principal companies operating the districts are the El Koro Mining Co., the Jarbidge-Buhl Mining Co. and the New York-Jarbidge Mining Co. In addition, there are a number of other companies working on a smaller scale.

In the Rawhide and Rand districts, only the higher grade gold ores are being worked, but Mr. Schrader found everyone taking a hopeful view of the situation. He also visited the new Broken Hills district, which is located near Rawhide in the outskirts of the Carson Sink region. He finds that the district has good surface showings of silver. The deepest working at the time of his visit was not lower than 150 ft. but the indications at that depth he regards as very favorable. There is good ore continuing from the surface to that depth. Sulphides begin at the 100-ft. level. The camp is dry. Water must be hauled fifteen miles across desert country.

NEWS BY MINING DISTRICTS

MEXICO

Sonora

Democrata Company Shuts Down—Calumet & Sonora Planning Changes in Mill

La Cananea—The Democrata Mining Co. at Cananea is closing down owing to the high cost of materials and labor. The smelter will be operated until all coke on hand has been used. There will probably be enough to keep its one furnace running until about the middle of August. The mine pumps will be pulled and the plant completely shut down. This property has been a small but consistent producer since 1912, operations having been suspended in 1917 when its new power plant was under construction. About 5,000,000 lb. of copper has been produced on the average for the last several years. The smelter has three blast furnaces and a converter. The mine will not be reopened until there is a more satisfactory price for copper. For some time operations have been extensively curtailed. At present about 300 men are being employed. The property is owned by C. E. Hoffman.

H. S. MacKay, superintendent of the Democrata Mining Co., has been appointed consulting engineer for the Calumet & Sonora Mining Co. Considerable development work has been planned at this property. The main shaft will be sunk below the 700 level and the Catalina shaft will be reopened. Certain changes in the mill will also be made.

The mine is producing about 300 tons of lead-zinc-copper ore. A lead concentrate and a copper-zinc concentrate are being made in the gravity mill. The copper-zinc concentrate is treated in an electrostatic mill which produces a clean copper and a zinc concentrate. The copper concentrate is shipped to the Cananea Consolidated Copper Co.'s smelter and the zinc is exported to the United States.

Mexico

Mexico City—In order to encourage a resumption of mining among the smaller owners, or at least induce small owners to resume payment of taxes, the government has issued a decree rescinding all previous decrees confiscating properties for failure to pay taxes, and will permit owners to make payment of back taxes on easy installments. The text of this decree was published in the last issue of *Engineering and Mining Journal*. The government was also induced to take this step as in many parts of the country mining records have been completely destroyed and the mining offices have no way of checking up ownership except where the owners voluntarily present themselves for tax payments. The decree has been well received and will probably be the means of getting several thousand mines on the rolls which have been dodging their taxes up to the present. More than three-fourths of the mine owners have not paid taxes in years, partly because of the unsettled conditions of the country, and partly because of extraordinary decrees and laws which discouraged many from a resumption of work.

ALABAMA

Woodward Company's Bessemer Mines Again Producing Regularly—Cars for Finished Products Scarce

Birmingham—The Woodward Iron Co. is again getting its regular supply of ore from its mines in the Bessemer district, Red Mountain, 12 miles south of Birmingham, where fire recently destroyed the boiler house, including machinery on which mine operations depended. The company has four blast furnaces in operation and a steady production of ore is necessary.

The operations of the Tennessee Coal, Iron & Railroad Co. on Red Mountain, between Birmingham and Bessemer, at Wenonah, Fossill and other points, are progressing steadily. Labor is being brought in and made as comfortable as possible. Electric lights, improved water service, better housing, schools and other improvements are being provided. Practically all the labor at the mines is colored.

The development of the deep-ore mining project of the Gulf States Steel Co., at Shannon, about 8 miles south of Birmingham, is being pushed and before January 1 it is expected there will be a production sufficient for present needs of the company and more. The company is at present getting ore from the Crudup mines, in Etowah County and elsewhere. Needs range between 750 and 800 tons daily. The ore that is to come from the Shannon mines will be of higher grade than that now used. At the Shannon the slope has reached the ore and an entry started. The slope has been concreted. Expectations are that within a year the daily output will be double the amount needed and that some may be offered on the open market.

Ore properties over the Alabama line in Georgia and in northern Alabama are being inspected with a view to development before long. Some negotiations are reported to be under way for the Trussville and Rome (Ga.) furnace propositions for which ore will be absolutely necessary.

Although there is dire need for railroad equipment with which to move finished products, pig iron, steel and steel shapes, there is but a slight interference in the intra-district haulage, the cars in the ore region not being very difficult to obtain, though a different kind is used in hauling ore. One or two of the pig iron companies in the Birmingham district have purchased railroad equipment for transporting ore to furnaces. Thousands of tons of pig iron and steel are to be seen in yards of the district, the railroads being unable to move them.

It has been announced that when the full equipment on the Warrior River is in service, in about 60 days, there will be steady shipments of Chilean ores from Mobile to the Birmingham district, providing a fairly good up-river traffic. As it is now there is very little or nothing coming up stream. Coal, steel shapes, lumber and other products in quantity are being shipped down river. The Chilean ores are being used in several industries of this district, at the manganese plant at Anniston in particular.

PLANT OF JEROME SUPERIOR COPPER CO., JEROME, ARIZ.

ARIZONA

Jerome Verde Planning for Further Development—Electrifying Jerome Superior's Surface Plant Completely

Jerome—The Jerome Verde is planning to raise funds for extensive development in the Main Top shear zone. It is considered important that development be continued on the 1,200-ft. level, which is 100 ft. deeper than any other working place and within a few hundred feet of the best ore shoots on the 1,100-ft. level. A failure of the present plan would endanger the rights of stockholders, for funds are insufficient to meet expenses of long idleness. H. P. Henderson is consulting engineer and John B. Harper manager.

Hopewell—Jerome Superior's surface plant is being electrified throughout. An additional compressor with a capacity of 1,125 cu.ft. per min. is to be installed, with a 200-hp. motor to drive it. A 75-hp. motor is being added to the hoisting equipment. This will increase the hoisting speed from 300 to 450 ft. per min. The shaft is down 860 ft. and will be sunk to 1,000 ft., at which level additional lateral work will be started. As the shaft gains in depth, the flow of water steadily increases. A new pump for the 1,000-ft. level has been delivered. A water softening plant will be installed. George Mitchell is general manager.

CALIFORNIA

Amador County Operators Protest Against Power Curtailment—Alta-California Discovers Old Channel

Sutter Creek—Drifting from the 3,850-ft. level of the main shaft of the Central Eureka has begun, and all efforts will be concentrated on opening several orebodies thought to lie within 50 ft. of the shaft. The mill continues to crush ore and the output is normal.

The Amador Queen has been taken under lease for 16 months by M. F. Thomas and preliminary work begun. The lease carries a nominal rental and a 25-per cent royalty on the gross output of gold.

The mine owners of Amador County have filed vigorous protests against the curtailment of electric power by the Pacific Gas & Electric Co. The delivery of power to the mines has been cut one-half and the companies forced to work with only night shifts. The action of the power company means a serious curtailment of gold production and increases the cost per ton of ore mined.

Marysville—Ten dredges are operating in the Yuba River field. They are owned by the Yuba Consolidated and

the Marysville companies and represent an investment of over two million dollars.

Grass Valley—The Alta-California company, operating in the Rough and Ready district about four miles below Grass Valley, has reported the discovery of the once famous Alta gravel channel. It is stated that the opposite rim of the channel remains untouched, although drifts have advanced 130 ft. from the point where the first rim was cut.

Alleghany—An option has been taken by the Alleghany Mining Co. on the bond held on the Gold Canyon group by W. H. Griffith. The shaft below the tunnel has been dewatered and preparations are being made to deepen it by sinking several hundred feet below the present point.

The Belmont property will install a small quartz mill soon. The vein is 12 to 18 in. wide, and considerable tonnage is in sight. The ore contains much free gold.

Portola—The Walker Mining Co., controlled by Anaconda, has under way a number of improvements which will materially cut production costs. The new tramway connecting the company's mill with Spring Garden, a station on the Western Pacific, will be completed in August and will do away with hauling concentrates and ore over almost impassable roads. The mill is 6,085 ft. high, Spring Garden 3,970, and the high point where the tramway goes over the mountain is 7,460 ft. Electric haulage is also being installed in the lower tunnel, bigger bunk- and cookhouses and homes for married employees are being built. A large tailings dam is being constructed. The company's saw mill is running steadily and over 200 men are employed on all operations. Complete details regarding the new tramway have already been published in a previous issue of the *Engineering and Mining Journal*.

The mine is opened up on three levels from the shaft, the deepest being 380 ft., but it is planned to do most of the future work through the tunnel that gains a depth on the vein of 1,000 ft. below the collar. The values on the tunnel level are about the same as on the 380. The orebody has been proved for 1,100 ft. north of the shaft and 1,600 ft. south. The tunnel is in about 4,750 ft. and a raise is being put up to connect with the fourth level. After this connection is made all ore will be dropped through the raise and run to the mill at the portal of the tunnel. Although a large tonnage has been developed in the mine workings and by diamond drilling, the vein has not been prospected southeast of the point where it was cut by the tunnel.

The Walker company's flotation mill is treating an average of 200 tons per day, but with improvements under way it is expected to handle about 275 tons daily. A high recovery is being made. V. A. Hart has directed operations since the Walker was first taken under option by Anaconda.

COLORADO

Smuggler-Union's Flotation Capacity Temporarily 400 Tons Per Day—Royal Tiger Mill Running

Ophir Loop—The Silver Bell property has been reopened and development work is being done under contract on two levels. Frank E. Trumble is manager.

Telluride—The Smuggler Union is installing enough flotation units to take care of 400 tons of ore per day. This will be the temporary capacity of the plant until additional equipment is delivered. The new office building, replacing the one recently destroyed by fire, is completed and in use.

Eldora — The Consolidated Leasing Co. has completed its mill, which will soon be running two shifts. C. E. Kahler is president and general manager.

Breckenridge—The Germania property on Little Mountain is being developed by lessees. Ore carrying 1 oz. gold per ton and some silver has been opened. Three carloads have been shipped recently to the Arkansas Valley smelter at Leadville.

The Missouri property on Shock Hill is being developed by George Robinson and associates. An electric hoist has been installed and shaft sinking resumed. The shaft will be sunk to the blanket vein of lead "sand carbonate" ore, which has been opened in the neighboring Iron Mask mine at a depth of 175 ft.

The Iron Mask is being operated under lease by Ostrom & Tillett. Raises from the main tunnel have opened a shoot of lead carbonate ore. The ore produced is being held temporarily in the hope that the silver market will improve. The pumps are handling about 500 gal. per min.

The Jessie property is being developed under the management of George Roth, with J. C. Warnecke as mine superintendent. Zinc-lead ore, carrying gold and silver, has been opened, and the concentration and amalgamation mill is in operation, with 20 of the 40 stamps dropping. The lead-zinc concentrate is shipped to Denver.

Tiger—The Royal Tiger property is being developed under the management of John A. Traylor. Several new buildings have been erected recently, and the small concentrating mill is in operation. The company has purchased the Cashier property, and a crosscut is being driven to cut the Cashier vein at a point several hundred feet below the old workings.

Idaho Springs—The Gem Mining Co. now owns the Gem Mines, the Freighters Friend property, the Newton mill, and the Gem electric plant and steam power plant. The Franklin Mines and the Silver Age Mines, owned by the Consolidated Franklin Mines Co., together with the Gem properties, will be operated by the Gem Mining Co., financed by a new syndicate, with the following officers: W. E. Renshaw, president; Sir Henry M. Pellett, chairman of the board; R. B. Lamb, consulting engineer; B. W. W. McDougall, general superintendent; and George C. Cochrane, mine superintendent. Capital has been provided for extensive development. The Gem shaft is being retimbered preparatory to resuming active operations.

Boulder—The Tungsten Products Co. is erecting a plant for treating radium ores from its property at Gateway, Col.

Rico—Shipments from the Rico Wellington have been resumed, two cars of $40 ore going out every thirty days. The ore is coming from the body found early this year. Shipments were suspended temporarily when the railroad was washed out.

IDAHO

Omaha Co.'s Compressor Plant Burned—Sabina Mines Co. Reorganized—Big Creek Building Long Flume

Wallace—Lightning struck the compressor building of the Omaha Mining Co. during a storm on July 18 and was followed by a fire which destroyed the building which contained the dry room and blacksmith shop, the loss being about $5,000. August Paulsen, one of the owners of the Hercules, is the owner of the Omaha. The plant will be rebuilt at once.

The Sabina Mines Co. is the name of a new corporation which succeeds the Sabina Mining & Milling Co. Certain shares of the old company were issued under agreement that they should be non-assessable and a test case in the district court sustained the agreement. The company being confronted with the necessity of levying assessments as the only means of providing funds for performing annual assessment work on eleven claims and otherwise developing the property, decided by a vote of stockholders representing more than two-thirds of the issued stock to organize a new company on an assessable basis which has taken over the entire holdings of the old. The party holding the non-assessable stock protested against the action and is expected to appeal to the court again.

The Big Creek Mining Co., which has been enjoined from discharging water containing slime and tailings from its mill into the creek from which the people of Kellogg receive their domestic supply of water, is building a flume that will convey all water and tailings from the mill to a point sufficiently removed from the creek to prevent anything foul reaching it. The injunction was issued by the district court upon application of the city of Kellogg and the Kellogg Power & Water Co.

The problem of separating the lead and zinc in the ores of the Coeur d'Alene district of Idaho and of making a closer recovery of both minerals has for over two years engaged the attention of the experiment station of the bureau of mines maintained in connec-

tion with the University of Idaho at Moscow. Much progress has been made in solving the problem in the laboratory and the process evolved is now being given practical tests in the mills of the Coeur d'Alene district under the personal direction of A. W. Fahrenwald, superintendent of the Moscow station.

The results of practical demonstration have so far proved satisfactory upon the same character of ore as that used in the laboratory tests, but as the lead-zinc ores differ in the various mines of the district and even in the same mine, much experimental work remains to be done to adapt the process to the varying conditions. However, the main problem seems to have been solved, and there appears to be little doubt but that the process can be adapted to the various classes of lead-zinc ores.

Mr. Fahrenwald has devised a flotation machine which has been in successful use in making laboratory tests in flotation. He will give practical demonstrations of the machine in connection with the present work in this district.

MINNESOTA

Mesabi Range

Assessed Valuations Increased in Chisholm District—Oliver Iron Building Houses at Leonidas Mine

Hibbing—Mahoning Ore & Steel Co. is conducting stripping operations along the north bank of the Mahoning pit using the new all-steel 30-yd. dump cars. The Oliver company has made the first shipment from the new Sweeny mine, an underground property with an estimated tonnage of 1,846,000 tons mixed bessemer and non-bessemer.

The office of the State Auditor announces that shipments from state mines this year will probably exceed those of last year. To July 17 the total shipments were 2,144,002 tons, of which 1,017,360 tons was shipped from the Missabe Mountain pit at Virginia.

Chisholm—The assessed valuation of mining property of the Oliver Iron Mining Co., in this district has been increased $7,400,000 by the local board of equalization. Increases were made in personal property amounting to $640,000 the principal items covered being location houses, warehouse supplies and mining timber. Increased valuations of stockpiles amounted to $1,500,000, the rest covering unmined ore. Other mining interests in the district have fared proportionately. It is understood that the local board is encroaching on the jurisdiction of the state tax commission and that the matter will be carried before that body.

The new Wellington shaft of the Oliver company is bottomed at 208 ft. The station for the main level has been cut at 170 ft.

Buhl—A factory expert has arrived at Buhl to take charge of erecting the new 300-ton electric shovel to be used in stripping the Wabigon mine of the Hanna Ore Mining Co. The base of the shovel has arrived and the rest is en route.

Shipments have started from the stockpile of the Frantz mine.

The Fort Henry Mining Co. is sinking an auxiliary timbered shaft at the Woodbridge mine.

Eveleth — The Oliver company is breaking ground at the Leonidas mine for 25 new houses, which have been planned for some time. One duplex, one triplex and 23 four-, five- and six-room dwellings are included. It is expected that many will be ready by winter.

Cuyuna Range

Trommald — The surface equipment and buildings of the Ferro mine of the Onahman Iron Co., at Trommald, were brought at the sheriff's sale on July 10 by the Gorham-Garbett Co., of Minneapolis, for $15,156.86. The latter company owns the fee of the property and was the only bidder.

Crosby — Shipping from the stockpile of the Croft, a John A. Savage property at Crosby, has been started and is proceeding at the rate of 60 cars per day.

Superior — It is reported that the Soo line is planning the construction of a steel and concrete ore dock at Superior to handle Cuyuna Range shipments and to replace the wooden dock now in use.

The Ida Mae mine of the Cuyuna-Minneapolis Iron Co. pulled its pumps on July 17, and allowed the mine to fill with water. This property was opened by the Merritt interests during the war, and had just started production when the armistice was signed. It remained closed during the winter of 1918-1919, and was opened last summer, a reorganization of the company's finances having been effected. Development on a small scale was carried on through the winter, but nothing but pumping has been done since March. The mine has a stockpile of about 18,000 tons of a good grade of manganiferous iron ore, low in manganese and silica. Inability to sell the product is given as a reason for the shutdown.

LOWERING HEAVY MACHINERY INTO SHENANGO PIT, CHISHOLM, MINN., TO BE USED IN CLEANING UP ORE

MISSOURI

St. Joseph Lead Co. Buys Jake Day Tract—American Metal May Re-enter St. Francois County

Leadwood—The Jake Day tract, near Leadwood, in St. Francois County, has been sold by the Baker Lead Co., of Boston, to the St. Joseph Lead Co. This property contains 357 acres, and was purchased ten years ago by the Boston interests for $357,000, or at the rate of $1,000 per acre, which at that time was regarded as a good price for a tract that had been repeatedly diamond drilled by all the large companies in the district and turned down every time. The first time the property was taken under option and drilled by the St. Joseph company, about 25 years ago, the price was only $100 per acre. The Baker company sunk one shaft on the tract on the edge of Big River that was about 400 ft. deep, but were not financially able to build a mill. From 300 to 500 tons of ore was mined daily for several years, and was hauled 12 miles over the M. R. & B. T. R.R. at an expense of 25c. per ton to the mill of the National Lead Co., where it was milled for 75c. per ton. The ore ran 7 to 10 per cent in lead by actual sampling and assay, under selection, and was decidedly profitable, in spite of this excessive burden of $1 per ton for milling and freight.

The St. Joseph Lead Co. has surrendered its option on the tract it recently drilled in Crawford County and has shipped its drills to Bonne Terre.

Interests connected with the American Metal Co. are examining several tracts in St. Francois County, as they desire to re-enter this district, where they formerly owned the Columbia property, which they later sold to the Doe Run company.

Pottersville — The discovery is reported of zinc ore of good grade on the farm of J. D. Ellison at Pottersville.

MONTANA

Anaconda Considering Doubling Capacity of Rod and Wire Plant—Potomac Mines To Have Rail Facilities

Butte—A program for doubling the capacity of the rod and wire plant at Great Falls, Mont., is said to be receiving consideration by Anaconda officials. This department has proved particularly profitable in the last two years and has been operated practically at capacity. Headway is being made in connection with the company's plans for working phosphate ground near Soda Springs, Idaho.

A second vein has been opened by the Davis-Daly on the 2,700-ft. level of the Colorado mine showing, it is said, 9 ft. of 6 per cent ore. It is believed to be a branch vein and not the No. 2 fissure, the objective of the cross cut on this level.

Sinking is progressing at a good rate at the Plutus shaft of the Butte & Plutus company, with three shifts at work.

Production has been maintained by North Butte at about the rate of about 2,000,000 lb. of copper per month since July 1, which shows practically full recovery from the effects of the I. W. W. strike in April.

Barnes-King's oil-drilling operations at the Kansas-Montana well in the Winifred district, in which the company is interested, are being delayed by a buckle in the casing. Bullion production for June decreased from that of May.

Shaft sinking has been started by the Roberts Minerals Co. on the Roberts claim, 3½ miles north-east of Butte and is down about 35 ft.

Electric power has been installed at the Honolulu and driving of the tunnel will be resumed. About two feet of ore has been cut.

Six mines only still hold a 100-per cent record in the Safety-First contest being held in the Butte district. An "ax-i-dent" meter daily registers the mines which have been free from accidents of any character.

Potomac District—It has been announced by the C. M. & St. P. that it will construct a line from Black Foot to Clearwater. This will bring the Potomac mines close to rail facilities which have been sadly lacking. Crosscutting for the Leonard veins and the Copper Cliff is still in progress.

Elkhorn—At the Boston & Montana the drift is now in the Blue Jay vein for nearly 500 ft. with milling ore continuing all the way and showing a width of more than 6 ft. Further development on the 1,000 level of the Idanha has been suspended. Ballasting of the Montana Southern railway has been completed.

Neihart—The state has instituted suit to prevent the Cascade company from dumping the tailings from its concentrator into a nearby stream on the grounds that it pollutes the water, killing fish and fouling the water.

NEVADA

Round Mountain Company Not To Close Down—Arrowhead Consolidated Pushing Development

Tonopah—Bullion shipments to date indicate a gross production of the district for July of about $500,000. Labor conditions are fair but there is still a shortage of steady men in the camp. The supply of men is adequate to operate all mines to capacity but the condition exists of intermittent working, which is probably due to the prevailing high wages of the district.

The Tonopah Extension company is making fair headway in sinking the Victor shaft from the 1,760 to the 1,880 level. The flow of water impedes operations to a certain extent but pumping equipment is adequate to handle even an increased flow of water. Cleaning up the old workings from the bottom level of the McCane shaft is progressing and it is hoped that within a short time actual development work can be started from this shaft. Tonnage for the last week was 1,550 tons. Development and stoping were satisfactory on the Murray and Merger veins from the 1,350, 1,540, 1,680, and 1,760 levels; and some ore was stoped from the Lower Contact vein.

The Tonopah Mining Co. reports no new developments of importance, tonnage of ore mined being normal and developments satisfactory. This company is making a determined effort to acquire new and promising prospects and is doing preliminary work on several prospects throughout the state.

Development by the West End company on the West End, Ohio and Footwall veins continues favorable, and the mill is operating to capacity on West End, Jim Butler Lease, and Halifax ore. Shipments from the West End mine totaled 1,300 tons for last week. The profit for June is announced as $43,124.42, from 4,425 tons of mine ore and 534 tons of Jim Butler lease ore. Prospecting in the Tonopah "76" ground, being done by the West End company under agreement with the "76" company, from the 800 level of the Ohio shaft, continues in favorable formation. Progress in "76" ground for June is given as 114 ft.

The Belmont tonnage is normal and development continues to prove large tonnage of mill ore both in the vicinity of old stopes, in hanging and foot-wall of the veins, and in new blocks. Narrow veins furnish grade and mine conditions are good. Bullion shipments for the first half of July are given as $83,600.

OLD SURFACE PLANT OF TONOPAH MINING CO. OF NEVADA, TONOPAH, NEV

Tonopah Divide—In the Tonopah Divide mine regular development is under way on the 1st, 3rd and 5th levels, with shaft sinking making good progress. Developments are encouraging and it is stated that the major portion of the 30 tons per day being shipped to the MacNamara mill in Tonopah is coming from development. Many smaller companies in both the Divide and West Divide districts are operating with no new strikes of importance reported.

Arrowhead—Crosscutting on the 300 level of the Arrowhead mine is being done and it is reported unofficially that ore of good grade has been encountered. Details are lacking. Favorable developments are reported in the Arrowhead Consolidated and work is being vigorously prosecuted.

Round Mountain—In spite of rumors to the contrary it has been officially announced that the Round Mountain Mining Co., operating at Round Mountain, has no intention of closing down its hydraulic and lode mines. The hydraulic season is over for this year and

gravel worked this season averaged about $1 per yd., the scale of operation having been about the same as in the previous year. Preparations are being made for impounding more surplus water which will mean a longer period of hydraulic operation during the coming year. The company has plenty of proved ground available for several years, with large areas not yet drilled.

The lode mine is being worked on a small scale only, selective mining being followed. It was not deemed possible to mine a large tonnage of the low-grade ore at a profit under existing conditions, so no increase in tonnage is anticipated at the present time. Gold is the major product, and like all gold mines this property is handicapped by the increased cost of production without a compensating increase in the price of its product. Relief by Governmental action has not yet materialized.

Rand District—There is considerable activity in the Rand district, formerly known as Bovard in the days of the Rawhide boom. For two months the Gold Pen Mines Co. has been operating a Kincaid mill, with a Senn pan amalgamator, treating 10 tons every 24 hours. The water for the mill is hauled 8 miles in trucks, 100 gal. per ton of ore being required. The mine is developed to the 250 level, and there is said to be a good tonnage of mill ore in sight in addition to the higher grade now being treated.

Hughes & Crabtree have made a promising find midway between the Gold Pen and the Walker Bros. ground. Eight feet on the surface averages $6.50 per ton.

Yerington—A transmission line from the high-tension line between the Bluestone mine and the Thompson smelter is being put in by the Walker River Copper Co. to its property opposite Yerington. The company has just completed a 50-ton experimental plant but will have enough power to operate the larger mill that it expects to erect eventually, as well as for more equipment at the mine.

Talapoosa—The camp at the Talapoosa is being moved to a point close to the main workings. It is planned to sink an old prospect shaft, now down 60 ft., to a depth of 300 and then crosscut to prospect the ground thoroughly on this level.

Barcelona — Work has been suspended at the Cons. Spanish Belt mine at Barcelona, near Manhattan, until the power transmission line to the property is completed, which will be several weeks. Hand work was proving too costly, according to the management. E. J. Schrader, superintendent, is now in the East.

Mina—A body of silver-lead-zinc ore has been drifted on for more than 50 ft. on the 350-ft. level of the Simon Contact property.

Contractors sinking the shaft on the Fagan Consolidated an additional 200 ft. have completed the first 100 ft. of the work.

NEW MEXICO

Manganese Mining Active in Little Floridas—Romaho Co. Installing Diesel Engine

Deming—There is considerable activity in the manganese field about 14 miles southeast in the Little Florida Mountains. The Humphreys lease on the Warren-Hoagland property, in charge of C. B. Allen, is working 15 men. The ground is opened in fair shape for production. One shaft, 100 ft. deep, three tunnels, 120, 100 and 40 ft. respectively, and a number of shallow pits, all of which show ore, constitute the development. An average of this ore shows 47.80 per cent Mn and 2.50 per cent SiO_2.

The Wayne Whitehill property, which is undoubtedly an extension of one of the Warren veins, shows about 4 ft. in width of solid ore. The opening is about 20 ft. long but of shallow depth. The Jim Finch property has an inclined shaft down about 40 ft., showing about 2 ft. of good ore. About a half car of sorted ore is on the dump at present. W. J. Summerville of El Paso has recently purchased a half interest in this property.

The New Mexico Metals Exploitation Co., of Santa Rita, N. M., has started to open up what seems to be the northeastern extension of the McClure & Hoagland manganese claims, high up on the easterly side of the Little Floridas. Superintendent Davis reports a 2½-ft. vein of high-grade ore showing upon the surface and traceable for three chains in length.

The ores from this district are shipped from Mesie station on the main line of the Southern Pacific, where the ore loading platform has been enlarged to take care of this tonnage. The distance is about 6 miles with good roads.

Gage—The Victor Mining & Smelting Co. has made a new strike of good lead-silver ore on the Wyman-Corbett property, which it is working under a lease and bond. This is one of the old Haggin & Hearst properties worked extensively during the '80s. Dr. Duryea and associates of New York are the principal stockholders. Norman T. Welch is superintendent.

The Gage Mining Co. has given up its lease on the old W. L. Bradley property and will retire from the district.

Columbus—The Romaho Mining Co. will finish timbering the Waterloo shaft to the 100-ft. level by August 7. A 50-hp. hoist is being installed and a 500-cu. ft. compressor will be purchased at once. A 50-hp. Diesel engine is now at Columbus ready to be hauled to the property.

OREGON

War Eagle Company To Erect 30-Ton Mercury Furnace

Gold Hill—The War Eagle Mining Co., of Medford, Ore., with the Utah group of quicksilver mines, 12 miles north of Gold Hill, has let a contract to W. H. Stickel, of Gold Hill, to burn 300,000 brick at the mines to be used in constructing a 30-ton Scott mercury furnace. The company has also acquired a right from the state to take two second feet of water from Morrison Creek, which will require two miles of 8-in. pipe, to be constructed by Oct. 1.

It is reported that the Chisholm group, adjoining the Utah group, will soon change hands and that a Scott furnace will be erected. This property is equipped with a pipe-type furnace, and has been worked in a crude way since 1878.

The Force group, adjoining, which is also equipped with the pipe-type furnace, has developed sufficient ore to justify a furnace of larger capacity. These properties have been operating only on cinnabar ore running better than 15 per cent mercury and dumping lower grade for future reduction.

UTAH

A. S. & R. Loses Sample Mill at Murray by Fire—Tintic Delaware Wins Suit Against S. L. F. & K. Railroad

Bingham Canyon—The Utah-Apex is successfully using the contract system in working some of its orebodies. The men are paid for the amount of work done, receiving from the company all necessary materials, power and powder. There are 285 men working at the property.

The old New England mine, owned by the Utah-Boston Development Co., is being reopened. It is said that the shaft is to be deepened from the 300 to the 800 level.

It is reported that the Montana-Bingham workings are to be connected with the Mascotte tunnel of the Ohio Copper for better transportation. Ore shipped recently is stated to have run 6 per cent copper; 2 to 6 oz. silver; and $1.50 in gold.

Murray—The destruction by fire of sampling mill No. 4 of the American Smelting & Refining Co. at Murray occurred early on the morning of July 27. The loss is estimated at $50,000. This mill built twelve years ago was the last in a series of four, and especially equipped.

Alta—The recent strike at the South Hecla is producing about half of the daily output of one car of ore. The new ore occurs about 700 ft. below the deepest workings of the old Rustler mine, and is believed to be the downward extension of the Rustler orebody.

Active work is being done at the Woodlawn property in Big Cottonwood Cañon, at which ore has been opened on the 100-ft. level in three places. The present average width of the shipping ore is given as 2 ft. The Columbus-Rexall at Alta in Little Cottonwood reports a large amount of shipping ore in sight.

American Fork—The tunnel of the American Consolidated, which has taken over the Bog and adjoining properties, is in 1,800 feet.

Park City—Shipments for the week ended July 24 amounted to 2,349 tons as compared with 2,267 tons the week

preceding. Again the Ontario, with 911 tons, was the heaviest shipper.

The Silver King Coalition followed with 645 tons.

The Ontario Silver Mining and London Guarantee Co. has been directed by the state industrial commission to pay Laura Cox for herself and for Laura Cox, a minor, $2,160 at the rate of $16 weekly for 135 weeks, to begin from April 27, 1920, and also to pay W. D. Richards, undertaker at Park City $150 for funeral expenses on account of the death of Stanley Cox, killed at the mine April 27.

Milford—There is renewed activity at a number of mines in this district. The Wild Bill, adjoining the Cedar Talisman, is being operated by lessees, who are making shipments. One car shipped recently is stated to have netted $4,000. It was the sixth car of high-grade shipped within three months. The ore was opened from a winze sunk from the bottom of an inclined shaft driven under by the company. There is no power equipment at the property, all work accomplished so far having been done by hand.

The lower tunnel of the Monitor, which is being driven to cut a north-south fissure productive in upper workings, is within 40 ft. of its objective. A thin sheet of ore is present in places in the tunnel roof, and where cut has proved to be 6 to 12 in. thick. The ore is lead-silver of high-grade.

The old Humboldt group is to be reopened by men interested in the Capital company. Equipment has been installed and shaft sinking started.

Eureka—Tintic shipments for the week ended July 24 amounted to 145 cars.

The Tintic Delaware in west Tintic has won a suit against the Salt Lake Fillmore & Kanosh railroad et al., to recover $5,000 and interest on money alleged to have been advanced to representatives of the railroad for building a railroad from the Salt Lake route in Millard County to the Deseret Mountain mine and other properties in the west Tintic district. The verdict is for $4,800 and interest at 8 per cent per annum from July 9, 1918, together with costs of the court. G. W. Craig, president of the company and Alva Craig Nelson, secretary, are held responsible under the decision.

The Tintic Milling will have a car of bullion ready for the market early in August.

The Eagle & Blue Bell is producing about 150 tons of ore daily. Drifting is being done on the 2,000 level, the lowest level, where work was discontinued for a time owing to labor shortage. Much development is being done, especially on the 1,500 and 1,800 levels.

Oakley, Idaho—The Vipont Silver Mining Co., situated in Utah near the Utah-Idaho line, is stated to be treating an average of 130 tons of silver ore in its mill, and shipping concentrates. The Idaho-Utah in this neighborhood is stated to show promise.

WASHINGTON

Northwest Magnesite Co. Operating at Full Capacity—Heavy Demand Reported for Calcined Product

Chewelah—The Northwest Magnesite Co. is producing upward of 300 tons of calcined magnesite daily. It has 3,000 tons ready for shipment. Consumers are offering a bonus of $4 a ton for immediate delivery and will accept shipments arriving in uncovered cars, a situation unprecedented owing to the loss from slacking sometimes suffered from moisture entering unprotected cars. The current price for magnesite at Chewelah is $28.50 a ton. The company is operating five steel kilns, each 136 ft. long. Its tramway brings 620 tons of crude magnesite daily from its quarries, which are working on two shifts. The kilns and tramway are operated continuously. Calcining reduces the weight of the magnesite by 50 per cent. Three hundred men are employed in all.

Invermere—The Silver King property, operated by the Toby Creek Mining Co., Ltd., of Vancouver, B. C., and near the Jumbo fork of Toby Creek, is showing up extremely well. At about 90 ft. from the surface a cross-cut is being driven to the hanging wall of the vein south of the tunnel. This has opened up a ledge about 80 ft. wide of silver-lead ore, running high in silver. There is considerable shipping ore already on the dump. A road is under construction.

Hedley—There now are employed at the Nickle Plate mine, Hedley, B. C., about 150 men, two-thirds of whom are underground and the rest at the mill and power plant. The company is mining $9 gold ore. As it costs about $8.50 a ton to mine, the profits are negligible.

SILVER KING CONSOLIDATED MINING CO.'S MILL ON CALIFORNIA-COMSTOCK SECTION OF PROPERTY, AT HEAD OF THANE'S CANYON, PARK CITY DISTRICT, UTAH

CANADA

Nickel Plate Working $9 Ore at $8.50 Cost—O. B. U. Demands Increase at Blue Bell

Stewart—The season's work has been well under way in the Portland Canal district for several weeks. With the snow gone and the prospectors and miners in the hills, the towns of Stewart and Hyder are almost deserted. On the various properties along the Salmon and the Bear rivers, however, activity prevails. The only notable new discovery reported is on the Georgia River, a few miles down the river from Stewart, where a number of promising gold-bearing claims have been recorded. The Marmot River is also being well prospected and many claims have been located. For the rest, development is continuing on all the better known mines and prospects of the Portland Canal, and road construction is in progress. The Unicorn Group is to be drilled, a contract having been awarded to Lynch Bros., of Seattle, Wash., and F. P. Stewart, familiarly known as "Pap," has returned to the camp to supervise plans for opening up the Mountain Boy group of crown-granted claims. "Pap" is a pioneer of the Portland Canal District, being credited with having directed the attention of Sir Donald Mann to the potentialities of the district.

Invermere—The Silver King property, operated by the Toby Creek Mining Co., Ltd., of Vancouver, B. C., and near the Jumbo fork of Toby Creek, is showing up extremely well. At about 90 ft. from the surface a cross-cut is being driven to the hanging wall of the vein south of the tunnel. This has opened up a ledge about 80 ft. wide of silver-lead ore, running high in silver. There is considerable shipping ore already on the dump. A road is under construction.

Hedley—There now are employed at the Nickle Plate mine, Hedley, B. C., about 150 men, two-thirds of whom are underground and the rest at the mill and power plant. The company is mining $9 gold ore. As it costs about $8.50 a ton to mine, the profits are negligible. Considerable development is planned in the hope that richer ore will be found. Ore is being mined on several levels, the upper one being 600 ft. below the surface and the lower 1,000 ft. Two-ton cars run on a narrow-gage electric railway for a mile out of the mine. The ore is then dumped into a tipple at the top of a steep side hill. From here it goes in cars to the mill.

Nelson—The Blue Bell mine at Riondel, B. C., is the latest property to come under the interdiction of the One Big Union. This organization has demanded for the workers in this mine a scale of wages which, it is said, amounts to an increase of 40 cents per day over what was being paid. The Blue Bell is the oldest mine in the Kootenays, dating back to 1895, and is operated by the New Canada Metal Co.

Salmo—Nugget Gold Mines, Ltd., is milling about 40 tons of ore daily which will continue until development is further advanced. The tails are running about 21c. a ton, the feed carrying $10 to $18 gold per ton. The mill is equipped to cyanide 150 tons daily.

Trail—Ore shipments received at the Consolidated M. & S. Co.'s smelter at Trail, during the week ended July 21, were as follows:

Mine	Location	Gross Tons
Bluebell, Riondel		69
Emerald, Salmo		33
Florence, Princess Creek		66
Mandy, Le Pas, Man.		313
North Star, Kimberley		78
Silver Bear, Kaslo		28
Velvet, Rossland		30
Company mines		6,444
Total		7,061

Victoria—Although no extensive development of the magnesite of British Columbia has taken place as yet, there are a number of large and noteworthy deposits. One of the most important is that situated near Atlin, in the northern section of the province. A few hundred tons of hydro-magnesite has been shipped from this point, but the freight charges have proved a handicap. The unusual purity of the magnesite in question, however, may permit its use for special high-priced work.

G. A. Young, of the Geological Survey of Canada, estimates that, within the various blocks, there are at present at least 150,000 tons of this hydro-magnesite which could be worked with the expectation of obtaining a product carrying between 41 per cent and 42 per cent MgO with about 3 per cent lime, iron oxide, alumina and silica. The thickness of the deposit is from 2 to 3 ft. The analyses show the material to contain about 2 per cent water that could be removed by drying and about 20 per cent combined water which could be driven off by roasting or calcining. Owing to transportation costs, it is considered desirable that the material be calcined before shipping. The material occurs in the form of a very fine powder when dried.

There are several magnesite properties in the central interior of the province, north of Ashcroft, none of which has been developed extensively, but there is no doubt that the deposits are large. The magnesite properties of this district have been described with analyses in the *Canadian Chemical Journal*, published 72 Queen Street West, Toronto, June and July, 1919, by L. Reinecke, of the Geological Survey.

The latest step taken by William Sloan, minister of mines, toward the acquirement of information bearing on the possibilities of the establishment of an iron and steel industry in British Columbia is the appointment of F. J. Crossland, of Vancouver, B. C., consulting mining engineer and geologist, to carry out a thorough inspection of the hematite and limonite ore deposits of the Clinton Mining Division situated in the Whitewater River region and to establish, as far as possible in one season's work, the tonnage of this mineral available.

At the last session of the Provincial Legislature, Mr. Sloan spoke of the possibilities of private enterprise or the government giving consideration to the taking of initial steps toward launching this industry. He spoke of a report received from William M. Brewer, government mining engineer, who made an examination of the deposits last year and was favorably impressed, figuring from an examination, necessarily superficial because of the limited time at his disposal, that there was a possible 50,000,000-ton deposit of limonite of good quality, eminently suitable for fluxing with the magnetite ores of the Coast in the production of pig iron by blast furnace, and so situated as to be easily mined. Mr. Sloan then stated that it was his intention to have the district well explored, and his engagement of Mr. Crossland is in line with that undertaking.

It is pointed out, in this connection, that the Provincial Government work is to be supplemented by that of the Geological Survey Branch, Department of Mines, Ottawa, which will have two parties in the field. One of these, under J. D. MacKenzie, will make a geological survey of the Taseko (Whitewater) Lake area and the other, under C. H. Freeman, will conduct a topographical survey.

As an instance of the utility of the amendment to the mineral act introduced by the Minister of Mines at the last session of the legislature, it is announced, coincidentally with Mr. Crossland's appointment, that a reserve has been declared on the drainage area of the Taseko (Whitewater) Lake, Chilko Lake, Tsuniah, Choilquoit, and the Chilko River and Big Creek, Clinton Mining Division. This reserve takes effect on the first of June. Claims already recorded will not be interfered with, as provided by the terms of the act, but all open iron properties, within the limits defined, will be held by the Crown until it is determined how far they need be used for the encouragement of the industry.

On the general question of the production of iron and steel from the iron ores of British Columbia, Mr. Sloan expresses the opinion that conditions were never more favorable for the successful establishment and maintenance of the necessary plant. If the limonite deposits of the Whitewater country turn out to be what reports appear to indicate, he says, there will be no problem to hinder the handling of the magnetite ores by blast furnace. The economic possibilities of the electro-thermic principle, however, are not being overlooked.

Ontario

Porcupine—Vein No. 5 of the McIntyre which has been opened up at the 1,125-ft. level is from 9 to 10 ft. wide and is said to average $18 gold per ton. It has been opened for nearly a quarter of a mile and found to extend into the Jupiter claim.

The shareholders of the Porcupine Vipond-North-Thompson on July 27 ratified the proposal to sell 600,000 shares of treasury stock to a syndicate in which English interests are prominent. Immediate delivery is to be made of 200,200 shares at 15c. with an option of 200,000 more at 30c. for six months; and a further option on another 200,000 shares for ten months at 50c. This transaction will secure funds for the re-opening of the mine.

The option that has been held by the Dome Mines on the Dome Extension expires Sept. 15 and whether it will be exercised or allowed to lapse is believed to be largely dependent on the result of operations now being carried on at the tenth level. A large orebody at a vertical depth of 1,150 ft. at the boundary line of the two properties, having a dip into the Dome Extension, has been indicated by diamond drilling. The core from the diamond drill hole was officially stated to show a gold content of $7.94 per ton for a distance of 93 ft., and $5.16 for an additional distance of 23 ft. The present work is being undertaken to verify these results. The orebody on the 850-ft. level of the Dome Mines shows a width of 43½ ft. and carries an average of about $7.60 to the ton, with an ore shoot stated to show much greater enrichment.

Kirkland Lake—Good progress is being made with the construction of the Wright-Hargreaves mill. The structure is almost completed and the mechanical equipment is in process of installation. Two crushers, a ball mill and two tube mills are in position.

The Orr Company has purchased the assets of the Kirkland Porphyry mines, which recently went into voluntary liquidation. Mining operations will be resumed immediately.

The Kirkland Combined mines has resumed work using the Sylvanite plant. The shaft is down 200 ft.

The Lake Shore Mines, Limited, during June recovered $37,546 from the treatment of 1,535 tons of ore, being an average of $24.46 per ton. The output for the first six months of the year was $244,710.

The shaft on the Kirkland Lake is down 900 ft., being 300 ft. lower than any other working in the camp. During the first four months of the year the total production was $107,700, the mill running at about two-thirds capacity and treating approximately 100 tons per day.

Cobalt—The Temiskaming has installed an oil flotation plant of the Callow type which is expected to be in operation about the middle of August.

At the Crown Reserve gold has been encountered at a depth of about 800 ft. occuring in the quartz. Assays are said to show $12 to the ton.

Sudbury—A large number of farmers in the neighborhood have brought actions against the International Nickel Co. claiming damage for injury to their farms from sulphur fumes.

West Shining Tree—The Wasapika Gold Mines proposes to sell part of 2,000,000 treasury shares at 10c. The capital of the company is $6,000,000.

THE MARKET REPORT

Published in part in San Francisco and mailed from there to our Western subscribers as a special service without charge pending the arrival of the *Engineering and Mining Journal*

Daily Prices of Metals in New York

July	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
29	18 50	44.75	48.00@48.50	8.60	8.25@8.75	7.65@7.70
30	18.50	44.75	48.00@48.50	8.60	8 25@8.75	7.65@7 70
31	18.50	44 75	48.00@48.50	8.60	8.25@8.75	7 60@7 65
Aug.2	18.35@18.50	44.75	48.00@48.50	8.60	8.25@8.75	7.55@7.60
3	18.35@18.50	45.00	48.25@48.50	8.60	8.25@8.75	7.55@7.60
4	18.25@18.50	44 00	47.50@47.75	8.60	8.25@8.75	7.50@7.55

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered" which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

July	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
29	90⅜	93¼	110	265	270	36⅜	36⅜	41	42⅜
30	92¼	94½	110	268¼	273¼	37¼	37½	41¼	42⅜
31	....	....	...	....	....	...	...	...	...
Aug. 2	....	....	...	....	....	...	...	...	...
3	92½	94⅜	111	273	278	37⅜	38	41½	43
4	94⅜	96¾	111	275¼	279¾	38⅝	38¾	42¾	44½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

July	Sterling Exchange	Silver			Aug.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
29	374	99½	93¼	56⅛	2	371½	99½	93⅜	
30	370½	99½	92⅝	56¼	3	367	99½	93¾	57
31	371½	99½	93⅜	56⅝	4	355	99½	92¾	57⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Aug. 4, 1920

Inactivity still characterizes the major metal market. Buyers refuse to be interested except at cut prices. With money at the present high rates of interest, some producers are willing to shade prices, to relieve themselves of accumulating stocks of copper and zinc. Dealing in metal for forward delivery is discouraged, owing to the fact that costs will be increased on account of the recent 25 to 40 per cent increase in freight rates, yet, in the present buyers' market, no increase can be obtained.

Copper

Buyers refuse to pay the prices asked by the large producers, so that the latter's quotations are nominal. Some fairly large lots have been sold for delivery during August and September at about 18.50c. delivered. We have heard of no sales for later delivery, but it is likely that business would be refused unless a premium of ¼ to ⅜c. were paid. The market is decidedly weak, and improved European conditions, on which the hope of better copper prices is founded, seem even further away than ever.

Monthly Average Prices for July

Copper:	
New York Electrolytic	18.576
London Standard	90.148
London Electrolytic	106.455
Lead:	
New York	8.338
St. Louis	8,283
London	34.960
Silver:	
New York, foreign.....	91 971
New York, domestic	99.500
London	53 736
Sterling Exchange	385.538
Zinc:	
New York	8.070
St. Louis	7.720
London	41.886
Tin:	
99 per cent	45.798
Straits	49.154
London	261.886
Antimony	7.500
Quicksilver	90.333

Lead

No change can be reported. As high as 9c. has been paid for small lots of New York lead for September and October delivery. Larger quantities have sold for 3c. less, and the A. S. & R. contract price remains at 8.50c. A shipment of 250 tons of English lead on the dock here has been offered at 8.90@9c. during the week without anyone showing interest. The report of scarcity of prompt lead is almost certainly artificial, and consumers are in general well taken care of by contracts. Lead is coming out of Mexico again after a practical cessation for the last six weeks, and further English importations are unlikely. Cable manufacturers seem to be taking an interest in the market for a change.

Zinc

The dragging zinc market is largely due to the fact that galvanizers cannot get black sheets. Bad transportation conditions have limited the supply, and the steel mills can sell all they have at fancy prices to automobile manufacturers and others without galvanizing them. The galvanizers in the Pittsburgh district are operating at only 25 to 50 per cent capacity. The expected improvement in transportation conditions and the lessening activity among automobile manufacturers should help the zinc market.

Most of the metal sold last week was for nearby delivery, at decreasing prices, but forward delivery can be obtained at about the same figure.

Tin

Consumers have shown a little more interest the last day or two, but the market is dead. The unsettled foreign

exchange is a bad influence. Twenty-five tons of spot Straits was auctioned on the Metal Exchange yesterday for 47.80c.

Straits tin for future delivery: July 29th, 48@48.50c.; 30th, 48@48.50c.; 31st, 48@48.50c.; Aug. 2d, 48@48.50c.; 3d, 48.25@48.50c.; 4th, 47.50@47.75c.

Arrivals of tin in long tons: July 29th, Hongkong, 10; 30th, Rotterdam, 100. Total for July, 3,870. Aug. 2d, London, 85; Straits, 725; China, 175; Liverpool, 100; Aug. 3d, Liverpool, 25; London, 100; Straits, 425; Singapore, 275.

Silver

The trade conditions in China and India are still unsatisfactory, and much of the demand for silver is of a speculative character. Domestic demand for the arts is dull at this season of the year.

Mexican Dollars — July 29th, 71c.; 30th, 70¼c.; 31st, 71c.; Aug. 2d, 71c.; 3d, 71⅛c.; 4th, 70¼c.

Gold

Gold in London on July 29th, 109s. 9d.; 30th, 110s. 6d.; Aug. 3d, 112s.; 4th, 114s. 6d.

Foreign Exchange

Disturbed European conditions have caused a continued decline in exchange rates. Yesterday francs were 7.34c.; lire, 5.15c., and marks 2.19c. New York funds in Montreal, 12¾ per cent premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7⅛c. per lb.; Cookson's "C" grade, 14c. Chinese and Japanese brands, 7½c. W. C. C. brand, 8¼@9c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—In sympathy with platinum jumped from $80 to $100 per oz.

Platinum—Sharp increase during the week from $80 to $105 per oz., caused by heavy demand of the jewelry trade. $95 per oz. in 100 oz. lots.

Quicksilver—Market steady; $88@$90 per 75-lb. flask. San Francisco wires $85. Unsteady.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Other ports show gain in shipments. Slow delivery of coal and coke to furnaces has caused operators to reduce their iron-ore requirements.

Manganese Ore — 70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 75@85c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO., $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$8 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 5c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo., July 31—Zinc blende, per ton, high, $50.90; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50; calamine, 40 per cent zinc, $36. Average settling prices: Blende, $44.23; calamine, $36; all zinc ores, $44.03.

Lead, high, $103; basis 80 per cent lead, $100; average settling price, all grades of lead, $100 per ton.

Shipments for the week: Blende, 7,327; calamine, 172; lead, 1,108 tons. Value, all ores the week, $440,980.

Shipments for seven months: Blende, 340,589; calamine, 5,885; lead, 53,405 tons. Value, all ores seven months, $22,492,790.

Platteville, Wis., Aug. 1—Blende, basis 60 per cent zinc, $51@$53 base for high-grade blende. Lead ore, basis 80 per cent lead, $95 per ton.

Shipments for the week: Blende, 1,555; calamine, 60; lead, 35; sulphur ore, 44 tons. Shipments for the year: Blende, 41,778; calamine, 2,300; lead, 3,680; sulphur ore, 1,142 tons. Shipped during the week to separating plants, 2,545 tons blende. Owing to general unfavorable conditions mines continue to close. The Wisconsin Zinc Co. ceased producing operations this week.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground,

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30, car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $20 in less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $13@$20 per ton; roofing grades, $12@$15; rubber grades, $12@$45, all f.o.b. Vermont. California talc, $20@$35, talcum powder grade. Southern talc, powdered, car load lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, prompt delivery, $225, freight allowed; last half, $200@$220; English, $200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$8.25 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, $33.50 per ton; wire, quoted 31½c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 12½c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26½c.; sheathing, 25½c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$90@$100 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $50@$55 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $45@$50. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$100@$110 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—9-in. per 1,000, $51@$55, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 3, 1920

Pig Iron—The market continues dull in point of tonnage, and those who buy are only those who are insistent upon early deliveries. A little foundry has sold at $46, establishing the market at $1 advance, while bessemer on limited sales has gone at $47, involving $1 advance. We now quote: Bessemer, $47, basic, $46; foundry, $46, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel—Some offerings of sheet bars have been made by middle interests at $68, the former minimum having been $70. We quote: Billets, $60@$65; sheet bars, $68@$75; rods, $70@$75.

Birmingham, Ala., Aug. 2

That there will be need for large quantities of iron ore in the South for a long time is evidenced by the pig-iron and steel markets, sales having been made on which delivery can hardly be finished for six months and longer. Inquiries are being received daily now by the pig-iron manufacturers as to iron for 1921 delivery, and a few sales have been made. Quotations are showing a little more [illegible], sales having been made at $41 per ton, No. 2 foundry, 1.75 to 2.25 per cent silicon, and $42 has been the staple price for some time. Full production at blast furnaces can be looked for into the second quarter of next year at least.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 4½c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

The Southern Phosphate-Rock Market*

A Brief Statement of the Trade Activities in the World's Leading Phosphate-Producing Region—Possible Impending Fall Shortage

AFTER the usual heavy spring and winter business, the customary lull in the phosphate-rock market and apparent inability to sell this material took place in April, May, and June, with an accompanying speeding up of mining on the part of producers, an invariable occurrence as the better weather of summer advances, resulting in what might be considered a soft market. As a matter of fact, some concession in price below $10 for 70 per cent ground rock, down as low as $9 per ton for this grade of material, was made, but instead of the Florida producers making a rush for domestic business, the export business was so enormously speeded up that domestic consumers were unable to draw on the anticipated over-production of Florida, and about the middle of last month another heavy surge took place in the demand for phosphate rock, resulting in the price going up for 70 per cent ground rock to $11 and $11.50 per short ton.

Unfortunately the supply of cars furnished to the Tennessee field was considerably cut down by the retardation of shipments during the spring fertilizer season, and it seems almost impossible to get the flow of empties started back to the Tennessee producers, with the result that a possible rock famine again confronts the acidulators or fertilizer manufacturers for this fall and winter.

Review of the Industry for 1919

The phosphate-rock mining industry in the United States experienced a greater swinging of the pendulum toward high prices during 1919 than has ever before been attained in the history of the industry. This history has been a succession of such swings of the pendulum from very high to very low, but with the exception of 1914, in each case the high swing had been higher than before and the low swing had never gone so far back as before. The last high swing of the pendulum had culminated in 1907 with the panic of that fall and the selling price of 75 per cent rock took a sudden downward surge from $7 per ton to $3 or $3.50 per ton. Following the panic the swing was, as usual, slow and gradually toward another high point, until 75 per cent rock had reached a price at $4.75 per ton during July, 1914. The outbreak of the European war, by cutting off export shipments, caused the supply to be exactly double the immediate demand, as prior to 1914, about one-half of the total production of phosphate rock in the United States was shipped abroad. In this way, the phosphate rock business was affected as adversely by the war as it favorably affected other lines of chemical and metallurgical industry.

Growing Domestic Consumption

The following table shows for selected years from 1874 to 1918 the total sales of phosphate rock in each of the years named, the amount exported and the amount sold for domestic consumption.

SALES OF PHOSPHATE ROCK IN THE U. S. IN TONS OF 2,240 LBS.

Year	Total	Exported	Domestic Sales
1874	122,790	70,546	52,244
1887	480,588	199,735	280,853
1907	2,251,459	1,018,212	1,233,247
1913	3,111,221	1,366,508	1,744,713
1914	2,734,043	964,114	1,769,929
1915	1,835,667	253,421	1,582,246
1916	1,982,385	243,678	1,738,707
1917	2,584,287	166,358	2,417,829
1918	2,490,760	143,455	2,347,305

The year 1874 is selected as the first year for which complete statistics of both export and domestic shipments are available, 1887 as the high point of the period of recovery following the disturbed conditions of the 70's, and 1907 as the high point of the period terminated by the panic of that year. The year 1913 has been selected as the peak of the last full calendar year before the European war, and 1914 to 1918 inclusive are given to show the course while the European war was in progress.

Business in 1919 had been well on its way to a large increase over 1918, when the Florida strike, culminating in April, resulted in such a heavy decrease in shipments from that field from April to October or November as to bring the 1919 estimate of consumption slightly lower than 1918, notwithstanding the herculean efforts made by Tennessee producers to make up the deficit in the Florida output. The present activity and demand are somewhat of a reaction to the disturbing labor troubles of last year.

Changes in the Uses of Phosphate

The ordinary consumption of phosphate rock in the past has been practically entirely confined to the manufactures of acid phosphate for fertilizers, but in the last few years the development of phosphate baking powders, and increased amount of phosphorus and phosphorous compounds manufactured from phosphate rock have constituted a considerable factor in the demand. Added to this, the use of the low-grade soft phosphates of Florida and the high-grade soft brown phosphates of Tennessee for direct application to the soil without acidulation has greatly increased, and bids fair in a short time to outstrip acid phosphate as a chief application of phosphate rock.

Practically all of the phosphate plants in Tennessee have increased their productive capacity and several entirely new developments have been made which are just coming on the market.

If the Florida producers pursue the same tactics that they have in the past, of competing with their very large production against the comparatively small production possible from Tennessee, lower prices may be secured by the fertilizer manufacturers in new low-priced long-time contracts.

The steady course of the phosphate-rock market seems to be toward a price per unit of phosphorus equal to that paid for bones used in the manufacture of phosphorus.

Were the Tennessee fields to attempt production of any such large tonnage as Florida produces, the high-grade brown rock would be quickly exhausted; hence there should be no difficulty whatever in any owner of this material ultimately securing from $10 to $15 per ton for all he has left.

The tendency of many of the largest holders of phosphate-rock deposits, because they are primarily fertilizer manufacturers, has been to keep down the price of phosphate rock and thus show a greater profit in the manufacture of fertilizer, and it is a question whether the results brought about by this tendency have been in any way healthy for the industry. The fertilizer industry in general may find it advantageous to consider the basic raw material of their business on the same plane as sulphuric acid and other materials entering into the manufacture of the complete fertilizer, instead of, as in the past, keeping phosphate in a condition prejudiced to their general welfare.

During recent periods of depression, some large phosphate producers again made low-price long-time contracts covering future requirements. It is the opinion of an important producer in close touch with the market that those who have done so will be as regretful as they were during the last two or three years of advancing prices, with the old $4, $5 and $6 contracts in force. If the holders of phosphate-rock deposits will join in a wise policy of conservation of this most important basic commodity, it will be easily possible to maintain the market on the steady progressive plan which will redound to the greatest good of the general public interested in the transmutation of this important element into food.

H. D. RUHM.

*See editorial comment on phosphate rock in the United States on page 245.

Correction—In the issue of July 31, the balance of the Howe Sound Co. should have read $3,220,381.39, instead of $441,738.72.

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York			London		
	1918	1919	1920	1918	1919	1920
January	88 702	101 125	132 822	44 356	48 438	79 846
February	85 216	114 540	131 295	47 792	48 027	85 005
March	88 082	101.125	125 551	43 620	48 121	24 194
April	95 346	101 125	119 729	47 215	48 886	68 848
May	99 505	107 135	102 585	48 980	52 104	60 010
June	99 500	110 430	90 957	48 825	53 896	51 096
July	99 625	106 394	91.971	48 813	54 133	53 736
August	100 292	111 320	.....	49 022	58 835	.....
September	101 125	114 540	.....	49 500	61 668	.....
October	101 125	119 192	.....	49 500	64 049	.....
November	101 125	122 924	.....	48 969	70 065	.....
December	101 125	131 976	.....	48 492	76 432	.....
Year	96 772	111 122		41 516	52 059	

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		(*b*) Electrolytic	
	1919	1920	1919	1920	1919	1920
January	(*a*)	18 918	92 238	118 095	106 619	123 238
February	16 763	18 569	78 200	120 188	95 700	126 950
March	14 856	18 331	76 871	109 533	82 021	118 348
April	15 246	18 660	77 300	103 025	82 200	111 500
May	15.864	18 484	72 262	96 250	81 227	109 200
June	12 610	18 065	83 062	87 864	85 900	101 909
July	21 600	18 526	99 526	90.148	103 046	106 465
August	22 319	..	97 300	.....	106 429	..
September	21 255	..	100 767	.....	.....	.....
October	21 534	.....	103 418	.....	.....	.....
November	19 258	..	98 894	.....	.....	.....
December	18 295		103 208	.....	.....	.....
Year	18 691		90 796	.....	.....	.....

(*a*) No market. (*b*) See note on page 287.

Lead

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	5 432	8 561	5 316	8 300	32 277	42 095
February	5 052	8 814	4 284	8 601	28 675	50 256
March	5 226	9 145	4 992	8 894	27 952	45 054
April	4 982	8 902	4 222	8 618	24 888	39 225
May	5 018	8 576	4 223	8 352	23 852	38 488
June	5 340	8 323	5 020	8.169	22 544	34 330
July	5 626	8 338	5 408	8 283	23 457	34 960
August	5 798	..	5 583	.....	25 330	..
September	6 108	..	5 853	.....	28 473	..
October	6 487	....	6 249	.....	34 731	..
November	6 808	....	6 649	.....	41 202	.....
December	7.231	....	6 955	.....	.....	.....
Year	5 759	..	5 530	.....	28 590	

Tin

	New York				London	
	1919		1920			
	99%	Straits	99%	Straits	1919	1920
January	67 702	.....	61 596	.....	248 552	326 517
February	66 801	.....	58 466	59 932	223 963	395 250
March	62 934	.....	61 037	61 926	236 843	369 489
April	77 500	.....	61 120	67 115	225 225	345 450
May	72 500	.....	53 230	55 100	234 398	294 813
June	71 240	.....	46 125	48 327	238 263	250 614
July	68 000	.....	45 298	49.154	253 222	261 886
August	52 226	..	..	.....	273 625	..
September	54 482	..	.....	.....	280 102	..
October	54 327	..	.....	.....	279 239	..
November	53 302	..	.....	.....	283 556	.....
December	53 870	..	.....	.....	314 113	.....
Av. year	63.328	..	.....	.....	257.601	.....

Zinc

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	7 222	9 483	6.922	9 133	56.045	58 643
February	6.623	9 058	6 273	8 708	46 150	61 338
March	6 500	8 881	6 150	8 531	38 500	53 467
April	6 465	8 534	6 114	8 184	36 118	47 388
May	6.429	7 938	6.079	7 588	35 427	45 088
June	6 901	7 815	6.551	7 465	36 763	41 193
July	7.823	8 070	7 523	7 720	41 815	41.886
August	7 789	.....	7 160	.....	39 338	...
September	7 510	.....	7 473	.....	40 955	...
October	7 823	.....	7 827	.....	43 630	.....
November	8 177	.....	8 350	.....	46 588	.....
December	8 700	.....	8 350	.....	53 101	.....
Year	7 338	.....	6.988	.....	42 829	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer ‡		Basic ‡		No. 2 Foundry ‡	
	1919	1920	1919	1920	1919	1920
January	$33 60	$40 42	$31 40	$39 88	$32 40	$39 86
February	33 60	42 954	31 40	42 61	32 40	43 40
March	32 54	43 40	31 40	42 90	29 12	43 40
April	29 35	43 22	27 15	44 22	28 15	43 90
May	29 35	44 003	27 15	44 885	28 15	45 36
June	29 35	44.89	27 15	45 41	28 15	46 40
July	29 35	42.21	27 15	47 42	28 15	46 56
August	29 35		27 15		28 15	
September	29 35	..	22 15		28 15	
October	29 35	.....	27 15		28 30	
November	31 60	.....	31 56		32 16	..
December	36 52	..	35 32	..	36 86	
Year	$31 11	..	$29 76	...	$28 35	

‡ As reported by W. P. Snyder & Co.

Antimony, New York; July, 7.500c.

Quicksilver, New York; July, $90.333.

Monthly Copper Production

The table which appears herewith represents the crude-copper content of blister copper, in pounds.

MONTHLY CRUDE COPPER PRODUCTION, 1920

	March	April	May	June
Alaska shipments	4,897,088	6,502,515	7,331,59	7,213,820
Arizona:				
Arizona Copper	3,000,000	3,000,000	3,000,000	3,000,000
Calumet & Arizona	4,428,000	3,127,000	4,760,000	4,764,000
Cons. Ariz Smelting	1,250,000	1,200,000	1 250 000	940,000
Inspiration	6.5 0,000	6,000,000	7,500,000	7,300,030
Magma	830.735	895 082	918,321	755,601
Miami	4,091,535	4,924,420	5,054,760	4,400,000
New Cornelia	3,408,000	3,560,000	3,220,000	3,664,000
Old Dominion	2,358,000	2,180,000	2,287,400	2,999,000
Phelps Dodge	6,145,000	5,700,000	6,761,000	6,627,000
Shattuck Arizona	344,938	214,122	219,118	198,327
Ray	3,900,000	4,500,000	4,260,000	4,520,000
United Verde	5,900,000	5,300,000	5,400,000	5,880,000
United Verde Extension	3,977,898	3,270,218	3,219,934	2,828,020
Michigan:				
Calumet & Hecla	9,880,577	9,537,476	8,803,811	9,027,879
Other Lake Superior	6,420,000	6,420,000	6,200,000	6,200,000
Montana:				
Anaconda	18,450,000	15,800,000	9,700,000	12,700,003
East Butte	1,909,720	1,291,840	1 412 260	1 396,140
Nevada:				
Nevada Cons.	3,700,000	4,140,000	4,350,000	4,650,000
New Mexico:				
Chino	4,413,329	3,543,471	3,930,228	4,010,069
Utah:				
Utah Copper	8,894,596	9,313,227	9,904,781	10,000,000
Eastern Smelters	1,610,000	1,610,000	1,600,000	1,600 000
Total reported	106,308,916	102,078,871	101,584,207	104,668,856
Others, estimated	14,000,000	14,000,000	13,380,000	12,000,000
Total United States	120,308,916	116,078,871	114,964,207	116,668,856
Imports: Ore and concentrates, etc	9,766,336	2,766,457	1,607,003	
Imports in blister, etc	19,108,437	14,182,933	43,253,540	
Grand total	149,183,689	138,028,261	168,824,750	
British Columbia:				
Granby Con.	2,095,500	2,105,400	2,131,219	2,029,093
Mexico:				
Boleo	1,193,416	1,063,168	650,908	802,474
Cananea	3,700,000	4,000,000	4,300,000	3,750,00
Phelps Dodge Mexican properties	1,786,000	2,098,000	1,141,000	1 427 000
Other Foreign:				
Cerro de Pasco	5,658,000	3,942,000	3,800,0	3 744
Chile	9,256,000	8,172,000	10,300	7
Katanga	3,229,739	2,601,428	3,847,0	4
Backus & Johnston	958,000	1,354,000		

Domestic copper production for 1918, 1919, and part of 1920 follows:

	1918	1919	
January	165,431,568	133 733,511	121
February	160,011,364	111 649,512	17
March	185,525,168	102,040 460	120
April	163,207,096	98 808,998	116
May	181,070.350	92 652,975	114
June	166,723,599	95,856 570	116,668 856
July	159,320.031	100,369,247	
August	165,555 799	107,904,040	
September	157,992.487	108,703,025	
October	168,838 775	115,143,143	
November	159,217 588	117,289,235	
December	161,801 916	102,997,633	

MINING STOCKS

Week Ended July 31, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston			*65		
Ahmeek	Boston	59¹	58	58	June '20, Q	.50
Alaska-B.C.	N. Y. Curb	1 5/16	1/2	11/16		
Allouez	Boston	2 3/4	25	2	Mar. '19,	1.00
Anaconda	N. Y	55¼	52½	53¹	Feb. '20, Q	1.00
Ariz. Com'l	Boston	10¼	9¼	10¼	Oct. '18,	.50
Big Ledge	N. Y. Curb	1/8	1/16	1		
Bingham Mines	Boston	8½	8½	8½	Sept. '19, Q	.25
Calumet & Ariz.	Boston	58½	56½	57	June '20, Q	1.00
Calumet & Hecla	Boston	300	299	300	June '20, Q	5.00
Canada Copper	N. Y. Curb	1 1/16	1/8	1/16		
Centennial	Boston			11¼	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	44	41½	42	June '20, Q	1.00
Chief Consol.	Boston Curb	3½	3½	3½	Feb. '20, Q	.10
Chile Cop.	N. Y.	15	14	14½		
Chino	N. Y.	29½	27¼	29½	June '20, Q	.37½
Columbus Rexall	Salt Lake	*41½	*35	*36½		
Con. Ariz.	N. Y. Curb			1/16	Dec. '18, Q	.05
Con. Copper M	N. Y. Curb			2 1/16		
Copper Range	Boston	38½	37	37½	June '20, Q	.50
Crystal Copper	Boston Curb	*30	*26	*27		
Davis-Daly	Boston	8½	8½	8½	Mar. '20, Q	.25
East Butte	Boston	12	11½	11½	Dec. '19, A	.50
First Nat'l	Boston Curb	*95	*90	*92	Feb. '19, SA	.15
Franklin	Boston	*90	*70	*80		
Gadsden Copper	N. Y. Curb			*71		
Granby Consol.	N. Y.	36	36	36	May '19, Q	1.25
Greene-Can	N. Y.	29½	28	28	Feb. '19, Q	1.50
Hancock	Boston			4½		
Houghton	Boston Curb			*60		
Howe Sound	N. Y. Curb	3¼	3½	3¼	July '20, Q	.05
Inspiration Con.	N. Y.	50	47¾	49½	July '20, Q	1.00
Iron Cap	Boston Curb	8¼	8½	8¼	Feb. '19, M	.25
Isle Royale	Boston	29	29	29	Sept. '19, SA	.50
Kennecott	N. Y.	25¼	23¾	24¾	June '20, Q	.50
Keweenaw	Boston			1¼		
Lake Copper	Boston	3	3	3		
La Salle	Boston			3		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb			30	Jan. '19, Q	.50
Majestic	Boston Curb			*15		
Mason Valley	N. Y. Curb			2½		
Mass. Con.	Boston	3½	3	3	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5½	4½	5		
Miami	N. Y.	20½	19½	20	May '20, Q	.50
Michigan	Boston	4½	4	4		
Mohawk	Boston	61	60½	60½	Feb. '20, Q	1.50
Mother Lode (new)	N. Y. Curb	6	5½	5½		
Nevada Con	N. Y.	12⅛	11⅛	11⅛	June '20, Q	.25
New Arcadian	Boston	3	3	3		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17½	17	17½	May '20,	.25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	16¾	15½	15⅝	Oct. '18, Q	.25
North Lake	Boston			*60		
Ohio Copper	N. Y. Curb			1 3/16		
Oulbway	Boston			1¼		
Old Dominion	Boston	24½	24	24	Dec. '18, Q	1.00
Osceola	Boston	39	37¼	37½	June '20, Q	.50
Phelps Dodge	Open Mar.	†195	†180		July '20, Q	2.50
Quincy	Boston	49	48	49	Mar. '20, Q	1.00
Ray Con	N. Y.	16	15⅜	15¾	June '20, Q	.25
Ray Hercules	Boston Curb			*60		
St. Mary's M. L.	Boston	39	39	39	June '20, K	2.00
Seneca	Boston	14	13½	13½		
Shannon	Boston	1¼	1¼	1¼	Nov. '17, Q	.25
Shattuck Ariz	N. Y.	9	8¾	8¾	Jan. '20, J	.25
South Lake	Boston	2	2	2		
South Utah	Boston			*15		
Superior	Boston			5	Apr. '17,	1.00
Superior & Boston	Boston	3½	3	3½		
Tenn. C. & C.	N. Y.	10	9	9½	May '18, I	1.00
Tuolumne	Boston	*55	*55	*55	May '13,	.10
United Verde Ex.	Boston Curb	31½	30½	30½	June '20, Q	1.50
Utah Con	Boston	6	6	6	Sept. '18,	.25
Utah Copper	N. Y.	66½	64¾	65	June '20, Q	1.50
Utah M. & T.	Boston	1½	1½	1½	Dec. '17,	.30
Victoria	Boston	2	2	2		
Winona	Boston	*59	*50	*50		
Wolverine	Boston	15	15	15	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	4½	3 13/16	4	June '20, QX	.20
St. Joseph Lead	N. Y.	15½	15½	15½	June '20, QX	.50
Stewart	Boston Curb			*16	Dec. '15,	.05
Utah Apex	Boston	1½	1½	1½	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	13½	12½	13	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	44½	44½	44½	May '20, Q	1.50
Butte C. & Z.	N. Y.	8½	7½	7½	July, '18, I	.50
Butte & Superior	N. Y.	22½	20	20	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	11	10½	11	June '20, Q	.50
New Jersey Z.	N. Y. Curb	196	186	188	May '20, SA	4.00
Success	N. Y. Curb	*4½	*4	*4½	July '16,	.03
Yellow Pine	Los Angeles			1.01	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y	1½	1⅛	1⅛		
Alaska Juneau	N. Y	1⅛	1⅛	1⅛		
Carson Hill	N. Y. Curb			26½		
Cresson Consol G	N. Y. Curb			1⅛	June '20, Q	.10
Dome Ex.	Toronto	*25	*24	*24½		
Dome Mines	N. Y	10¾	10	10	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	May '20, Q	.02
Goldfield Con.	N. Y. Curb	*10	*8	*10	Dec. '19,	.05
Hedley	Boston			4½	June '19,	.10
Hollinger Con.	Toronto	5.60	5.48	5.48	June '20, BM	.05
Homestake	N. Y			55	Sept. '19,	.50
Kirkland Lake	Toronto	*54	*50	*54		
Lake Shore	Toronto	1.25	1.17	1.17	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	1.95	1.89	1.89	May '20, K	.05
Porcupine Crown	Toronto	*27	*26	*26	July '17,	.03
Portland	Colo. Sprgs.	‡		*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb	*4½	*3	*4	May '19,	.05
Silver Pick	N. Y. Curb	*6	*4½	*6		
Teck Hughes	Toronto	*9	*8	*8		
Tom Reed	Los Angeles	1.03	1.00	1.03	Dec. '19,	.02
United Eastern	N. Y. Curb	2 3/16	2½	2 1/16	Apr. '20, Q	.01
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome	Toronto	*7	*7	*7		
White Caps Min.	N. Y. Curb	*10	*8½	*9		
Yukon Gold	Boston Curb			1	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*20	*14	*17	Apr. '20, M	.03
Beaver Con.	Toronto	*44½	*43	*44	May '20, K	.03
Conagas	Toronto	†3.50	†2.50		May '20, Q	.25
Crown Reserve	Toronto	*25	*25	*25	Jan. '17,	.05
Kerr Lake	Boston	3⅜	3¼	3¼	Sept. '19,	1.00
La Rose	Toronto	*35	*32	*32	Apr. '18,	.02
McKinley-Dar	N. Y. Curb			*50	July '20, Q	.03
Mining Corp.	Toronto	1.85	1.84	1.84	June '20, Q	.12½
Nipissing	N. Y. Curb	8¼	8⅛	8⅛	July '20, Q	.25
Ontario Silver	N. Y.	6	5½	5½	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	⅜	¼	⅜	Jan. '12,	.10
Peterson Lake	Toronto	*13½	*12½	*12½	Jan. '17,	.01½
Sil. King Ariz.	N. Y. Curb.			*34		
Temiskaming	Toronto	*34½	*34	*34	Jan. '20, K	.04
Trethewey	Toronto	*29½	*28	*28½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1½	*1½		
Barnes-King	Butte			1.11	May '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb.	*7½	*7	*7		
El Salvador	N. Y. Curb.	2¼	1½	1⅝		
Jim Butler	N. Y. Curb.	*14	*12	*12½	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*5	*4	*5	June '16,	.05
Louisiana Con	N. Y. Curb			3/16		
MacNamara M	N. Y. Curb.	¼	3/16	¼	May '10,	.02½
N.Y. Hond. Rosar	Open Mar.	†13	†11½		July '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅞	1½	1⅝	Jan. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1 3/16	1⅛	1⅛		
Tonopah Ex.	N. Y. Curb.	1¼	1	1 1/16	July '20, Q	.05
Tonopah Mining	N. Y. Curb.	1⅞	1½	1⅝	Oct. '19, SA	.15
West End Con.	N. Y. Curb	1 1/16	1 1/16	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*23	*18	*19	July, '20, M	.01
Consol. M. & S.	Montreal	26	25	25½	July '20, Q	.62½
Daly Mining	Salt Lake			2.60	July '20, Q	.10
Daly-West	Boston			4	July '20, Q	.25
Eagle & Blue Bell	Boston Curb			2 1/16	Apr. '20, Q	.10
Electric Point	Spokane			30	May '20, SA	.03
Fed. M. & S	N. Y.	12	12	12	Jan. '09,	1.50
Fed. M. & S. pf	N. Y.	34½	33½	34½	June, '20, Q	1.75
Florence Silver	Spokane			*45	Apr. '19,	.01½
Iron Blossom	N. Y. Curb.	1/16	1/16	1/16	Apr. '20, Q	.02½
Judge M. & S	Salt Lake			3.90	July '20, Q	.12½
Marsh Mines	N. Y. Curb	*12	*10	*11		
Prince Consol.	N. Y. Curb.	1/16	⅛	1/16	Nov. '17,	.02½
Rambler-Cariboo	Spokane			*10	Feb. '19,	.01
Rex Con	N. Y. Curb.	*7	*6	*7		
South Hecla	Salt Lake			*96	Sept. '19, K	0.15
Stand. S. L.	N. Y. Curb.	¼	¼	¼	Oct. '17,	.05
Tamarack-Custer	Spokane			2.42	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.40	3.35	3.40	June '20, Q	0.10
Wilbert	N. Y. Curb.	*3½	*3½	*3½	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	18⅜	17⅛	17½	Mar. '19,	.50
Internat'l Nick.pf	N. Y.			81	May '20, Q	1.50
QUICKSILVER						
New Idria	Boston			5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb			*10		
VANADIUM						
Vanadium Corp.	N. Y.	83½	74	75½	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	87½	82	84	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	95½	93½	94½	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y	58½	55½	56½	June '20, Q	1.00
Am. S. & R.pf.	N. Y.	90¼	88½	88½	June '20, Q	1.75
Am. Sm. pf A.	N. Y.			75	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	57	55	55	July '20, Q	1.50
U.S.S.R & M. pf.	Boston	44¼	43	44	July '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly
SA, Semi-annually BM, bimonthly. K, Irregular. I, Initial. X, includes extra

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries

METALS NON-METALS PETROLEUM

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Volume 110 New York, August 14, 1920 *Number* 7

The Sleeping Nations

ASIA, the birthplace, so far as we know, of the human race—certainly the birthplace of civilization—shows many signs of rousing itself from its long dormancy. There is an element of compensation in nature which opposes many popular conceptions of evolution. The sons and grandsons of supermen are noticeably often mediocre or inferior—hence the fallacy of the aristocracy or "best families" theory. Races and nations surge upward and forward so as to command the admiration of all subsequent mankind, and then the surge dies away, inactivity supervenes, then degeneration. Where, asks every rhetorical orator on some occasion, are now the glories of Assyria, of Egypt, of Carthage, Greece and Rome?

A field that has been well tilled should lie fallow for a period if it is to repeat its productivity. The apple tree that bears phenomenally this year will bear very little next: it has exhausted its vitality and must recuperate.

The civilization of China and Japan, of India and Persia, flourished while Europe was the hunting-ground of husky savages—our ancestors—and then lapsed into the sleep of centuries. Is there a natural cycle of recurrence of virility in races or nations? Do they ever "come back"? Japan would answer in the affirmative and attempt to prove it. Is all Asia sensing some long-accumulated pressure of forward development? There are signs which may be so read. Much of Asia, like China, may be interpreted as having been static for centuries, rather than having degenerated. If all these races adopted the mechanical secrets of power which the European races have discovered in such relatively recent times, the result would be stupendous.

Students generally agree that our modern European civilization has not exceeded that of Greece, for example, in moral development, or in point of artistic or literary achievement: indeed, many believe that it perhaps has not attained so far. We have, however, exceeded all history in science, in knowledge, understanding, and mechanical appliances, which quite recently have all been put to savage uses. Asia is learning these secrets rapidly; and a possible development would seem to be in the process of time the transfer of the world's chief arena of interest back to the Great Continent.

Asia and the Silver Miner

NO DOUBT a flight of fancy is required to catch the connection between the ability of a Nevada silver miner to operate his silver mine profitably with silver at one dollar an ounce—any other value will do—and the speculative proclivities of some Chinaman, the bedecking of a dusky bride in far-off India, the favorableness of the monsoon, or the possibilities of educating the Oriental to the use of modern methods in currency and finance. Yet the relationship of one to the other is very close and vitally important to the silver-mining industry, which, oddly enough, depends largely for its prosperity on the idiosyncrasies of the natives in the thickly populated Asiatic countries.

Ever since the adventurous and roving British and Spanish sailors several centuries ago began to venture to the Orient, exchanging silver pieces and bullion for the rich products and highly prized treasures of the East, an unabated stream of silver has flowed from the Occident to the Orient. Occasionally this stream would diminish in volume, as if the Oriental silver appetite were satiated, but more often this was only a lull in the vigor of the flow, and it continued in even greater volume. Practically all of the silver that finds its way to Asiatic parts is absorbed in the fullest sense of the word, and disappears from circulation as if removed entirely from the face of the earth, gradually percolating through the interior of India, China, and even Africa, finding ultimate lodgment no one knows where. The tremendous forces that account for what appears to us the enigmatical and peculiar behavior of the Asiatic native have been accumulating momentum through the years; they act ponderously yet surely, and a reversal of the flow would upset the habits and customs of generation after generation.

Silver enters into intimate daily association with the life of the Indian and Chinese native. Both have a striking fondness for the metal, and their handicraft, as exemplified by the painstaking ornamental work which they have produced, needs no eulogy here. Vast quantities of silver are consumed by the arts in the Far East, and comparatively trifling amounts of silver per capita assume staggering proportions when multiplied by the teeming millions of Asiatic inhabitants. China, with her enormous population, could account for 100,000,000 oz. of silver if the per-capita consumption were but ½ oz. annually. This would be about half the world's production. India, which is a greater silver sponge than China, has actually taken more silver than the entire world's production, and did this last year, or from June, 1918, to June, 1919. In fact, that country accounted for more than 112 per cent of the world's output. No wonder silver reached such high prices last year! However, on a per-capita basis, even this ratio is small, ¾ oz. of silver per person. For ten years prior to the war, India imported about 35 per cent of the world's silver production.

The Oriental mind is noted for its aversion to changes in habits and customs of centuries. Hence the difficulty attached to the attempts to alter existing conditions in Asiatic currency and finance. There is talk of Chinese currency reform—India's is being continually modified. It needs it, and the world would welcome the change. Unification of the currency on a silver basis is suggested

as a start, with a gradual conversion to a gold standard or modification thereof. But to do this it is necessary to overcome the inclination of the Chinese to the present intricate currency system, which lends itself admirably to the speculative characteristics of the native. Even should currency reform become a reality, weaning the Oriental away from the use of silver as a monetary medium will not be easily accomplished. The importance of Asiatic conditions to the white metal, and vice versa, is astounding.

Mining in Siberia And Russia

IT IS SO DIFFICULT to form a clear idea of political conditions in Russia and Siberia that we are publishing the latest Siberian point of view in an article in this issue. It is interesting in this: that the Siberians have totally abandoned communism, Bolshevism, and anti-capitalism, and declare for an equitable cooperation of labor, brain work and capital. Capital is invited to come to Siberia to assist in the development of mines, and fair treatment and guaranteed profits are assured.

The idealism of the Siberian and his fair intentions are evident; but the reaction against the autocracy of the Czar, although recovered from the Bolshevistic extreme, still probably goes too far. It is doubtful if any loose scheme of government can function or hold together. The idea that mineral wealth is the property of the local community in which it is found, rather than of the larger community, such as the province, is not a sound one; nor, in spite of the enthusiastic optimism of the Siberians, can it be expected that local dealings with ignorant men of small caliber can be productive of anything but an unusual amount of corruption and graft. Some more compact form of government will have to be devised before capitalists can be sure of fair treatment and protection.

It will be noted that Vanderlip characterizes the Siberian scheme of government as "literally no government." In a way this is true—the "ideal" plan is really the primitive scheme which obtained in countries like those of Europe before the independent villages, cities and rural communities banded together for efficiency and strength, with an organized common government.

The offer to guarantee profits to mining enterprises is a seductive one, which many companies would gladly embrace if it were feasible; but it shows the lack of experience of those who, in the goodness of their hearts, offer it. We are familiar in this country with the vendors of oil or metal-mining stocks, who guarantee 24 per cent a year on the purchase price of the stock; and their offer does not get many takers from the initiated. Mining is a hazardous business. In most cases there is no profit; and a very large profit must be possible to make the speculative business attractive.

The author observes that the government of Siberia is really very much like that of Russia at the present time. We do not gather this from the scraps of enlightenment which are available to us regarding the true conditions in Russia. In Russia, we have apparently the tyrannical dictatorship of Lenine and his henchmen, an organized tyranny, militaristic and imperialistic, in which not only the army, but labor, is under the order of the so-called state. It has been pointed out that labor under such conditions finds its prototype in the slave labor of Egypt; and it is also like the Belgian slaves which the Germans drove out of Belgium and put to forced labor, except that in Russia the slaves and the masters are both Russian.

Organized labor in the United States sees nothing but tyranny in Russia, and even Emma Goldman, prosperous and disturbing in America, has found that, so far from Russia being the land of liberty, liberty has totally abandoned it. The Russian leaders themselves have found out that the ideal democracy was impracticable, and they are frankly governing the moujiks "for their own good," as the Czar did. The chief difference between the old and the new autocracy, except for the disappearance of the nobility, is in the lack of any sense of moral responsibility or of business honesty in the new. This is a development that is characteristic of advanced demagogues and their followers the world over, even in the United States.

We do not know to what extent mining men are preparing to return to Siberia and to Russia; but it is plain that any government which refuses to recognize old titles is not trustworthy. In the United States we recognize the old titles to the Spanish land grants, given by the Kings of Spain, which grants became binding on the later government of Mexico, and still later on the Government of the United States, when the lands in question passed successively, by the fortunes of war, to these countries. Expropriation without compensation marks a dishonest government and people.

East Is West

WHEN Kipling wrote in his rhythmical strain that "East is East and West is West, and never the twain shall meet," it is quite probable that he was confining himself strictly to the meter and sense of the rhyme and concerned himself not with such a sordid matter as that generally known in business circles as foreign trade. At that period romance and business were regarded as separate, whereas today romance becomes more and more a part of everyday business. We are becoming more human in our dealings and broader in our vision. And with this gradual humanizing process comes a sweeping away of old prejudices, the approach to a common footing, and a keener appreciation of the value of co-operation. It is by this means that we approach and gradually reach the highest type of commercialism.

It may not be true that we of this country are suspicious of those with whom we deal in foreign lands, but we have at least been credited with "Yankee shrewdness," and that, after all, is not unlike certain characteristics shown by merchants of the Far East. But apparently this mutual shrewdness, or whatever we choose to call it, has not been detrimental to trade, for actual figures show a steadily growing commerce between the United States and our neighbors on the other side of the Pacific. So that in so far as the matter of exports and imports is concerned, there is little disposition on the part of the East or the West to establish an unsurmountable barrier.

Recent figures issued by the National City Bank of New York, state that our exports to Asia have increased from 113 million dollars in the year ended June, 1914, to 804 million in the fiscal year ended June, 1920. This shows a gain of 33 per cent above the figures for 1919, in which year they totaled 604 million dollars—particularly encouraging inasmuch as it was expected that

Asia would return to her former practice of dealing largely with Western Europe. Part of this increase is undoubtedly due to higher valuation and also to the fact that the supply of European stocks are depleted as a result of the Great War.

There is also an encouraging note in the fact that while exports have increased the same is true of imports, and such reciprocation lays the foundation for an amiable and lasting commerce between nations. Our imports from Asia for the fiscal year ended June, 1920, totaled 1,350 million dollars, as against 831 million in 1919.

It is interesting to note the increases and distribution of this trade. Sales to Japan for the fiscal year 1920 totaled 460 million dollars (51); to China, 115 million (25); India, 78 (11); Dutch East Indies, 45 (less than 4); Philippines, 72 (27); Hongkong, 20 (10); and to Straits Settlements, 15 million dollars (4). The figures in parentheses represent the totals for a similar period in 1914 in millions of dollars. Imports show corresponding increases, and are as follows: Japan, 500 million, as against 107 in 1914; China, 225, against 46; India, 180, against 74; Dutch East Indies, 97, against 6, and from the Philippines, 70 million in 1920, as against 18 million in 1914.

Truly, the order changeth and commercialism is wearing down the old barriers of racial prejudice.

A Great Eastern Enterprise

PROMINENT among the great mining enterprises of the Far East is that of the Burma Corporation, operating the lead-zinc-silver mines at Bawdwin. These have been worked for silver for centuries, though they did not attract the attention of Europeans until about 1795.

No one knows when it was that the Chinese began operations at Bawdwin. By some the date is placed at more than one thousand years ago, though others reduce this by half. According to J. Coggin Brown, of the Geological Survey of India, so little was known of the mines that in 1895, when the sixth edition of the quarter-inch topographical map was compiled, their position was not marked. The Chinese finally abandoned the district about 1868 as a result of the great Mohammedan rebellion in Yunnan. The first prospecting lease was applied for by Europeans about 1902, and the present operating company was organized about twelve years later.

"Bawdwingyi," as the Burmese call the mines, means "great silver mines," but neither they nor the Chinese have had any conception of their greatness. In the ignorance and unreadiness of the past lies the profit of today. Ignorance has played a greater part in conserving the world's resources than it has in wasting them, which probably even Gifford Pinchot will admit. Were it not for the backwardness of past generations, the search for raw materials might be even more difficult than it is.

Bawdwin is the only lead mine of importance that is being worked in the Indian Empire today, though it was never valued by the ancients for its lead. At the start, the company's smelting operations were directed to working over the slag dumps left by the Chinese. Today the chief tonnage smelted comes from the underground workings. Reworking old tailings has been profitable in this country in recent years. It is one of those pursuits in which men are glad to take some one else's leavings and willing to pay for the privilege. Modern metallurgy is endeavoring to make these leavings as small as possible.

As the bonanza becomes increasingly scarce and even the promising prospect is harder to find, the gaze turns westward to the continent where civilization first had its home and where men have lived for countless generations unmindful of their mineral wealth that perhaps lay at their doors. But gazing westward to the East would profit little. Already more than one exploring party is abroad looking for other Bawdwins.

"Yellow Peril" Was "Made in Germany"

THE World War proved to be earth's greatest melting pot. It produced a fusing of the nations—of flesh and spirit. The tragic aftermath, in which we live, and concerning whose outcome the veiled future vouchsafes no vision—cannot obscure the fact of the forging of that confraternity of peoples and of racial aspirations which will in history mark its great result.

Yellow men, fought side by side with white and brown in those terrible days of the spring of 1918—with the engineers. They were no "Peril" then—nor ever. Standing in the bright light flashing from the war, around the council table of reconstruction, China, Japan, America, England, France, and Italy may well clasp hands in mutual regard and self-respect.

In this new era, China and Japan are our next-door neighbors, and to erect spite fences and double blinds is the essence of folly. East needs West and West needs East. It has been ordained that we must live together on this acre of creation, and if statesmanship cannot contrive that we may exist in peace, it ought to go out of business.

China needs money. Japan has recently weathered a financial panic. The United States has so much money that its tokens have ceased to command their former respect. But with a plethora of wealth, America cannot obtain the labor needed to perform essential tasks—in mine and field, in forest, shop, and mill. Were it not for the bugaboos and ghosts of the past—Foreign Devils—that's us (we mean "we") and "Yellow Perils"—that's them (we mean "they")—the creation of mutually advantageous agreements would be both logical and easy.

The United States has the money and the technically trained men that the East must have to develop its vast mineral and other natural resources. The East possesses in great abundance that very class of labor which we most need to solve our present pressing problems. Common sense and business sense declare that arrangements could and should be made whereby the needed capital and technical labor might be afforded to the East, and the East supply our great need of human workers.

There is always a way to do that which ought to be done. Without sacrifice of ethnic pride or self-respect, with mutually acceptable agreements and guarantees, a way should be found—must be found, if peace, not chaos, is to rule—whereby the great financial and technical power of America can be placed where the world needs it most, and through which the labor that we must have may be made available.

We are conscious of the obstacles that have barred the consummation of such an arrangement as is here suggested. But what ought to be done ought to be done, and by those whose duty and destiny it is to do it.

WHAT OTHERS THINK

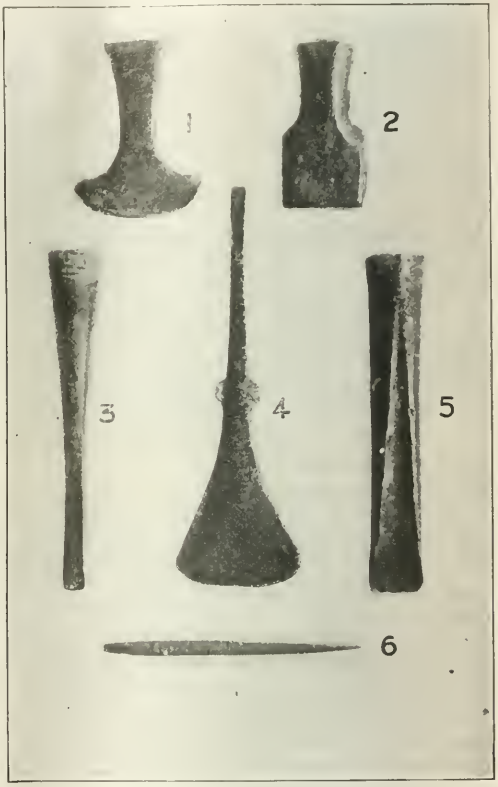
Ancient Principles of Modern Machines

Supplementing K. S. Twitchell's interesting photographs of ancient machines in *Engineering and Mining Journal* of July 24, the accompanying photographs of exhibits in the British Museum may be of interest. These stone and bronze instruments are believed to belong to the Bronze Age of England and Ireland, about 2,000 to 500 B. C.

The stone hammers, which do not look much unlike hammers used by modern miners, are four or five inches long. The sockets, as is evident, are well bored, with straight edges, as metal was available. In the previous neolithic period the perforation was affected from both faces by means of a stick revolving in wet sand. The resulting hole was more or less of hour-glass form. The ancient Egyptians, as can be seen in the Metropolitan Museum of Art, did not put a socket in their bronze battle-axes, but merely tied them to a wooden stick.

The bronze razors of perhaps 3,000 years ago have a tang for hafting. They are about three inches long.

STONE HAMMERS OF THE BRONZE AGE



BRONZE TOOLS, BRITISH MUSEUM

Shaving, fortunately, did not become popular until Alexander the Great, who wished to retain his youth, set the fashion, and by that time better razors were in the market. However, the ancient copper miners long retained control of the metal market, and iron was a minor metal until comparatively recent time.

The other bronze tools are from the best period of the Bronze Age, after the invention of the socket. No. 1 is a socketed chisel from Ireland, No. 2 a socketed hammer, No. 3 a socketed chisel from the Thames, No. 4 a tanged chisel, No. 5 a socketed gage, and No. 6 an awl.

H. G. Wells in his "Outline of History" says that gold was the first known of the metals, and appears among bone, jet, and amber. Then native copper was used. Lord Avebury has suggested that the secret of smelting was discovered by the chance putting of lumps of copper ore with other stones around a fire. "In China, Hungary, and Cornwall," Mr. Wells remarks, "copper ore and tinstone occur in the same veins, and so, rather through dirtiness than skill, the ancient

smelters, it may be, hit upon the harder and more fusible bronze." This view of the origin of bronze is that of Dr. Gowland, "The Metals of Antiquity" (Huxley lecture, 1912); but Lord Avebury quotes the verbal opinion of the late Lord Swansea against the view. Tin was little known as pure metal for implements, although the Egyptians imported tin in the fifteenth

BRONZE RAZORS OF EARLY TYPE

century B. C. "In India," says Mr. Wells, "where zinc and copper occur together, brass was similarly hit upon."

If any reader is especially interested in the subject of early machines, he should not miss reading the excellent article[1] on Leonardo da Vinci by Edward P. Buffet. That great artist and scientist filled his notebooks with sketches of lathes, drills, pumps, and war engines, at about the time of the discovery of America, besides painting several of the greatest pictures of all times.

P. B. McDONALD.

New York.

New Caledonia Nickel

In the July 3 issue of *Engineering and Mining Journal* you publish on p. 20, under the heading, "Three Nickel Companies Operating in New Caledonia," certain remarks to the effect that the firm of Ballande & Son is the trade name for a Roman Catholic order of priests, and also that the Société le Nickel has taken over the electric furnaces installed by the Hauts Fourneaux de Noumea.

We are the agents in this country of Ballande & Fils, of Bordeaux, and New Caledonia, and as a matter of fact Ballande & Fils are very closely connected with the United States Nickel Co. We in turn are closely connected with the Hauts Fourneaux de Noumea, which is one of Mr. Ballande's companies in New Caledonia. We know that Ballande & Son, or as the correct name should be, Ballande & Fils, are existant persons trading and doing business absolutely for themselves all over the world. Mr. Ballande's son, as a matter of fact, was a lieutenant in the French army and died in the war about the eighth of November, 1918. Mr. Ballande conducts all his operations for his own account and not for any order of Catholic priests.

With regard to the statement in your article that Société le Nickel has taken over the electric furnaces of the Hauts Fourneaux de Noumea, we know this to be an absolute inaccuracy, as evidenced by the fact that our matte is supplied us by the Hauts Fourneaux de Noumea and that we are continuing to receive such matte entirely from the Hauts Fourneaux de Noumea under our contract with that company, and also, to substantiate this statement, we have recently had a visit from some of our friends in New Caledonia, and no such question as allowing the Société le Nickel to take over the electric furnaces was ever thought of. Ballande & Fils or the Hauts Fourneaux de Noumea have no connection with the Société le Nickel or the other Japanese company which is said to be operating in New Caledonia at the present time.

We were inclined to disregard these statements in your magazine, but it seems that in preparing an article on "nickel" another magazine had taken this article bodily and incorporated it in its copy, and it is in this way that the small snowball may develop into an avalanche.

We wish that you would take steps to disabuse your readers' minds on the subject and if you will publish a correcting paragraph in one of your issues we shall be perfectly satisfied.

UNITED STATES NICKEL COMPANY.

New Brunswick, N. J.

The paragraph in question was copied from and credited to the *Chemical Engineering and Mining Review* of Melbourne, Australia. It is now up to our esteemed contemporary to explain the Australasian news.—EDITOR.

Ah Say Can You See?

An Essay

So much has been written about "Technical Writing" of late in some of the mining papers, and so much about the terms "Extraction and Recovery," that it may not be amiss to delve into the Pronunciation Department as well and educate the college-bred engineer so that when he enters the outside world of experience he will be able to spread the gospel of proper pronunciation as well as be a disciple of the gospel of the quill.

Many years ago I was taught to pronounce the word "assay" correctly, but I must own up to the fact that nearly all the mining men, of high and low degree, with whom I have come into contact, invariably mispronounce the word. It matters not whether they are from the "Hub" or from New York, or from the windy town of the Lakes, or from the mountains of Colorado; yes, from the far North to the extreme South, and even to the gentle Pacific; invariably my ears catch the same musical tone of the four-legged braying animal of the prospector—I am always reminded of the ass'-say, of the prospector's friend. Never once does any disciple of Noah Webster pop up with the musical rhythm of as-say'.

In every dictionary that I have examined—and I believe I have looked into some eight or nine of them—from Johnson down to the Standard, published by Funk & Wagnalls, strange as it may seem, there are no two ways given of speaking the word. There is one correct pronunciation and only one for the poor little word of three different letters of the alphabet arranged so as to make two syllables. Why a college man does not conquer it and pronounce it "as-say'," as in all dictionaries of the English-speaking nations, is beyond my understanding. Usage has no more right to claim as'-say than it has to claim that the word "ain't" should be used. So, may the overworked ass-sayers be brought into the proper realm of the as-say'ers!

Hedley, B. C. ROSWHEEL.

[1] *American Machinist*, Oct. 28, 1909, "Leonardo da Vinci as Engineer and Machinist," p. 731.

CHINESE STUDENTS WORKING IN THE ASSAY LABORATORY OF PEE YANG UNIVERSITY

Mineral Enterprise in China

Difficulties the Foreign Operator Must Contend With in Mineral Exploitation in That Country —Small Possibilities of Discovering Extensive Ore Deposits—Development of Properties Hindered by Lack of Transportation Facilities

BY THOMAS T. READ*
Written for *Engineering and Mining Journal*

IN THE *"K'ao Kung Chi,"* a work on the industries of the Chou dynasty (B. C. 1122-249), written during that period, six different bronze alloys are described in detail and their uses for the making of axes, hatchets, knives, spear and arrow heads, mirrors, bells, caldrons, gongs and a variety of utensils are carefully explained. A biographer of Lu-Tsu, who lived in the latter half of the eighth century, says that "among the eight stones he made most use of cinnabar, because from that he extracted mercury; and among the five metals he made most use of lead, because from that he obtained silver."

These historical references are introduced to illustrate that mineral enterprise in China is an art of ancient lineage, and as a result the search for mineral wealth in this part of the continent of Asia differs fundamentally from exploration in the continents of North and South America, where the natives before the coming of the white man were little interested in the mineral wealth of their country. Even the Aztecs and the Incas paid little attention to minerals other than gold, but the natives of eastern Asia had a well-developed metallurgical art when the countries that are now the principal producers of mineral wealth were inhabited only by people of the most primitive type of civilization.

This is a basic fact of great importance in considering the mineral wealth of China, for it indicates that, on the average, the possibility of developing profitable mineral enterprises there always involves some change in economic conditions, because for many centuries there have been available the necessary knowledge and skill for the working of deposits that could be profitably developed under the conditions then prevailing. An economic change to effect lower working costs by the application of modern methods naturally suggests itself, but its possibilities are almost invariably overestimated.

In a country where as recently as ten years ago the wage for skilled labor did not exceed 10c. per day few operations except those involving the expenditure of great power or special tools can be more cheaply performed by modern methods than in the primitive way. With the food costs and standard of living prevailing in China until recently the human mechanism was the most economical machine that could be employed. From the power standpoint it was cheaper to oxidize rice or millet in a coolie than coal under a boiler. Attempts to develop gold, silver, and lead mines in China under foreign direction have usually ended in nothing more profitable than a demonstration that working costs could not be lowered sufficiently to provide interest and amortization on the equipment investment.

An example of another aspect is the iron-mining and

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smelting industry of Shansi. Next to agriculture this was and is still the principal industry of the province, but it offers no chance whatever for development by modern methods. The ore deposits are too small and irregular to permit of their being mined on a scale that would keep a modern blast furnace running. Yet they have been the basis of a considerable metallurgical industry, and before trade with the Occident made foreign iron available it was even an essential industry to the whole of North China. Another example is the quicksilver mining industry of Kwei-Chou, which had a somewhat similar local importance, but which, when made the basis of an Anglo-French mining enterprise, proved unremunerative. I will not further multiply instances.

It may be assumed that the large majority of mineral deposits existing in China have been the objects of a mining and metallurgical art that, though crude, is skillful and relatively economical. To make them the basis of a successful large-scale enterprise new economic conditions must be introduced. Provision of efficient means for handling water and working deep levels is one possibility, but the Burma enterprise at Bawdwin, in the Shan States, is about the only conspicuous example of success attained by this means. Though I have not personally examined the copper deposits of southwest China such evidence as I have been able to gather indicates that, like the iron deposits of Shansi, the ore deposits are probably not large and regular enough to be made the basis of cheap large-scale mining.

The tungsten deposits of South China are an instance of finding a use for a substance that the natives did not utilize, but this is a sporadic example, and scarcely likely to happen again. Perhaps, most commonly, transportation will be the new economic factor that is essential. This is especially true of iron-ore deposits, for except when they occur in close proximity to coal deposits they have not previously been worked by the natives to an important extent. All of the half-dozen or more iron-mining and smelting enterprises which have sprung up in China in the last decade are based on deposits which had not been worked in a large way by the natives. It is only fair to say, also, at this point that all these enterprises are as yet in the probationary stage of their existence, and it is by no means certain that they will be notably successful.

It was recently announced that the project for building a steel plant of 200,000 tons a year capacity at An-shan-chang, in Manchuria, has been abandoned, and the blast furnace plant, which was expected to have a capacity of 750 tons per day, at this time is turning out only about 200 tons per day, according to reliable reports. Ocean freight rates are low enough to permit iron and steel to be carried long distances in competition with the product of a plant whose working costs are high, and the transportation that makes a mineral enterprise possible may also prove its undoing.

Transportation is an economic factor in China that can scarcely be overemphasized, as it bulks so large in the development of mineral as well as every other form of enterprise. In the hills west of Peking excellent coal is mined, but it is not used even in the shops and restaurants of Tiensin, which is only fifty miles east of the mines as the crow flies. There the cooking operations in progress are being carried on in *kuo* (cast-iron pans placed over a clay or earthenware furnace), and the fuel used is all manner of vegetable refuse, stalks of jute, *kao-liang* (a species of broom corn), corn, marsh hay, stubble raked up from the fields—in short everything of the general nature of cellulose that is not more valuable for some other purposes than the production of heat units.

Ten years ago the cost of the fuel used in preparing the food of an average Chinese in the neighborhood of Tientsin amounted to roughly one-half the food cost, or about 40 per cent of the total living cost of the laborer. Remembering that homes of this class are practically unheated in winter, and that much of the food is either cooked in public shops, where cooking in large quantity utilizes the heat most efficiently, or else over a domestic furnace that utilizes all the heat not absorbed in cooking to heat the brick bed on which the family sleeps, it is evident that heat economy is a prime requisite in a Chinese household. In an American household fuel cost is about 5 per cent of living costs. The comparison is interesting and suggestive.

Coal production in China is roughly one-twentieth of one ton per capita per year, as compared to 6½ tons per

UNLOADING CARS

This is done by carrying the ore in baskets slung on the "*tan-tze*" or carrying pole. The open-cut stripping and mining costs on this operation were almost exactly the same as those of the open-cut "porphyry coppers."

capita per year in the United States, though the coal resources per capita are, like those in the United States, large. There is plenty of coal in China for everybody who can afford to use it, and the reason the people use so little of it as yet is because the transportation cost makes it too expensive.

Along the coast of China the coal market is absorbed to a marked degree by coal brought from Japan, because many of the Japanese mines are conveniently situated as regards water transportation. The Kailan Coal Administration is the only large coal mine in China that is conveniently situated with respect to tidewater and so far able to compete in any effective way with Japanese coal for the bunker and export trade.

J. W. Beardsley has recently published a study of transportation costs in China. It is not necessary to go into details here, and photographs of the *tan-tze*, or carrying pole, the wheelbarrow, and the springless two-wheeled cart are familiar to everybody. Beardsley estimates the following costs: "Coolie with carrying pole, 20 to 30c. per ton-mile; wheelbarrow, 6c. per ton-mile up, according to character of road; two-wheeled cart, average 40 to 50c. per ton-mile; may be as low as

6c. per ton-mile on good roads. Costs of transporting goods by canals has been estimated at ⅝ to ¾c. per ton-mile and by railroad at ⅜c. per ton-mile." Beardsley does not give the source of the estimate in the sentence just quoted, and I regard the figures as too low.

These figures are interesting approximations, especially when compared with railway transportation in the United States, which averages somewhere near 1c. per mile. The railways do most of our moving for us, but railways in China do not bulk large yet, for the total now in operation in China is less than 6,000 miles. China, on the other hand, is estimated to have over 200,000 miles of canals and improved waterways, or, roughly, about equal to our own railroad mileage. I hope I have made my point clear that transportation in China is, on the average, not cheap. The Shanghai papers for June 16 quote house coal (bituminous) in their market columns at $16 a ton and stove coal at $20 a ton.

Shanghai is a competing point for Australian, Japanese, and Chinese coal. Probably most of the Chinese coal comes about 1,200 miles by sea from the Kailan mines, and though it is true that these mines make large profits, there is also abundant coal along the Grand Canal, 500 miles from Shanghai, with all-water routes between. The figures given do not represent abnormal conditions such as now prevail in our own coal markets. West Virginia bituminous coal can ordinarily be dumped into bunkers at Hampton Roads at about $5.50 per ton,

A NATIVE GRAIN MILL

Exactly similar mills are used for crushing gold quartz. Sometimes the stone is pulled by a donkey, illustrating the close balance between the animals and men as a source of power.

total cost. This reminds me of the story of the man who sent a bale of rugs from China to New York. Ninety miles of the distance was by camel back, and the freight cost was $4.70; the 17,000 miles by sea cost $4.30, including one transfer charge. The example is rather extreme, but illustrates the point.

Another important factor in mineral enterprises in China is the title to mineral property, and this is so complicated a matter that general remarks regarding it are sure to be susceptible of misconstruction. Like some of the rules of grammar, there are as many exceptions as examples of the rules. Theoretically, mineral rights are independent of surface rights, belonging to the crown in the days of the empire, and now federal property under the republic. But in all the districts where mining is important complicated local customs prevail which I will not attempt to describe. Inaccuracy of survey and record add to the complication. Land taxes in China are based on the transfer records in what corresponds to our county clerk's office, and after a large tract of land has been sold off piece by piece the original owner not infrequently finds himself still in possession of a remainder, on the records, upon which taxes are still due, though all the actual land has passed into the possession of others.

Overspreading this basal complex is the laccolith of concessions. Concessions differ from one another in extent and location, but they are all much alike in being couched in terms which offer infinite scope for diplomatic skirmishing at Peking to secure everything possible for the concessionaires and to keep out would-be intruders. The Prichard Morgan-Standard Oil difference over rights in Szechnan is still fresh in mind.

An example of the extreme type of concession is that granted in 1898 to Cheng Monyuen and his associates, which was afterward the basis of the Anglo-French Q. & M. Co., Ltd. This gave to the concessionaires the development rights for all kinds of mining in the Province of Kwei-Chou for a hundred years, and naturally would prove an obstacle to any other enterprise desirous of entering the field in Kwei-Chou. All such difficulties can be overcome by employing time, diplomacy, and some money, but the delays and complications are a source of irritation to business men accustomed to more direct methods and are therefore a handicap to the development of mineral properties in China.

In negotiating the agreement with the government of China for exploration for petroleum, the Standard Oil Co. stipulated that all difficulties as to titles and rights should be assumed by the Chinese government. This makes it simpler for the foreign investor and also simplifies the problem somewhat, for the government can bring a good deal of pressure on the natives, and if the issue is simply one between itself and a concessionaire, instead of between two concessionaires, only one embassy is officially concerned instead of the representatives of two governments. Recent reports indicate that co-operative agreements of the kind just mentioned, where the government participates in the profits of the enterprise, are regarded with favor by those now in power, and as such agreements have many advantages it will be well for any persons interested in the mineral possibilities to shape their plans with this in view.

Investors in mineral properties who are in the habit of sending out their scouts to look for promising properties without revealing the identity of their principals until an agreement is about to be concluded should not suppose that it is possible to work along the same lines in China. Every foreigner in China is under the jurisdiction of his legation or embassy, as the case may be. As soon as he begins to exhibit any activity inquiry is at once made as to his character and what he represents, and unless the legation is able to make a satisfactory reply no further progress can be made. It is obvious that this should be so, for any dispute between foreigners and Chinese has to be submitted to the legations, and the Chinese principals naturally wish to know the circumstances and facts before committing themselves in any way.

The American investor sometimes thinks that his officials do not exhibit as much interest in himself and his plans as their importance deserves, but it is well to

keep in mind the fact that the forwarding of such projects is not the chief duty of a legation, even though the practice followed at times by some European legations would seem to indicate the contrary. Besides, the officials have been on duty a long while and have seen many ambitious schemes come to nothing in the end, so a Missourian attitude on their part would be both natural and excusable. In the circumstances it is remarkable that they are able to summon as much enthusiasm as they do. I do not believe that there is justice in the accusation, less frequently heard of recent years, that American enterprise abroad does not receive the official support it merits.

Co-operation in the development of mineral enterprises has many points of interest. The investor, knowing the great risk inherent in any mineral enterprise, naturally wants the full benefit of the odds as to possible profits, and the owner, overestimating the potential value of his property and underestimating equipment cost and risk, naturally desires to retain a good part of profits for himself. This is especially true in China, for travelers since the earliest days have been misled by native operations and almost invariably report them as indicating deposits much larger and richer than is actually the fact, with the result that general ideas as to the mineral wealth of China, both at home and abroad, are exaggerated, making it just that much harder for foreigners and Chinese to get together on an equitable agreement.

A story is told that in the early days in Wyoming, before much of organized activity had developed, a resident of one of the little towns conceived the idea of starting a bank, which he did by placing a sign reading "National Bank" over the door of a shack and then waited for results. Within an hour somebody came in and deposited $20, and soon afterward another deposited $100, whereupon the embryo banker gained such confidence in his enterprise that he put $50 in it himself.

I am reminded of this tale because Chinese investors are generally reluctant to put any money into mining enterprises. They will plunge on a straight gamble, such as speculating in rubber shares, or put money into a trading enterprise, because they know how to play that game, but it is hard to interest them in mining to the extent of putting their own money into it. There are a number of rather complicated reasons why this is so, but it is not necessary to pursue the matter further than to make the point that in planning a co-operative enterprise expectations of the procuring of capital in China are not likely to be realized.

Not infrequently the proposal is made that American firms furnish the equipment for a property, taking payment in notes to be paid out of the future profits of the enterprise, and the Chinese always prefers to be surprised that such a proposition is unattractive to those who are counted on to supply the equipment. The Chinese are usually good business men, and I have never quite decided whether the making of such a proposal indicates ingenuousness or ingenuity.

A word must be said as to the mining laws of China, in closing. Actually there are none, for the treaty of peace after the Boxer outbreak provided that a revised mining law should be drawn up that would meet the approval of the foreign legations as well as the Peking authorities. A number of drafts of proposed laws have been made, but none of them have yet met the approval of both parties. The principal difficulties are extraterritoriality and Japanese aggression. The Chinese are unwilling to concede majority ownership in a mining enterprise to the foreigner, for that at once puts the enterprise under the jurisdiction of the foreign legation; each property becomes a little *imperium in imperio*.

Within the last few years Japanese investors have been able to get most of what they wanted in the way of Chinese mineral deposits, so it will soon be unnecessary to provide a lock for the stable door. The latest mining law is in a sense the prevailing one, but so far as I can learn the native miners continue to operate in much the same way they always have; most foreign projects are the subject of special agreements, and the constitution bears much the same relation to friendship in China as it used to in Tammany Hall. If a responsible American company is willing to proceed with the development of a mineral enterprise in China there is little likelihood that satisfactory arrangements cannot be made at Peking as to the conduct of the enterprise.

UNLOADING A SHIP BY HAND

To summarize in conclusion, the thickly settled million and a half square miles that constitutes China proper has been well prospected by the natives, and there is not much likelihood of finding any Goldfield Consolidateds. Even a Utah Copper is improbable. Such properties are the rare exception even in America, but every now and then in China a fair-sized property will develop. Behind this area lies three million more square miles of territory, nominally under Chinese control, that is as remote from transportation as Wyoming was in the time of Brete Harte and Bill Nye. The chances are that it will prove more like Wyoming, from the mineral standpoint, than like Colorado and Montana. But Wyoming, long a mineral disappointment to the mineral seeker, has developed a good deal of wealth in coal and oil, and the "back blocks" of China may prove valuable in the end.

The great distances involved and the delays arising from the causes described are likely to make the acquiring of a mineral property somewhat expensive, especially if the investor proceeds on the theory of rediscovering first principles for himself. But with Russia cut off from intercourse with us by Bolshevism, China is the only important area on the Northern Hemisphere that provides a field for mineral enterprise on the "open-door" basis, and its possibilities in that regard should be neither overemphasized nor overestimated.

A GENERAL VIEW OF THE OOREGUM SECTION OF THE KOLAR GOLD FIELD, SHOWING THE MODERN EQUIPMENT AND UP-TO-DATE COMPANY HOUSES

The Romance of Gold Mining in the Mysore State

An Historical Review of the Discovery of Gold in the Kolar Gold Field and the Inception of Operations in This Important Gold-Producing Area, Together With A Description of the Industrial Conditions

By E. W. T. Slater
Written for *Engineering and Mining Journal*

A KANARESE proverb says that if gold is to be seen even a corpse will open its mouth. The search for gold has always held a keen attraction for mankind, and the story of how, in various parts of the world, men have been prepared to undergo every possible kind of suffering to obtain this precious metal is replete with romance.

The mining of gold in the Mysore State has not been associated with the hardships experienced in other fields, yet it affords romantic incidents. Few who now visit the Kolar gold field, with its up-to-date plant, and its advanced social life, can imagine that a hundred years ago the district was a wild, almost untrodden region. In a few years the field has become one of the most prolific producers of gold, and it is believed that there are still many reefs that are undiscovered, but which will yield handsome returns once they are exploited. Incidentally, while the mines have brought great wealth to the investors, the State of Mysore has greatly benefited through revenues received from the gold field.

Gold and Rice Plants

The beginnings of great industries are always full of interest, and some reference should be made to the early attempts to capture the hidden wealth of this district. It is generally believed that grains of gold found on the ears of the rice plants led to the discovery of gold here. An account of this tradition is given in one of the old records of the Mysore government. It appears that a Lieutenant John Warren, who was employed in surveying this part of the state in 1800, was told by a Brahman that "in the prosperous years, when the gods favored the village with an ample harvest of rice, now and then grains of gold were found on the ears of the plants grown under the tank lying close to the village."

The explanation is simple enough. The rice plants are usually grown in nurseries and transplanted in bunches of several plants, after which the fields are flooded. When there are heavy downfalls of rain the plants are often submerged, and no doubt grains of gold could have been deposited on the plants. As these grew the gold would naturally rise with them, and thus often be found adhering to the rough-coated rice-grain.

Being interested in the reports, Lieutenant Warren visited the places referred to, and he thus records what he found: "When the women of the village were assembled, and each being provided with a small broom and vanning basket, and hollow board to receive the earth, they went to a jungle on the west of a village. Here they entered some small nullahs, or rather breaks in the ground, and, removing the gravel with their hands, swept the earth underneath into their vanning baskets, by the help of which they further cleared it of the smaller stones and threw it into the hollow board mentioned above. Having thus got enough earth together they adjourned to a tank and placed the hollow boards containing the earth in the water, but just deep enough for it to overflow when resting on the ground and no more. Then they stirred the earth with the hand, but keeping it over the center of the board, so that the metal should fall into the depression by its own weight, and the earth wash over the edges. After a few minutes' stirring they put the metallic matter thus freed of earth into a piece of broken pot, but only after examining it for gold, which they did by inclining the board and passing water over the metallic sediment which adhered to it. They thus drove the light particles

before the water, leaving the heavier metal behind just at the edge, where it could easily be seen, however small the quantity." Nothing could be simpler or more primitive, but what he saw evidently impressed the survey officer.

Warren next inspected several places where small villages. Then they elect a duffadar, or head man, to superintend the work and sell the gold, and they subscribe money to buy lamp oil and the necessary iron tools. Then, partly from the knowledge of the ground, and partly from the ideas they have that the tract over which a peacock has been observed to fly and alight is

A COMPANY HOSPITAL IN THE KOLAR GOLD FIELD

mines has been dug and made a descent of one or two of these by means of small footholes which had been made in the sides of the mine. One mine was two feet broad and four feet long, with a depth of about thirty feet, and other mines were about forty feet deep, with a number of galleries. The miners passed the gold they extracted from hand to hand in baskets to men stationed at different points for the purpose of banking the stones. It was the work of women to take these stones to a large rock where they were pounded to dust. The panning process already described was then followed in the treatment of this dust.

It is also interesting to note the manner in which the Indian villagers organized for the gold search in their district. "When they resolve on sinking a mine they assemble to the number of ten or twelve from different

that of a vein of gold, they fix on a spot and begin to mine."

Some of the native workings are still to be seen on the gold field, and in the opinion of skilful miners these primitive workers showed great knowledge and ability in their work. Some of the mines are about 260 ft. deep, but for the most part these workings are now choked up. Large quantities of water were found, and it required continuous pumping by modern machinery to keep them clear. It is not known how the early workers

HEADFRAME ON THE EDGAR SHAFT OF THE MYSORE MINE

controlled the flows of water, but it is supposed they conveyed it to the surface by earthenware buckets, by passing them from hand to hand.

Having given this brief account of the way in which these workers carried on their limited mining it is of interest to review the events that have made this

district among the famous ones of the world. In 1873 a Mr. Lavelle applied for the right to carry on mining operations in the Kolar district, and the next year he entered into an agreement with the government. He was given the right to mine for twenty years, and it was stipulated that a royalty of 10 per cent on all metals and metallic ores should be given to the government. A small syndicate was formed, and though the work was carried on for some time it was later abandoned; but Mr. Lavelle was not without hope, and the next year he succeeded in initiating the formation of a number of companies.

In February, 1883, the Nundidroog mine was ordered closed, and practically every company was on the point of collapse. When one recalls the marvelous dividends disbursed by the Mysore Mining Co. it is interesting to remember that at this time the works were almost closed down. In 1884 ten or twelve thousand pounds of the subscribed capital remained and a meeting of the shareholders was called. Some were for closing down at once and dividing the balance of capital, but Messrs. Taylor & Co. advised them to hold on. Seldom has advice been so profitable. The 10s. shares were then sold at 10d., but within a short time a change took place and the value of the shares steadily rose until they could not be purchased under 100s. But apart from the direct gain to themselves, had the shareholders of this company not persevered there is little doubt all the other companies would have closed down and the industry would have been at an end.

Community Developments

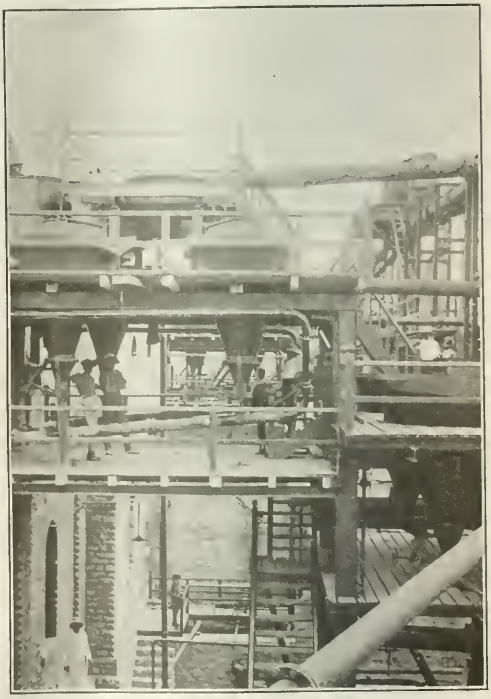
Turning to some account of the Kolar gold fields as they are at present, it is to be noted that the total length now covered by the mines is about seven miles, and the average width from two to three miles. The general appearance of the country all around is rocky and sterile, but the companies at work here have done much to improve the appearance of the area where the mines are situated.

A long, broad road has been cut out from one end of the field to the other, and this is always kept in splendid condition. There are smaller roads branching from the main roads to the bungalows and mines. The bungalows of the officers are well built, and in most cases the inhabitants have spent considerable time in making gardens around them. These are in marked contrast to the surrounding country, and were only made possible by bringing large quantities of fresh soil from a distance. In many cases rocks had to be blasted to give the necessary depth. The gardens on these gold fields are indeed a credit to the people, and they do much to give relief to a district the physical attractions of which are not many.

The companies realized that the occupation of the Kolar gold field would be of considerable duration, and wisely determined to house their men well and to introduce as many social amenities as possible. For many years no women were permitted to live on the field, but gradually, as the work developed, the officers were allowed to bring their wives. In many ways this has transformed the whole aspect of life there, and instead of the roughness usually associated with mining life there is a refinement and even suggestion of luxury that would surprise most visitors to Kolar for the first time.

A fine club has been built, and in connection with it arrangements have been made for tennis, golf, and other sports. The hospital is one of the best in South India, being manned by skillful British doctors, and provided with the latest surgical apparatus, no expense being spared in the care and treatment of either European or Indian workmen. This expenditure has more than justified itself, for it helps to create that sense of confidence between master and men that is so necessary in a work of this kind, involving considerable risk of life and limb.

For the high wages obtainable Indians are ready to risk the work underground, but they do so with full confidence that the authorities will use all care possible in the protection of their lives. Although their interests in connection with their work are not neglected, the companies are not indifferent to their comfort above ground. The provision made for the European workers is quite satisfactory, especially for those who are permitted to have their wives and families with them. The accommodation provided for the Indian coolies may not strike one as specially lavish, yet it does not fall behind the kind of house they would live in in their own districts.



PART OF THE CYANIDE PLANT

Geological Details

Without entering into details, a brief résumé may be given of the general occurrence of the gold on this important field. Dr. W. T. Smeeth, D.Sc., A.R.S.M., has written an interesting account of the subject, and I am indebted mainly to him for the following facts regarding the occurrence of gold here:

"The Main Champion Reef runs almost continuously through the Mysore, Champion Reef, Ooregum, and

Nundidroog mines. In places the quartz has been from thirty to forty feet wide, but the average of the parts worked is probably between three and four feet, although in places the lode is represented by mere stringers or veined schists. The quartz sometimes branches, and in several places there are occasionally parallel veins, from which a good deal of ore has been obtained. The veins strike north and south. The dip, or inclination, from the horizontal of the veins is to the west and is least in the Mysore mine, where it is about 45 deg.

"In recent years, as the mines have been sunk deeper, there has been a tendency for the veins to get steeper, so that at 4,000 or 5,000 ft. the dips are from 50 to 60 deg. in Mysore, and well over 70 deg. in the Champion Reef mine. The most important feature is the occurrence of the more valuable portions of the veins or shoots with intervening areas of poor quartz or lode matter, and the successful development of the Kolar gold field is due to the fact that these shoots are of considerable size and value, and sufficiently numerous to permit of new discoveries being made before the old ones are exhausted.

Veins Not Uniform in Character

"The steady progress of the mines is not due to the uniformity in the veins, as the distribution of the gold is uneven, but to the very extensive exploratory work which is carried on far below the points where ore is being extracted, and which permits of work being planned several years ahead of the milling requirements. The existence of slides or faults cutting the veins has received much attention in recent years, particularly in Mysore and Champion Reef. . . . The auriferous veins lie in a narrow belt of hornblende schists and are believed to be older than the gneiss which cuts off the schists on both sides and below, and will therefore be cut off along with the schists at some depth below. This depth represents the ultimate limit of the Kolar gold field, and there is no reason to apprehend that it will be less than 10,000 to 15,000 ft. from the surface."

These facts are important, in view of the anxiety that always exists respecting gold mines as to how long they will continue to produce. It has been said that work may be done to the level of 8,000 ft., and at the present rate of working there seems no likelihood that the ore will be worked out under thirty years. Yet there are many uncertainties, and an expert recently stated "The problem of the continuance of the Kolar gold field is, therefore, a speculative one, and in mining work the more unfavorable contingencies are wont to occur with undue frequency. However, it is opined that the Kolar gold field should continue for another twenty or thirty years at least, with a probable diminution of output in the later years."

Simple Amalgamation and Cyanidation Method Used

Though there is great similarity in the methods adopted in most mining fields, it may be said of this field in particular that the companies are keen to be abreast of every modern improvement, and their plants will probably compare favorably with those of any other mining field in the world. The head gears are of the latest type, the underground machinery is mainly electrical, and most of the surface work is electrically performed by current supplied by the generating plant at Sivasumudrum, and though there are differences in the various mines, some following more antiquated methods than others, on the whole it may be said that the plant is modern and adequate.

The ore is worked and sent to the surface in lifts, and immediately sorted and broken up into workable sizes. At some mines the sorting is done in the head gear, whereby the ore is passed through various grids and the waste rock eliminated. By this process about 18 per cent of the total ore is rejected. The ore then goes into the rock breakers or primary crushing machines, where it is prepared for secondary grinding in the stamp battery, a practice that is followed in many gold mills all over the world, and is next passed on to the stamp mills, where it is pounded with water into a fine sand, to pass through wire screens having about a thousand holes to the inch. The product is then treated on amalgamating tables in the customary manner.

The greater part of the gold is recovered on the plates, but cyanide treatment is used as a supplementary process. Fine grinding accompanied by leaching of the sands, agitation of the slimes, and precipitation of the gold in zinc boxes is practiced. The cyanide treatment for low-grade ore has made available a large tonnage of old tailings.

The Kolar gold field is certainly one of the most interesting places in India and is among the most important of the gold fields of the world. It has proved a most profitable investment for those who have possessed original shares of stock, and has provided labor at high wages for large numbers of Tamils. The government of Mysore has reaped great royalties from the Kolar gold-mining industry, and under the care of Messrs. Taylor & Co. this field has prospered and has many years of prosperity before it.

Belgian Plastic Earth Industry Active

Intense activity is reported by Consul General Henry H. Morgan in the plastic earth industry at Saint-Ghislain and environs, where these manufactories are established, as well as in the faience and porcelain industry and in refractory plants. Stoneware concerns in the region of Bouffioulx are also working at full speed, with the exception of two small plants whose production is used mainly in the arts. All the refractory industries at Tertre, Baudour, Jurbise, Hautrage, Sirault, and Saint-Ghislain are in full operation. A factory at Saint-Ghislain devoted to ceramic products has resumed work; two porcelain plants at Baudour are active, and there are reports of the establishment of a new enterprise at Quaregnon. The Usines de Sirault (tiles) are operating. Within a radius of several miles there are no fewer than twenty-five factories, some of which are not neglecting artistic production. Some of them have under consideration intensification of production and the question of better adapting their fabrication to present needs.

Graphite in Western Australia

The Western Australian Minister of Mines, according to the *Journal of the Society of Chemical Industry*, announces that an English company is making preparations to work the very extensive deposits of graphite in that state. He was advised that this deposit was one of the biggest in the world, and that in view of the fact that the world's requirements were about 300,000 tons per annum, and that most of the big sources of supply were dwindling, the enterprise should prove of great value.

The Mining Opportunities in Siberia Under the Present Régime of Zemstvo-Soviet Government

By Ivan Narodny*
Written for *Engineering and Mining Journal*

SINCE the overthrow of the Kolchak régime, Siberia has gone back to the same kind of half zemstvo, half soviet government that was established immediately after the first revolution in 1917. There are indications that this is going to be, in a modified form, the permanent government not only of Siberia and Central Asia but of all Russia.

While the news stories are still trying to paint Siberia in the grip of Bolshevik orators or those red-haired preachers of anarchy and absolute communism who marked the first era of the Bolshevik rule, the fact is that the economic-political conditions of this vast territory are as normal as they were in America when the states formed a union, if we disregard the bloody episodes in Russia of the past winter. Nearly all municipal and rural institutions are reorganized, and systematic reconstruction work has just begun.

A new free spirit emanates from every corner, and the population is looking forward for a prosperous and peaceful future. The purely economic conflict with Japan, which occurred in Vladivostok, Habarowsk, and Nicolaewsk, is only one of those natural results of the past turmoil and intrigues of the various political cliques. It will be solved in the immediate future with satisfaction to both parties, and there is no foundation whatsoever for the rumor of a war between Japan and Russia. Such a war would be harmful for both. In the same way, it would not benefit Japan to hold Vladivostok for any length of time, as her retention of that port would mean a commercial boycott of both countries and guerilla warfare for generations to come. This is fully understood by both governments, and they are working now to settle the matter soon. In fact, the Japanese authorities have not interfered with the local administration of Vladivostok, which is in the hands of the Russian institutions.

Traffic Service Reorganized

The Siberian Railway has begun to increase operation and has reorganized the passenger and freight traffic. Regular express trains have begun to run from Vladivostok to Irkutsk, Tomsk, and Moscow. The big rivers are being used during the summer months to take care of the freight accumulated all over the country. This summer will see everything fully re-established, so that a year from now Siberia will have trade and industry in a normal state, at least as it was before the war.

Siberia, having been an agricultural and mining country, has suffered less from the ravages of the revolution than any other parts of Russia, except in the towns and around the railway. The farmers have accumulated enormous quantities of hides, bristles, wool, and grain that could be kept, and have increased their herds of sheep, cattle, horses, and camels. Hunters have not hunted much during the last five years, so the forests are full of wild animals. The people have had plenty to eat, have had fuel and lived retired from the exciting events of the outside world. The mines are unexploited, though the miners have worked here and there is a primitive way, as in the coal mines, and in the gold and platinum mines, which are under the control of the government. The Kuznetzk Mills, the big Lena Gold Mining Co., and various other mills in the Ural section have continued to work with reduced capacity. The Nerchinks Gold and Platinum Mines are abandoned, as here the machinery was ruined by the miners.

Report of Finance-Economic Council

I have received a copy of the official report of the meeting of the Finance-Economic Council (Finanso-Eknomichesky Soviet) at Vladivostok, on March 24, on which occasion Mr. Leonoff, the director of the Industrial Department of Siberia, gave an account of the situation. Leonoff, in his report, emphasized the importance of an immediate reorganization and increase of the river and railway traffic and the building of a railway from the harbor of Alexandrowsk, at the Island of Sakhalin, to the interior mining and lumber regions. The next step of importance, according to his view, lay in the establishment of a special mining reconstruction bureau and the opening of mines that belonged to the government and the companies controlled by foreign interests. The report emphasized the fact that all claims should be investigated by the new government, and justice done to everybody.

The local co-operative societies had already started the establishment of tanneries, canneries, soap factories, and flour mills. When Siberia is organized its dairy products can control the markets of the world, as the butter produced in the Omsk, Semipalatinsk and Tobolsk regions only, would be twice as muh as that of the United States. Siberia will have always the advantage of cheap labor and hay, as alfalfa here grows wild. Leonoff insisted that the zemstvos should liberally help the co-operative societies and farmers' unions in the establishment of big dairies for butter, cheese, casein, and milk sugar, on the one hand, and modern slaughter houses on the other. While the population in Petrograd and Moscow was dying of starvation, the herds of Siberia increased, as there was no market in which to sell the meat.

As the vast territory of Siberia, which stretches from the frozen arctics to the semi-tropics, has forests, mines, plains and riches that represent enormous values, and as the debts incurred by the past régime are comparatively nothing, this part of Russia will recover immediately from the turmoil. The Siberian population has a more practical spirit and greater active energy than that of European Russia; therefore it plays a great rôle in political life. To quote Mr. Leonoff:

"We need in Siberia now most of all foreign industrial co-operation: machinery for exploiting the mines;

We publish this article without subscribing to the views therein. Frank A. Vanderlip, recently returned from the Orient, has this to say regarding Siberia: "In Siberia there is literally no government. There is no money there that is readily acceptable, although there is plenty of paper currency; no banking; nothing necessary for law and order. The Japanese say they have 40,000 troops in Siberia making an attempt to maintain order. They originally went there with the Allies, but the latter and the United States have no policy in regard to Siberia and gradually withdrew their forces. The Japanese went back alone." See editorial, p. 249. —Editor.

machinery for the building of iron, steel, copper, and other plants. We need machinery for paper mills, canneries, tanneries, shoe factories, textile mills and sawmills. We have all kinds of raw material. Our Altai coal region is the richest in the world, and there the iron, copper, and manganese ores adjoin the anthracite fields. We have unlimited markets in China and Central Asia. We have the cheapest labor. Our own Russia will consume for a generation to come everything that we can manufacture.

Foreign Capital Invited

"The industrial policy of Siberia is co-operation between labor, the intellectual leadership, and the government. In order to pursue the evolutionary course, we will propose to foreign capitalists to come and take charge of our mines and mills and bring their machines and engineers. We give the labor and the raw materials. At many places we can give mines and mills which were operated by the past régime or its favorites; and, finally, we take responsibility and guarantee the profits. All we want is co-operation and just treatment of everybody. But we will not tolerate criminal exploitation as used to be, or corruption and all the methods of an autocratic government. More important than anything else, we will guarantee that there will be no strikes or destruction of any property, and see that always a fair profit is made by everybody.

"Therefore our proposal to foreign capital is this: Bring us your machines and engineers, and we will give the rest. Should the foreigners not like the agreed profit, we pledge ourselves to repay the value of the machines and other expenditures. We realize that a perfect state of co-operative industry cannot be established immediately, as some communists think in European Russia, and we admit that there should not be a hostile capital and labor, and the government should not be hostile. Our principle is harmony between these three factors in commerce and industry. We fully admit that the intellectual and talented mind should control physical force, but that control should not consist in economic but in purely moral power.

Local Government System

"The Siberian zemstvo government has concluded peace with the soviet government of European Russia, and is in many ways like the latter. The difference between a Russian soviet and Siberian zemstvo is merely in details and in certain forms of administration. The Siberian zemstvo is practically the same institution as in the state government of the United States, only with the difference that the provincial zemstvo of Siberia is far more independent from the central government than is an American state from the Federal Government.

"Besides, the Siberian provincial zemstvo consists of the county zemstvo only in certain major matters, but not as much as a state controls a county in America. Finally, there is the *mir* of the local district, or the *volost*, which, again, has its individual governing body for the immediate locality. Matters of land and forest concessions, in many cases even of mines and mills, depend not upon the central, provincial, or county zemstvo, but upon the peasant community, the *mir*. The zemstvo and soviet system of government is therefore the most free government imaginable and the possibility of rule by politicians is excluded. Though independent locally, zemstvos and soviets are united morally, and a concession granted a foreign capital by a local zemstvo is traditionally not objectionable to the provincial or the central zemstvo.

"Therefore dealings regarding concessions have to be conducted with each local administration; yet these all have their executive secretaries in a town like Vladivostok or Irkutsk, where the preliminary negotiations can be carried on till the final sanction has been granted. Also, the present government honors all the concessions and rights that were sold or granted to any company in the past by a municipal or local government. All that Siberia objects to is the method and way the Czar's régime granted such concessions, which were without any exception fraudulent, and contradictory to the local interests.

Function of General Government

"It is only matters pertaining to national questions, as the general financial policy, the declaration of war, making of peace, negotiations with the foreign countries, postal, railway, telegraph, shipping and other services, that are decided by a federal board, elected for one session only from all the provinces of the republic. Therefore dealings in matters pertaining to a mining, industrial, or trade question in Siberia are to be concluded with the Siberian local governments only.

"The Siberian zemstvo government is at this particular moment most favorably inclined to the manufacturers, engineers, and business men of the United States, and will be greatly pleased to grant to those the most favorable privileges and concessions and give preference over those of any other country except China. The American troops and their leaders in Siberia won the love and confidence of the whole Siberian population, and the American engineers left the warmest memories among the population wherever they came in touch with the people. Siberia is grateful to those who are her sincere friends; therefore what our local governments might even not accord to our own promoters, they are happy to grant to the Americans. We are a hospitable people."

This semi-official statement of an important functionary of the new government is a sufficient proof of the opportunity that an American business man or manufacturer can expect now in Siberia. Though there will not be a chance to heap billions in Siberian enterprise, as it will be under the control of the government, there will be a fine opportunity and an enormous field for new activity. One thing is sure: industrial enterprises will not be subject to taxes and bribes, blackmails of politicians and bureaucrats, but all transactions will be open for everybody.

Siberia Seeking Democracy

Democracy, the power of the people—that is the tocsin of new Siberia. Never before in the history of the nation has Siberia been shaken so strongly in its fundamentals as at present. Probably in no country in the world was the government so misrepresentative of the people as was the old government of the Czar.

It is the Siberian people and their qualities that eventually will show forth in their new institutions, just as the character of the Saxon has asserted itself in English institutions, and as it was the character of the first American settlers that molded the United States into what it is. For what the Siberian peasant is today, that, quickened and refined by education and by the stir of larger interests, will the Siberian population be tomorrow.

More than three hundred years ago Russia began to exile here the political offenders and the followers of new religious sects. Later the Department of Justice exiled here all the common criminals, with the exception of petty thieves and burglars. Those exiles became farmers, hunters, or miners, and they usually organized their individual colonies. Then emigration was encouraged, and young couples who found the village too limited for their energy wandered out to Siberia. Therefore it is the village more than the city that is the backbone of all the life and peculiarities; therefore it is the village and not the city that will give the best ideas of Siberia. Out of a thirty million population, only one million or a little more are living in the cities. It is through Vladivostok and Irkutsk or Omsk and Tomsk that the outside world thus far has seen Siberia—a class too highly colored by foreign influences to afford a fair view of a people whose life from time immemorial has been one with the open fields.

The first thing that strikes one on seeing the Siberian rural life is its strong similarity to the American colonies in the West. Like the American settler, the Siberian by his nature is an individualist. He is willing to take his chances in a general mix-up and yet remain an individual socially. Though the American colonist always envied the patrician until he himself settled in a town, a Siberian moujik loves nature and land and comes always back to his village. The European farmers sold their land to the nobility, but the Siberian peasant community never recognized any nobles.

Characteristics of the People

The average Siberian is exceedingly hospitable, generous, simple, religious, and highly emotional. Emotionalism has been, to a great extent, the cause of many Siberian social-political troubles in the past, for a moujik would sacrifice his last property for a cause, an idea, or a venture, regardless of results. You will not find a better-hearted man in the world than a Siberian moujik or Cossack. With all his illiteracy, his lack of education, he is a born artist, a man for whom the æsthetic ends of life are everything. For that reason you will find big municipal theaters, music halls, museums, and schools of drama and dancing in all the Siberian towns. You will find all the impulsiveness of a child-like nature. In all the communal life a Siberian peasant has remained always a strong practicer of co-operative methods.

The "Artel"

Despite the early start which the other nations had over Russia in industrial development, there has quietly grown up in Siberian towns an institution which shows a deep philosophy in the national character. This institution, which is known as the *Artel*, had its origin in the traditions of the village. Though still in a most primitive state, the ancient Russian farmers perceived a truth which the western nations are only now beginning to realize: that it is better to co-operate than to compete. And so, instead of working their fields, selling their products, and purchasing their supplies individually, they acted in groups and divided the profits. Despite the allurements of the "civilization" of the city, the Siberian peasants have continued their barbarous practice of co-operation.

The co-operative tendency is so widespread, both in the rural districts and in the cities—it has taken hold of the people's imagination so strongly—that they cannot conceive any big success in a large commercial or industrial enterprise unless it is based upon co-operative principles. The number of Siberian co-operative societies has increased so fast, and they are so powerful, that they compose the controlling financial force. The co-operative societies form a nation-wide trust. Everybody earns money and is satisfied with the system. This is proof that the Siberian, peasant and workman are instinctively democratic.

The Gentle Dinosaur

Written for *Engineering and Mining Journal*

If some of our readers have difficulty in visualizing the fact that sedimentary or stratified rocks have accumulated slowly as actual layers of sand, gravel, and mud, the footprint of the monster shown in the photograph may bring the conception home to them. This is one of two prints showing through the shale of a 26-ft. coal bed at the Castle Gate mine of the Utah Fuel Co. This airy creature trod the slimy mud (which is now

FOOTPRINT OF GIANT DINOSAUR IN ROOF OF COAL MINE

The photograph was taken by A. C. Watts, chief engineer of the mines of the Utah Fuel Co.

shale) in the swamps where the vegetable layers had previously accumulated to form what is now coal. Note how the mud "squashed" away from his foot—quite as if it had not happened a matter of thirty million years ago, more or less. The gentleman evidently was a three-toed dinosaur, or "terrible lizard," as the derivation of the name indicates. With a paw measuring two feet in each direction (the size of this track), he was really quite a terrible lizard.

The Production of Refractory Brick in the United States may be roughly divided as follows: Silica brick, 18 per cent; fireclay brick, including bauxite brick, 80 per cent; and magnesite and chrome brick, 2 per cent.

Smelting in Namtú, Burma

Trying Conditions During the War — Shortage of Labor, and Supplies Unobtainable — Plague, Cholera, and Influenza Epidemics — Details of Treatment of Lead-Zinc-Silver Ore in Smelter and Refinery

By Arthur W. Jenks*
Written for *Engineering and Mining Journal*

THE lead-silver plant of the Burma Mines, Ltd., up to the spring of 1919, when I left Burma, had experienced many difficulties caused by the war in that region, so remote from manufacturing centers. The plant was not up-to-date, and, during the war, extensive construction to remedy that state of affairs could not be entertained. Early in the war, the activities of German agents in Bangkok were successful in organizing an expedition against Burma. This expedition was promptly met by the British near the frontier, and numerous trials and sundry executions in Mandalay were the sequel. But at one time the matter looked serious in Namtú, and the best possible military measures were taken to repel the expected attack. The Europeans were organized into a company of volunteers; frequent and regular military drills were carried on; and the military organization then started was continued throughout the war. In fact, this local company, furnished with arms by the Indian government, was all the protection that could be provided, as no outside troops could be spared for isolated places like Namtú. As a matter of fact, no fighting occurred, but the time consumed by these protective measures, and the anxiety, were not conducive to the smooth running of a plant.

Up to the time of the entry of the United States into the war, there was much feeling among the British subjects against America. Later, this feeling was lessened; fortunately so, because, in the staff, composed as it was of Americans, English, and Australians, nationalistic antagonisms were developing.

As the war progressed, the Indian government was obliged to become more and more stringent in its regulations to compel the conservation of supplies. Coke suitable for retorts soon could not be obtained, and fuel oil from the Burmese field was substituted. Good belting and belt lacing were very scarce; repair parts for telephones and motors were unobtainable; and coal brought from Calcutta soared in price, and, besides, was difficult to obtain. The government listed the stocks of iron and of other supplies in all forms, in the hands of firms and corporations in India, and put its veto on the purchase of many articles. Yet, owing to the fact that the Burma Mines, Ltd., were listed in "Class A" of the manufacturing establishments, that being the classification given to the essential industries, preferential treatment was obtained. The fate of establishments with lower classification can be inferred. The

LOOKING SOUTHEAST DOWN THE NAMTU RIVER

*Formerly smelter manager, Burma Mines, Ltd.

shortage of supplies was such as to preclude serious construction work at the plant, and even many most necessary repairs and replacements, such as ventilating hoods at the blast furnaces, were not effected, owing to lack of available material.

In 1918, the price of food began to rise, and the coolies were complaining of the cost of living. Wages in the smelter, by bonuses and otherwise, had to be raised somewhat, and the ordinary roustabout coolie received a rupee (32c.) per day on day wages, about twice what the same coolie would have received in Bengal. On contract the coolies were making from 1¼ to 1½ rupees at the beginning of 1919.

A calamity not directly connected with the war, but which in connection with the war difficulties badly upset regular operation at the mine and smelter for many weeks, was a succession of epidemics. The first, that of bubonic plague, was not so serious; a vigorous campaign against rats, vaccination of Europeans and of many Asiatics, and other sanitary measures checked it. But in August, 1918, cholera appeared, and, almost immediately, the influenza. The European staff were largely withdrawn from their usual vocations and used to form a defensive quarantine cordon around Namtú. Only one case of cholera developed among the Europeans, and by injection of saline solution the victim's life was saved. However, there were a number of deaths among the natives in Namtú. Outside the cordon, along the narrow-gage railway connecting Namtú with Namyáo on the meter-gage Burma railway, the deaths were numerous.

The bodies were cremated, when they could be found; the natives often would not report illness to the doctors, or even deaths. But by far the larger number of fatalities was caused by pneumonia resulting from influenza; the scarcity of doctors was such that it was impossible, for a time, to give proper attention to the large number who were ill. The company maintained in Namtú an excellent medical and sanitary staff, but the work at that time was entirely beyond their capacity. Many physicians had left Burma for the seat of war, and, though the company endeavored to secure more medical assistance, it was impossible to do so. The total number of deaths in and near Namtú was about 200, which was a good record in comparison with most places in India. In the whole of India, the deaths from the 1918 epidemic of influenza were estimated at from five to six million.

The effects of the epidemic of cholera and influenza upon the ignorant and superstitious laborers can be imagined. Only 40 per cent of the men at the smelter and refinery remained, 60 per cent being either victims of the epidemic or frightened away. The worst of the shortage was over by the end of November, but even in mid-winter of 1919, when the supply of coolies from the Chinese Province of Yunnán should have been good, the number of men was insufficient in Namtú, and the wood choppers, of whom there formerly were several thousand, had almost entirely failed to appear.

LEAD SMELTER AND REFINERY, LOOKING SOUTHWEST

Wood Fuel Not as Economical as High-Priced Oil

Until the year 1918, the supply of wood fuel, cut from the surrounding government forest reserves, had been sufficient to supply the roasters, the lead refinery, and the boilers furnishing power for the blowers of the blast-furnace department; but the increasing distance of the timbered areas from Namtú, the higher rates at which

it was necessary for the company's forestry department to let the wood-cutting contracts, the large amount of handling required in the plant, then, finally, the demoralization of the labor market by cholera and influenza, necessitated a sudden and complete change, at the close of 1918, from wood fuel to oil throughout the plant. Despite the high cost of fuel oil at that time, 81 rupees per ton, the change was economical as compared with the wood fuel.

The wood choppers persistently split the wood too fine, and added small limbs, with the object of increasing the cordage; but laborers were too few in the forest in the first half of 1918, and almost entirely absent in the last half, and no output commensurate with the needs of the works was possible. If sound fuel of proper size had been available, very possibly wood fuel might have been as economical as the high-priced Burmese oil; but owing to the scarcity of fuel for many months, old, partly decayed wood, a fuel giving no heat, and many small sticks, were shipped to the works; and this procedure necessitated the opening of the fire-doors with excessive frequency. The great amount of such wood fuel required, and the large amount of iron ore coming from Namyáo, strained the transporting capacity of the company's railway to the utmost, and fuel shortages were frequent. In consequence of the decreased rolling stock available on the Burma railways, threatened famines of oil supply, and of coke, often occurred; though it must be admitted that usually the coke and oil arrived before a serious shut-down was imperative.

Hindus Will Work in Rain, But Yunnánese Will Not

The rainy season is from May to October, continuing somewhat into November. This is the season of labor shortage, because the Chinese generally return to their homes in Yunnán province to work their farms. Besides, the Yunnánese do not enjoy working in the rain, even when, as in our case, they were furnished with rain coats. The same remarks apply to the Mainthas, a border tribe whose territory is partly in Burma and partly in China. The Yunnánese and Mainthas are usually excellent laborers, intelligent and cheerful. Their faces are expressive, and in that respect they differ widely from the Chinese seen on the Pacific Coast. They are very fond of meat, whereas the thin Hindu on whom one must depend mainly in the rainy season for any outdoor labor, eats little animal food.

The Hindu will work in the rain, but is inferior to the Chinese as a laborer, this difference being largely due to the fact that, on the same wages, the Chinese spend more for food than the Hindus. Early in December, the rains having ceased and the weather having become fine, the coolies normally poured into Namtú from the north, and there was labor enough until the beginning of the next rainy season. But large numbers of laborers were sent from India into Mesopotamia during the war, and this fact rendered it difficult to maintain in Namtú the needed quota of men in the various departments. As the sale of opium was permitted in the vicinity of Namtú, and as it was prohibited in Yunnán, confirmed opium smokers remained on the Indian side of the boundary. Such men naturally are nearly useless as laborers, and were only employed in case of dire need.

Though in 1916 and 1917 the shortages of labor in Namtú were not as frequent as in Mexico, they were often prolonged and led to many shut-downs of the furnaces, and delays in repair and construction work; but in 1918, the labor situation became excessively bad. As a result, the men, in the fall of 1918 and on into the following winter, were mainly new to the work, and were the despair of the European foremen. The furnace men often would come for a few shifts and then disappear; it would be necessary to begin again and replace them by absolutely green men. A bonus based on the production, or tonnage per month, and another based on the number of shifts worked in the month, helped considerably, but it was impossible to effect large economies of labor until three new shifts, mainly composed of raw material, had been trained.

Crushing Plant Unsatisfactory

The crushing plant for sulphide ore and iron ore gave much trouble and was not efficient. There were several causes. It was difficult, and sometimes impossible, to crush the iron ore from the Manpwe deposit, because it contained so much clay; there were mechanical difficulties; and it was impossible under the conditions at that time to secure competent men in charge of that plant. The Mong Tat deposit, which was being developed, yielded a hard ore high in iron, and gave no trouble in crushing and screening to ¾-in. mesh. The lead-silver ore itself, from the Bawdwin mine, crushed readily, except when it came from a stockpile, or when it had been wet much in transit by rains.

The roasting was done in six Godfreys running at the rate of 40 tons per 24 hours, and bringing the sulphur down to 11 per cent. They were used as pre-roasters, followed by sintering pots. One Dwight-Lloyd was finished in the fall of 1918, after much delay, and received its charge also from the Godfreys. The calcine from the pots ran between 4 and 5 per cent sulphur; from the Dwight-Lloyd, running at the rate of 90 tons per 24 hours, the sinter averaged 3½ per cent sulphur in material running 16 to 18 per cent zinc.

Dwight-Lloyd Machine Efficient

The selected Bawdwin ore sent to the crushing plant was running 40 per cent lead with 37 ounces of silver per long ton, 22 per cent zinc, over one-half of 1 per cent of copper, and a similar amount of nickel. At the crushing plant, the mixture for the Godfreys was made, and consisted of 25 per cent crushed iron ore and 75 per cent crushed lead ore. Material so high in zinc had not, as far as I was aware, been treated on the Dwight-Lloyd machine, and I naturally felt considerable anxiety until the machine had been tested on our mixture and found efficient. Additional testing and adjustment were necessary to improve costs and methods of operation, and were being carried out.

Our coke was shipped to Rangoon from Calcutta. It contained 22 to 24 per cent ash, and was not as dense as it should have been to obtain proper reduction in the blast furnaces. Usually 14 per cent was used on the charge. Better coke was being made in India, but it was all used by the iron and steel companies on war work. The two blast furnaces ordinarily used put through 180 tons of charge each per 24 hours. A third and smaller furnace had a capacity of 100 tons, and was principally used for the smelting of refinery residues. Of course the iron flux was largely contained in the sinter itself, but there was no arrangement whereby

the iron ore and limestone added direct to the charge at the blast furnaces could be crushed mechanically.

The blast-furnace slags up to the fall of 1918 had run 15 to 16 per cent ZnO. At that time, a small amount of matte was being made, and occasionally a speiss with 25 to 30 per cent nickel. To increase lead fall in the charge and the lead output of the plant, higher zincs were attempted, and were being run successfully, the average for January, 1919, being nearly 26 per cent ZnO, if the zinc is considered to be an oxide in such a slag. But there is manifest impropriety in so doing, as such slags contain 4 to 5 per cent of sulphur. An average slag of that character with a specific gravity of 4.1 ran approximately: Pb, 4 per cent; ZnO, 26 per cent; FeO, 39 per cent; SiO_2, 18 per cent, and CaO, 4 per cent.

The alumina was not determined daily, but was running about 5 per cent. The slag also contained much of the copper and nickel occurring in the ore, because there was no separation of matte. The limestone required for such a zincky slag was much less than had been required previously, and as against the increased *percentage* of FeO in the slag must be placed the lessened quantity of slag produced as compared with the slag formerly used, with 15 to 16 per cent of ZnO. The slags ran well, the tuyères were bright, but there was a decided tendency to form a zincky accretion on the bottom and sides of the crucible.

Dwight-Lloyd Sinter Improved Blast-Furnace Tonnage

The ores sent to Namtú from the mines were entirely sulphides, requiring roasting. The Burma Corporation began its operations on the slags, low in zinc but high in lead, produced in the ancient small Chinese furnaces; but of this material little remained. Consequently, the quantity of ore smelted was limited by the roasting capacity of the plant. Additional Dwight-Lloyds have since been provided. The use of Dwight-Lloyd sinter at the blast furnaces increased the tonnage put through; also, as was to be expected, the lower the sulphur in the roast was, both from the Dwight-Lloyd and from the pots, the better the furnace ran on these high zinc charges. Slag with 4 per cent lead, with 1½ to 2 oz. of silver, with appreciable percentages of copper and nickel and 20 per cent of zinc, can hardly be considered a waste product. In emergencies it can be made to produce lead and silver for the refinery with great rapidity.

As roasting capacity was limited, it was not practicable to utilize any of the Godfreys in the pre-roasting of blast-furnace matte. It was also impossible to export concentrated copper matte, because of the shortage of ships. These facts militated against the normal practice of working up the copper products of the blast furnaces and reverberatory residue furnace as quickly as possible. Baghouses or a Cottrell plant were needed at the refinery and blast furnaces, but during the war it was not found practicable to obtain the materials.

Refinery Had No Kettle Plant

As the necessary kettle plant for dressing and cleaning the blast furnace lead had not been provided, the bullion was run into rakes of molds at the lead well, weighed, and sent direct to the refinery. There it was charged into a reverberatory drossing furnace, the heavy copper-nickel skimming being withdrawn at a low heat. The composition of this was variable, but the following may be taken as fairly representative: Silver, 40 oz. per ton; lead, 62 per cent; copper, 10 per cent; antimony, 2 per cent; arsenic, 4 per cent, and nickel, 5 per cent.

This material was charged into the residue furnace, with the antimonial skimmings from the softening furnace, a small amount of ore from the mine, and the usual coal or coke dust as a reducing agent. The resulting copper matte ran low in nickel, but a speiss was formed abundantly, running 35 per cent nickel, this material being stored for possible future treatment. The speiss often gave trouble in the residue furnace, freezing around the lead tap.

The zinc used for desilverizing came largely from Japan and was of good quality. For example: Silver, 1.2 oz. per ton; lead, 1.21 per cent; copper, trace; zinc, 98.68 per cent; arsenic, trace; antimony, none, and iron, 0.05 per cent.

The percentage of zinc actually consumed was reasonable, but the cost of the spelter delivered in Namtú rose to nearly 1,000 rupees per ton, and the effect on refinery costs can be imagined.

The pressure for the double-cylinder Howard press at the kettles was deficient, and the mechanical arrangements for handling it were slow. These defects were remedied gradually, but the mechanical department was handicapped in many ways by the war conditions. The lead in the desilverizing kettle ran 100 to 150 oz., and when, occasionally, the high pressure was obtained, the assay of the crusts rose to 3,500 or 4,000 oz. per ton.

Wood a Satisfactory Fuel

Scotch coke, followed in 1917 by fuel oil, was used at the retorts; otherwise wood fuel was formerly used throughout the refinery and gave good results. With selected fuel, this was true even of the cupels. But the increasing cost and scarcity of wood fuel, as already explained, combined to cause the change to oil fuel throughout the refinery, which decreased the fuel expenditures. Besides, the Chinese workmen quickly became accustomed to the use of oil, and regulated the heat better than was possible when using the variable wood fuel delivered in 1918.

The Bawdwin ore contains no gold; or, more strictly speaking, there is one ounce of gold to twenty thousand ounces of silver. Consequently, no parting was done. The silver bars as sent to the mint ran about 998 fine, the principal impurity being copper.

A three months' average analysis of refined lead produced in 1917 gave 99.982 per cent lead. The bars of lead as sent to the Indian government weighed 115 lb.; but much heavier bars were molded for the Chinese market, as the import duty on lead in China is reckoned per bar, and not by weight. The Burma Mines Co. furnished the Indian government with all the refined lead it required during the war, 1,500 tons per month. The excess of the monthly production, 300 to 400 tons, went to China and to the local trade. The refined silver was sent to the Indian mint.

Deposits of Inter-Bedded Magnesite and dolomite beds, with small amounts of slate and promising deposits of talc, occur in South Manchuria, according to a bulletin issued by the Guaranty Trust Co. Though the Japanese have secured large areas of the deposits, considerable areas are under the control of the Chinese.

Mining Engineers of Note

W. H. Shockley

REGARDLESS of the merits or demerits of simplified spelling, W. H. Shockley can be credited with having the courage of his convictions in his advocacy of the movement, and, although disliking the notoriety which his views have brought, he is convinced that the measure is a necessary step toward a needed reform. Few American engineers can include in their list of experiences the numerous and extensive travels which have fallen to the lot of Mr. Shockley, and it is probable that his championship of spelling reform is due, in part at least, to his contact with the complexities of many languages. William Hillman Shockley was born in 1855, at New Bedford, Mass. His father was a whaling captain and his mother had been a school teacher. His maternal grandfather was Jethro Hillman, a builder of whaling ships, famous for their durability, and his paternal grandfather was a ship carpenter, a farmer of rocky soil, and the father of fourteen children. Mr. Shockley married May Bradford, an engineer (formerly a U. S. Deputy Mineral Surveyor) and artist, and they have one son. Following his graduation from the Massachusetts Institute of Technology in 1875, Mr. Shockley went to Florida as a surveyor, and later to California. From 1880 to 1893 he was employed at the Mount Diablo mine, Candelaria, Nev., as assayer, surveyor, bookkeeper, and finally as general manager. During this period he built a dry-crushing silver mill that was said to have held the record for capacity at that time. He operated a small gold mine at Grass Valley, Cal., for a few months in 1893, and the two years following studied languages, literature, art, and music in New York and Europe.

W. H. SHOCKLEY

Late in 1896 Mr. Shockley was sent to China by Bewick & Moreing as mining engineer for an expedition headed by William Pritchard Morgan, ex-Member of Parliament, with the aim of obtaining concessions, making loans, and establishing a mining administration. A nearly completed British loan of £16,000,000 was thwarted by Russia's threat to send troops into Mongolia. In 1898 he took over the Shansi concession of the Peking Syndicate. On this journey, Mr. Shockley religiously followed Agent Luzzatti's instructions to "be kind to Chinese," but, despite this kindness, two years later a reward was offered for his head by the Shansi officials.

During 1899 Mr. Shockley spent eight months searching for petroleum and visited the noted "fire-wells" of Shansi, long extinct and now mere seepages of dark oil. During his stay in China he made a collection of porcelains and embroideries, which are now loaned to the Stamford Museum. After leaving China in 1899, he "globe-trotted" through India, took a side trip to Egypt, and in 1900 went to Vladivostok, where an iron tramp steamer was placed under his charge. In this, with a gang of Russian and Korean workmen, Mr. Shockley and some American assistants explored the Siberian coast opposite Cape Nome. No gold was found, but considerable coal was seen. Mr. Shockley had a semi-mutiny among the men, but was able to complete the work planned and examined copper deposits at Petropavlosk, Kamchatka, and gold placers near Gejiga, at the head of the Okhotsk Sea. During 1901 Mr. Shockley examined gold mines scattered over western Australia and in 1902 surveyed a concession in Korea. In 1903 he reported on quicksilver mines in Texas and a gold mine in Peru, where, instead of the tens of millions of dollars reported by the vendors, Mr. Shockley found only a few rich spots of ore guarded by myriads of bats. Later he examined a large property in the Urals, comprising iron mines and furnaces, copper mines and smelter, gold placers and dredges, a chemical manufactory and a fleet of steamers plying on more than 2,000 miles of rivers. The wealthy Russian family owning this domain had invested $10,000,000, and never received a dividend.

Mr. Shockley investigated a concession in the eastern Sudan bordering on the Red Sea and Abyssinia during the early months of 1905, and later in the same year prospected gold and platinum claims which he, in company with a Russian engineer, had located in the northern Urals. Platinum was found on the property, but its occurrence was not in payable quantity. In 1913 Mr. Shockley returned to California, where he now resides.

BY THE WAY

Who Put the Ass in Assay?

Our Bolshevist editor, who never can be tamed, contributes the following comment on Roswheel's letter in our What Others Think department. We disclaim all responsibility:

"Although it is true that the dictionaries all accent the last syllable of the word 'assay,' even when used as a substantive, it is nevertheless true that the first syllable is universally stressed in this country. This in itself constitutes the best of authority, for usage makes language, of which the dictionaries are but the tardy recorders. By gradual change of the spoken language, Old French developed from Latin, and modern French from Old French. It is not the task of spoken language to keep back with the dictionary; but for the dictionary to keep up with modern diction. Moreover, when the same two-syllable word is used both as a substantive and a verb, it is the modern spirit of the language to stress the first syllable when used as a noun, and the last syllable when used as a verb. My dictionary (said the Bolshevist editor) states that 'assay' and 'essay' are substantially the same word, but the meaning of the two forms has drifted somewhat apart. Yet the dictionary stresses the first syllable of 'essay,' used as a noun, and the last syllable of 'assay,' as Roswheel points out. Wherefore (said the Bolshevist editor)? The trouble is (he said) that the dictionaries are not quite up to date.

"Anyhow (he said) I claim that 'Ain't,' to which Roswheel appeals as a horrible example of bad habit, is a perfectly good English word. It is the abbreviation for 'am not.' The proper conjugation of this form is: 'I am not or I ain't; you are not, or you aren't; he is not or he isn't; we, you, they are not or we, you or they aren't.' Can you make a better shortened form for 'am not'? It is in accordance with all the rules of euphony and elision given by the best of grammarians (said he). It has been a good form, hallowed by usage and correct in origin, since before the lexicographers were born, but they had nobody to explain it to them and couldn't find it in the Latin dictionary." (We have given the Bolshevist editor his time. He would have broken out into a defense of spelling "rhyme" as "rime," or some other fool thing, next).

Early Mining in California

"A roving and reckless miner, known as Bill, who had been washing gold on the Middle Fork of the American River, had occasion in 1849 to visit Coloma," says Hittel's "History of California." "There he managed to purchase for eight dollars a bottle of French brandy, which had been laid by for medicinal purposes. Upon drawing the cork, he insisted on the persons from whom he had bought it assisting him in emptying the bottle. Upon their refusing several times, he dashed it violently against a tree and broke it in a thousand pieces. On another occasion in the course of his spree, while paying for something, he dropped a small lump of gold, worth some three dollars, which a bystander picked up and offered to him. Bill, without taking it but looking at the man with a comical mixture of amazement and ill-humor, exclaimed, "Well, stranger, you are a curiosity. I guess you haven't been in the diggings long. You had better keep that lump for a sample." About the same time Bill, finding a congenial spirit in a man from Philadelphia, whence he himself hailed, induced him to join in purchasing a barrel of ale at $3 per bottle and a case of sardines at half an ounce per box. They then, armed respectively with a bottle under each arm, a glass in one hand and a box of sardines in the other, went about almost forcing everybody they met to eat and drink; and finally they settled down by the side of what was left of their refreshments for a general evening entertainment, to which everybody was invited and welcome. Scenes like the above were of frequent occurrence. But sometimes the dissipation wound up with a quarrel or a fight and sometimes bloodshed. Practical joking of the roughest character was also occasionally indulged in. An instance is related of a party of roistering mountain blades getting very full one evening in 1849, when one of them, unperceived, emptied a can of alcohol over the head of another who was somewhat of a bully, and, seizing a candle, set it ablaze. In an instant, "Man on fire! Man on fire! Put him out! Put him out!" was shouted on all sides; and put him out his companions did with a vengeance—many of them embracing the opportunity, in extinguishing the fire, of paying off old scores and effectually curing the bully of any further propensity to indulge in bluster.

No Use for Witchsticks

The State Commissioner of Corporations of California does not believe in so-called "witchstick" methods of locating oil or minerals. "I have no time for or patience with these age-old superstitions," he recently stated, "and, while the men who advocate them may be entirely honest in their belief, yet the fact remains that these methods are questionable and, I believe, entirely unreliable. Permits to sell the stock of corporations are not issued by the Commissioner of Corporations based upon any such representation.

"I have formed no definite opinion concerning the accuracy or value of the so-called 'Vibratile Motion Instrument' which, I understand, is being used to determine the presence of oil and minerals, and any representation made to the effect that this method of locating oil has my approval is absolutely incorrect."

Catacomb vs. Honeycomb

The following description of a Nevada mining property is credited to a Missouri engineer by the paper which published it:

———— ———— should be called the Catacomb Mines of Nevada, for man, with all of the ingenuity that gave rise to the term, could never equal Nature's results there. It is, in fact, a great repository that promises to keep many workers busy for a great length of time, as they uncover and remove the precious metals now known to have been cached by the caprice of forces that combined to create what we call a phenomenon because we do not understand them.

That Missouri engineer was thinking of "honeycomb" when he wrote "catacomb." The latter is about as good a name for a promising mining proposition as "cemetery" would be. Many a mine or prospect is indeed a cemetery of lost hopes. The claims could well have been located with tombstones at the corners, as happened a few years ago in Nevada when a rich strike was made in a certain graveyard. But this condition should never be reflected in the name.

CONSULTATION

Manganese Battery Ore

"Being a subscriber of your journal I am taking the liberty of writing you for some information on manganese dioxide. We are producers and shippers of high-grade metallic manganese ore. This class of ore we have no trouble in disposing of but we have a good grade of pyrolusite that runs about seventy-nine in dioxide which we have been unable to find a market for as a dioxide. A complete analysis of the ore follows:

Moisture	1 20	Calcium carbonate	3 15
Silica	9 00	Calcium fluoride	5 40
Iron oxide	0 43	Magnesium carbonate	1.00
Manganese dioxide	78 73	Gold, silver, phosphorus	
Aluminum oxide	0 92	trace; platinum, none	
		Nickel, copper, cobalt,	none

"You can see it is a suitable ore both for battery and dye purposes. While it is a little high in silica we can get it down to about 6 per cent by sorting. It contains no copper, small iron, no other metals.

"I would appreciate it very much if you would give me some information as to who could use this ore and about what price it should bring"

Manganese ore for use in dry cells or batteries is customarily supplied by brokers to the manufacturers in lots ranging from 5 to 100 tons under guaranteed specifications. There is no general and definite schedule existing in the market for manganese ore suitable for battery purposes as there is in the manganese for use in the steel industry. There are not many known deposits of manganese ore in the United States that are capable of meeting the rigid requirements of battery manganese (less than 1 per cent of iron and not more than traces of nickel, copper and cobalt) and furnishing a steady output—one that will not vary too much in grade. The analysis you present indicates a suitable battery grade or ore. Prices we are quoting for this sort of material vary between $75 and $90 per ton at New York, depending upon the analysis.

The value of an ore for battery use depends upon its content of manganese dioxide rather than upon its metallic manganese content, although naturally the compound is directly dependent upon the metallic manganese. Formerly Russian manganese ore from the Caucasus region was imported, as its richness and unusual purity made it admirably suitable for battery purposes. Analyses ran from 85 to 90 per cent and higher in manganese dioxide and usually contained considerably less than 1 per cent of iron. The analysis shown contains a lower percentage of manganese, but as considerable ore during the war containing but 70 per cent manganese dioxide was used, as the Caucasian ore was unavailable, the analysis is relatively high in that particular. The market for domestic battery ore depends upon the possibility of obtaining richer ore from other sources. The readily available Russian ore, its excellent quality and general superiority over American supplies made competition by United States producers practically impossible before the war. It was only after the Caucasian supplies had been shut off that attempts were made to experiment with domestic "battery" ore to determine the suitability of the various manganese minerals and to define the impurity limits. Battery users have found that by manipulation, results from domestic ores and foreign ores other than Caucasion closely approximate the results from the Russian ore.

Experimental work has shown that minute quantities of copper, nickel, and cobalt are harmful and that fourtenths of 1 per cent of these impurities render the ore unfit for battery purposes. It has also been found that 2 to 3 per cent of iron oxide does not necessarily harm the efficiency of a dry cell. Frequently, however, a 1 per cent limit is arbitrarily set.

The physical properties of manganese battery ore are also important and the ore should be somewhat porous to be most efficiently used in the dry cell. A hard but porous ore has been found to give better results than a hard dense ore, in spite of a higher oxygen content in the latter. Coarsely ground ore gives longer life to the cell than finely ground material. Screen analysis, hardness and density are all important in determining the qualities of a manganese ore.

We would suggest as possible interested buyers dealers who are practically all located in the East, or the manufacturers of dry cells. Consumption of manganese ore in glass and battery manufacture is estimated at 25,000 tons per year.

Relative Output of Electrolytic Zinc

"How does the production of electrolytic zinc compare with the total amount produced in the United States, and where is the largest electrolytic zinc plant?"

In 1919 there was produced 27,056 short tons of electrolytic zinc out of a total domestic production of primary zinc, amounting to 456,743 tons, or roughly 5.75 per cent. In 1918 the production of electrolytic zinc was larger, 39,669 tons, or 7.65 per cent of the total production of 517,927 tons. The following table gives comparative results compiled from U. S. Geological Survey statistics since 1914:

	Electrolytic Zinc	Total Primary Zinc	Ratio in Per Cent
1914	[illegible]	353,049	[illegible]
1915	252	489,519	0 05
1916	12,916	668,343	1 94
1917	26,910	669,575	4 10
1918	39,669	517,927	7 65
1919	27,056	465,743	5 75

The largest electrolytic zinc plant is at Anaconda, Mont., operated by the Anaconda Copper Mining Co., and with a capacity of 150 tons of zinc daily.

Increasing Production of Zinc Dust

"Has the domestic production of zinc dust increased in the past few years?"

The production of zinc dust in the United States

	Tons		Tons
1910	69	1915	1,755
1911	254	1916	2,709
1912	492	1917	5,915
1913	423	1918	6,995
1914	1,004	1919	6,598

shows a gradual increase from 1910 to 1919, with a slight decrease last year, and is given in the table.

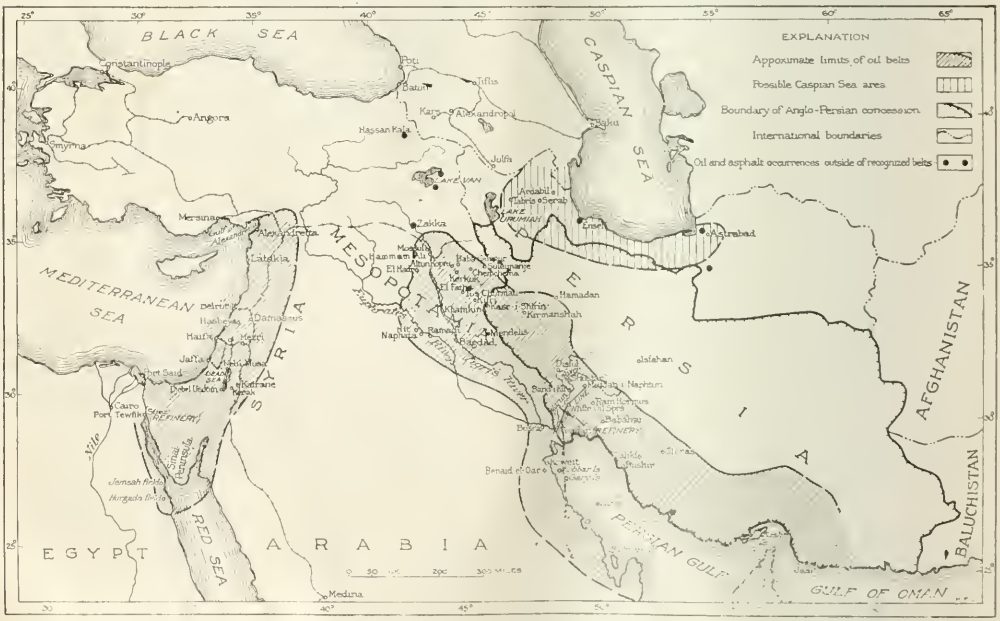
THE PETROLEUM INDUSTRY

Petroleum in Persia and the Near East

Area Comprises What Is Probably the Richest and Most Extensive Oil-Bearing Region of the Globe— Geological Characteristics and Commercial Possibilites—Potentialities of Development Indicated by Recent Changes of Political Control

BY EDMUND M. SPIEKER*
Written for *Engineering and Mining Journal*

IN A RECENT publication[1] of great interest to American oil executives a detailed summary of the occurrence and development of oil in Persia and in the former Turkish territories of the Near East is presented. The work might be characterized as a business man's paper, as it emphasizes, in particular, political and legal matters, the business history of oil concession-seeking, prospecting, and development. In addition, it summarizes in a fairly complete manner the available geologic and other technical data. It is the most comprehensive summary concerning petroleum in these regions yet published, and it is obviously of great value to an oil enterpriser planning a campaign of investigation and seeking a basis for intelligent first action. The author is a scientific assistant in the Hamburg Colonial Institute, and the work is doubtless a byproduct of German imperial ambitions and activities in these Asiatic territories during the period antedating the beginning of the war.



OIL REGIONS OF THE NEAR EAST

The importance of the region as a source of future oil production appears to be of first rank. Within ten years British operations in a single field in Persia have developed an annual capacity of over 30,000,000 bbl. of crude oil, and the scope of territories with similar geologic conditions and surface indications is so great that it seems more than likely that similar exploitation elsewhere in the Near East region could be multiplied many-fold.

With nothing more than normal commercial competition to meet, and under a fair "open-door" policy, these

*Published by permission of the Director of the U. S. Geological Survey.

[1]Schweer, Walther, "Die Turkisch-Persischen Erdolvorkommen. Hbh. Harmburgischen Kolonialinstitats Bd. XL., 1919": (Large 8 vo., 249 pp., with maps and illustrations.)

fields would doubtless be very inviting to American oil interests. At present all of the Turkish territories described are included in the so-called "mandatory area" of the peace-treaty settlement, and are the subject of great diplomatic and political activities, especially by the British, aimed mainly at control of the oil resources.

The interesting surface occurrences of oil in Persia and the Near East, mention of which is woven into the literature and primitive religion of remote periods in the history of these areas, are fully described, the data having been gathered from many sources. These facts, coupled with what little is known of the geology of the region, form the basis for the many optimistic forecasts of the oil possibilities of the area.

A remarkable belt of seepages lies along the entire southwest coast and frontier of Persia, extending in a general northwest-southeast direction into Mesopotamia. It is about 1,200 miles long, and appears to be the longest single stretch of territory, with more or less continuous surface indications of oil, yet found on the globe. In addition to the seepages of this Persian-Mesopotamian belt, scattered showings are known in all of the major divisions of the former Turkish areas, the most important of which are those in Palestine, Syria, and Arabia.

Mesopotamian Occurrences

The northwestern limit of the Persian-Mesopotamian oil belt appears to lie about twenty miles north of Mossul, on the Tigris. A seepage for which an exact locality description is lacking, appears to be the northernmost indication along the belt. To the south of Mossul, at the town of Hamman Ali, there are seepages at hot sulphur springs, some of which are used as curative baths. Oil and asphalt rise continually to the surface of the salt-sulphur water in a small pit at one of the springs. About 80 km. southwest of Hamman Ali, at El Hadr, is another seepage at which the natives collect the oil in pits.

A series of much richer occurrences extends to the south of Hamman Ali, in a zone which is called the Gajara field. This region, which is of great extent, contains many seepages which, having long been active, have built up asphalt deposits several meters thick. In this field the locality at the narrows of the Tigris, near El Fatha, where thick beds of bitumen outcrop in the steep river banks and indications of petroleum are plentiful, is especially worthy of note. Here a soft white limestone is the source of many streams of petroleum and asphalt which trickle down the banks into the river. These occurrences promise to be of much importance, particularly as they are on the line of the Bagdad railway.

To the north of the caravan road from Mossul to Bagdad, at a point about five miles northwest of Kerkuk, are occurrences in which the oil seeps from gypsum beds, running out over the road; and at Baba Gurgur, north of Kerkuk, there is a gas spring. Ten other seepages, the odor of whose petroleum is noticeable at a considerable distance, have been found in the bed of a small stream to the north of Kerkuk. Here the natives have dug pits about twelve feet deep, from which they obtain from eight to ten gallons of petroleum a day. The oil is carried by camels to Kerkuk. Other seepages, of which less is known, exist at Guil, to the east of Kerkuk, and south of Chemchema.

At Tus Churmati, about 20 km. south-southwest of Kerkuk, are several productive oil springs, which have been exploited in primitive fashion by the natives. The source of the oil at this locality is a series of marls, gypsum beds, and highly saliferous red sandstones dipping from five to thirty degrees to the northeast. Other oil springs are in the vicinity of Kifri, about 150 km. northwest of Bagdad, where beds of gypsum yield quantities of salt, sulphur and petroleum.

Farther to the south, about half-way between Mendeli and Khanikin, and on a series of hills approximately 200 m. above the Naphat River valley, an oil-bearing clay-shale is worked by the natives, several dug wells furnishing daily about 100 gal. of petroleum. The oil seeps out on the surface of salt water springs at the faulted crest of an anticline, and flows down the valley-sides to the river, making the water unpotable for a long distance down-stream.

Ancient Asphalt Deposits of Euphrates

On the Euphrates the most important occurrence is at Hit, between Wadi Mohamedi and Kubeisa. The asphalt deposits at this place were known and much used by the ancients, and are today, with the exception of the famous localities in Trinidad and Venezuela, the most remarkable known. The crude working methods of the natives yield about 2,500 tons of asphaltic oil yearly, and those who have visited the place say confidently that the amount could, with little difficulty, be greatly increased.

The oil-bearing formations, which form a series of gypsum beds in layers up to two meters thick, intercalated with sandy clays, are similar in geological association to the beds at Mendeli and Tus Churmati, and have been pronounced of Eocene age. The oil flows freely in numerous springs and at scattered points in valley bottoms about Hit, gathering on the surface of the water, and hardening on exposure to the air to form a brittle substance of the consistency of hard pitch. This is collected by hand as it forms on the water and is used by the natives for many purposes. The oil is highly inflammable. Other seepages of oil and asphalt occur along the Euphrates at Nasrieh, Ramadi, and Naphata.

Near the Turko-Persian boundry, on the pilgrim road from Mesopotamia to the Persian interior, are seepages of oil near the town of Kasr-i-Shirin. The uncertainty of the course of the international boundary at this point makes it impossible to say with certainty whether the individual occurrences are in Turkey or Persia. The oil seeps from a sandstone exposed in a small creek valley on the axis of an anticline in the Tertiary strata which form the hills in the vicinity of Kasr-i-Shirin, and is accompanied by salt water and some ozokerite. In 1901 D'Arcy drilled to a depth of nearly 3,000 ft., with discouraging results, but later attempts are said to have met with more success.

Occurrences in Persia

The principal oil belt in Persia is a continuation of the Mesopotamia area. Extending in a northwest-southeast direction along the western frontier and the Persian Gulf, seepages and other indications of oil occur in well-distributed succession from the region north of Shustar to the southeastern corner of the country, comprising an area about 1,000 miles long and 100 miles wide. Actual production is confined as yet to comparatively small areas, but the success of operations in those areas

which have been drilled, and the similarity of conditions in the remaining parts of the region, promise much for Persia in the matter of oil production.

The topography of most of the Persian oil belt is rough and mountainous. There are only a few regions of low relief in the southeastern part of the zone, along the coast of the Persian Gulf. The northern part of the main belt, which includes the Maidan-i-Naphtun field, is the most important developed oil region in the Near East. Outside of this fairly well-defined belt, there are scattered occurrences of oil in northern Persia, and it is believed that there may be another belt of similar importance along the south shore of the Caspian Sea.

Petroleum Springs Yield White Oil

In the mountains near Shustar, which is one of the largest cities in west Persia, are four petroleum springs which yield a clear white oil that is sufficiently light for use in lamps without refining. The rocks of the vicinity are red sandstone, soft limestone, gray marls, gypsiferous marls, and black marly shale, from which last the oil seeps. The general strike of the rocks is reported to be N. 45° W., and the structure at the seepages is apparently anticlinal. About twenty-five years ago attempts were made here to obtain oil by drilling, and although large quantities of gas were found, there was no resulting oil production.

About 115 miles from Shustar, at Haf Sheid, are seepages which yield small amounts of oil for native use. The source is a bed of light yellow loam, rich in sulphur and gypsum, and the daily production of three of the springs is 90 liters. Other occurrences have been found to the north of Disful, on the Kir-ab plain. The oil springs are in a deserted spot surrounded by the high Bakhtiari Mountains, and are worked by the inhabitants of the region, the production of the year 1850 being approximately 20,000 kg. Strata of sandstone, marl, and gypsum in disturbed position form the surrounding region.

The Rich Maidan-i-Naphtun Field

To the east of Shustar lies the producing field of Maidan-i-Naphtun, where the Anglo-Persian Oil Co. has enjoyed great success since 1908, in which year D'Arcy drilled the first well. The oil-producing region is situated in the foothills of the Bakhtiari Mountains, a wild and barren spot which in summer is intensely hot. Evidences of oil are to be found on every hand for great distances about, and following the unsuccessful attempt in the district of Kasr-i-Shirin and in the southern part of the Anglo-Persian concession, D'Arcy moved the drilling equipment to Maidan-i-Naphtun. His initial success there has been followed by further drilling, the succeeding wells all flowing under strong pressure, and after ten years or more of phenomenal production showing no signs of exhaustion. Several geologic surveys of the region have been made, and the information amassed to date is sufficient to indicate tremendous reserves of petroleum, which definitely establish the position of Persia as one of the world's leading producers of crude oil.

From the Maidan-i-Naphtun field the oil is conveyed by two pipe lines, one six inches and the other ten inches in diameter, to the refinery at Abadan, an island at the head of the Persian Gulf. Upon the completion of pumping stations now building or projected the line will have a capacity of 22,000,000 bbl. a year. The refinery, which had an initial capacity of about 1,750,000 bbl., has been enlarged, and is now able to treat much of the company's production. The oil is reported to be of high grade, containing a very large proportion of gasoline and kerosene of high quality, excellent lubricating oils, fuel oils of good quality, and a good percentage of paraffin.

Karun Valley Wells of Anglo-Persian Company

South of Maidan-i-Naphtun, in the Karun valley, are other evidences of petroleum. Near Band-i-Kir are seepages which have long been used by the natives, and at White Oil Springs, 54 km. southeast of Maidan-i-Naphtun, are producing wells of the Anglo-Persian Co., which are connected with the refinery at Abadan by the pipe line above mentioned. There are no surface indications of oil at this point.

About 250 km. southeast of Shustar, in the general vicinity of Ram Hormus and Shardin, are occurrences of petroleum which have been described by several travelers. Seepages about 16 km. southeast of Ram Hormus afford a local supply of petroleum and a thick oil, which is used as a varnish; and at Shardin are beds of hard bitumen up to thirty inches thick. Shallow wells drilled at Shardin have yielded a good quantity of oil, and a deep well drilled there in 1908 is said to have flowed under appreciable pressure.

A series of occurrences from Babahan, at the upper end of the Persian Gulf, to the vicinity of Jask, on the Gulf of Oman, give ample evidence of the continuation of the Karun oil belt along the Persian coast and in the southern interior. Near Babahan is a locality at which bituminous material oozes out of the rock, and at a point south of the road between Babahan and Isfahan are deposits of asphalt and bitumen.

The most productive occurrences of southern Persia are at Daliki, a stopping place on the road from Bushir to Shiras, 80 km. from the coast. Here oil flows in large quantities from a bed of limestone, and travelers report that in hot weather the air is almost saturated with the vapor of naphtha. The springs are worked on a small scale for native use, and attempts at more extended operations have not thus far met with success. The yield of all these springs has been noticed to increase materially immediately after earthquakes.

Oil Springs of Kishm

On the Island of Kishm, west of the narrows separating the Persian Gulf from the Gulf of Oman, are springs in which the oil issues from a sandstone which is said to be of Lower Miocene age, but which does not seem to be the original source of the oil. Drilling carried on here by the Mining Rights Corporation achieved little success, and later attempts are said also to have proved fruitless. On the mainland opposite the island are small occurrences at Latihun and Chamaevallah, and other indications of smaller importance have been reported from localities in the same general region.

In middle and north Persia are many localities which give evidence of petroleum. There are strong suggestions of an oil zone extending for 600 miles along the south coast of the Caspian Sea, from the Elbrus Mountains, at Ardabil, to Shah-Kuh-i-balae, 40 km. south of Astrabad, and on the east coast seepages are known to exist. However, the geological features of the region are too little known to admit of more than a supposition.

The petroleum zone of Kasr-i-Shirin appears to be continued through the Province of Kermanshah as far as Hamadan and perhaps farther. Oil springs have been reported in this region, and De Morgan states that oil is brought to market at places in the province, but here the evidence is likewise too meager to permit of definite statement. Drilling in the Province of Kermanshah has disclosed the presence of gas, but no oil is mentioned.

Arabian Occurrences

On the Arabian side of the Persian Gulf occurrences of oil are known to exist at Basra, where the presence of bituminous matter has been known since ancient times; and on Bahrein Island, where a deposit of asphalt very much like that of Trinidad was discovered in 1902. Indications of petroleum are said to be present also near Koweit, at Benaid el Oar. Travelers sailing along the gulf have reported the presence of oil on the water in the vicinity of Farsi Island, and a similar occurrence is said to be noted between Kubbar (Khubla) and Garu islands. Arabian sailors say that such occurrences are frequently noted in many parts of the gulf.

Further data concerning the indications of petroleum in Arabia are not available, and indeed so little is known of the country, as far as the geology is concerned, that it is not possible to suggest anything concerning its promise as a future source of oil beyond the obvious inference that the indications so far known easily justify further carefully directed investigations.

Syria and Palestine

Occurrences of asphalt and bituminous limestones, as well as showings of petroleum, are distributed throughout Syria and Palestine. Many of the deposits in Palestine were important sources of oil and asphalt in ancient times, and at the present time some of the more favorably located occurrences are being exploited profitably for both local and foreign trade.

On the east coast of the Gulf of Alexandretta, at the upper end of the Syrian coast, several small brooks flowing from Alma Mountain show traces of oil, and in the vicinity of the city of Alexandretta some drilling was done in the 90's, although apparently with no success. Farther down the coast, in the neighborhood of Latakia (Laodicea, Ladikije) are beds of asphalt and bituminous limestone, which are mined at several small villages, the most important of which is Kefrie.

In the Beirut province, 56 km. south-southeast of the city of Beirut, are deposits of asphalt at the town of Hasbeya, in the upper Jordan valley on the west slope of the Hermona Mountains. Here occur beds of pure asphalt as thick as 4 m., and much greater thickness of limestone containing 10 per cent of bitumen, from the rubble of which the asphalt is extracted either by solution in benzine or by mechanical concentration of the crushed rock. The yearly production of the locality is said to be between four and five hundred tons of asphalt, which could be increased by better methods.

There is a very rich deposit of bituminous limestone in the valley of the Jarmu, a stream flowing into the Jordan to the south of the Lake of Genesareth, at which place drilling just before the outbreak of the recent war is said to have disclosed petroleum at a depth of 400 m. Outcrops of asphaltic limestone have been noted at Mrani, about eight miles from Mezrib, at Ain-el-Tineh, north of Damascus, and at Sunuhre. Seepages of petroleum are found between Katrane and Kerak.

The region about the Dead Sea has been known since ancient times for its deposits of asphalt, and at present the natives exploit the better occurrences by rather crude methods, though, despite the good quality of the asphalt, and its consequent high market value, the trade in it is not actively carried on, and production is small. The asphalt, which is apparently the residual product of partial evaporation of petroleum, occurs in Cretaceous limestones and sandstones, in Pleistocene formations, and in the Dead Sea itself as floating lumps, which, having been separated from deposits along the shore and on the sea bottom, are brought ashore by the natives for local consumption.

Asphalt Masses Recovered From Sea

On the southern coast of the Dead Sea, southwest of Masada and near Djebel Usdom, is an asphalt conglomerate which contains 18 per cent pure asphalt. Not far distant from the asphalt outcrop are several oil seepages. On the northeast coast, in the lower course of the Wadi Muhamvat, the upper Cretaceous dolomites are veined with asphalt, and are of rather high bituminous content. On the east coast are seepages of a viscous, barely fluid asphalt at Ain-el-Hommar, where the asphalt gathers until the mass breaks off and falls into the Dead Sea. In the Juda desert, at Nebi Musa, on the northwest shore, are bituminous limestones which have been reported to contain 25 per cent of asphalt, and which are burned by the natives to make lime for plaster.

At many other places in the Dead Sea region the Cretaceous limestones and sandstones are charged with bituminous material. The occurrences of greatest importance to the natives, however, are the masses which rise occasionally to the surface of the sea and under the influence of the wind and waves drift to the shore. It has been noted that after earthquakes unusually large masses make their appearance. Following the shock of 1834 there appeared a mass from which the Arabs obtained twenty tons of pure asphalt, and after the earthquake of 1837 another mass, from which fifteen tons were obtained, rose to the surface. Smaller masses, which appear at the surface from time to time, are gathered by the native Arabs and sold at the market in Jerusalem.

Prospecting and Exploitation of the Oil Fields

Legal Considerations

The apportionment of mineral land concessions in Turkey and Persia has always been purely a political and diplomatic procedure, involving negotiations between diplomats and capitalists, and in consequence the matter of national interest has figured prominently even when the mineral rights have been sought by private individuals.

A source of much difficulty in the settlement of territorial rights has long been present in the form of the Turko-Persian boundary disputes. The uncertainty of the location of the national frontier, particularly in oil-bearing regions, has led to questions of concession tenure and caused considerable trouble, particularly to English companies whose oil fields are in disputed territory.

Since the Turko-Persian War of 1823 a long series of attempts at reaching a decision concerning the boundary has failed, despite the activity of numerous commissions and deputations of both interested and foreign powers.

Co-operation between England and Russia brought about an understanding between Turkey and Persia in 1913, the result of which was the erection of 223 boundary monuments, but the matter is not yet entirely settled.

The most important points on the boundary are the Karun region, the Kasr-i-Shirin district, and the Urmia region. In the Karun region the English interests have protected their holdings by reaching a friendly agreement with the Sheik of Mohammerah, but the boundary in the Kasr-i-Shirin district has been the source of conflict between Turkish and Persian troops, and as, through Turkish invasions in 1913, the region about Tschiasurk then became Turkish territory, the question of boundary regulation at this point in particular has become an important political problem.

Other difficulties in the exercise of concession rights have been found in the application of the land laws of Turkey and Persia. The Turkish law in particular was very complex and difficult to apply. Divisions of land into classes which were hard to define, and mining conditions which were not easy to follow, made prospective development a rather unsure undertaking, and it is to be hoped that the distribution of authority over Turkish territory resulting from the war will bring about a simplification of the law.

Persia has no definite mining law. According to the Persian constitution of 1906 the granting of concessions was put within the power of Parliament, but an exception was made if the interests of the Persian government or people make advisable a special arrangement, and in such cases the consent of the Parliament was not necessary. However, these conditions have no practical interest at present, as under existing conditions they are no longer in force.

Petroleum Concessions in South Persia

The weakness of the Persian government and the strength of Russian-English competition were important features of the history of concession granting in Persia during the nineteenth century. The advance of loans, and even military protection by stronger powers whose subjects were interested in developing natural resources, brought the Persian government nearer and nearer to complete dependence on outside assistance, until at present the production of mineral commodities, particularly of petroleum, is almost entirely in the hands of foreign interests.

The first grant of importance, the Reuter concession of 1872, was the cause of much international strife. The result of a strong political movement on the part of the English, it embodied sole rights to practically every branch of commerce, including not only natural resources of all kinds, but also building and manufacture, banking, railway building and operation, and general financial activity. It failed, as did many other attempts on the part of outside interests, to establish business in Persia between 1872 and 1888.

Failure of Persian Bank Mining Rights Corporation

After the opening of the Karun River to shipping in 1888, the number of concessions increased greatly. The Persian Bank Mining Rights Corporation, Ltd., in 1890 gained the privilege of exploiting undiscovered mineral land, but after spending its capital in fruitless exploration the company failed in 1894, and the French lost an opportunity to gain mineral rights of considerable value, chiefly through the counter-activity of the Russians and the English, in 1898. The history of English control of the oil industry in southern Persia begins with the granting to W. K. D'Arcy, in 1901, the rights of the Persian Bank Mining Rights Corporation. The detailed conditions of this agreement were not published beyond the statement that 16 per cent of the net earnings of the company were to go to the Persian government.

In 1909 the Anglo Persian Oil Co. was formed to take over the D'Arcy concession. (See summary for details.) An important feature of this grant was the promise of full protection to the enterprise from attack by hostile natives, and a guarantee of reimbursement for loss by damage to any of the property of the company. In a country as wild as the Persian interior this is a provision of great value. In 1914 the British government entered the company, obtaining important representation on the directorate, and later arrangements made the government the dominating interest.

TABLE I. SUMMARY OF CONCESSIONS AND CORPORATIONS IN SOUTH PERSIA SINCE 1901

Date Granted and Term	Owner	Character, Rights, and Locality	Remarks
901-60 years	W. K. D'Arcy	Monopoly for the exploitation, sale, and export of petroleum and its products in all of Persia excepting the five northern provinces.	1. All unimproved lands offered free of cost and taxes. 2. Exemption from import or export duties. 3. Sixteen per cent of net earnings to be paid to the state. 4. After 60 years properties and improvements revert to the state.
1903	First Exploitation Co.	Established for development of the D'Arcy concession. First operation in the Karun River region. Later limited to an area of one square mile in the Maidan-i-Naphtun field.	Founded by D'Arcy with the aid of the Burma Oil Co.
1905	Concessions Syndicate, Ltd., Glasgow.	Established for the development of the D'Arcy concess on.	Mainly owned by Burma Oil Co.
1906–110 years	Persische National Bank	Prospecting and development of meta's from vacant and state-owned lands.	Presumably a German corporation.
1909	Anglo-Persian Oil Co., Ltd., London.	Formed to take over the D'Arcy concessions and most of the stock of the First Exploitation Co., and the Concessions Syndicate.	Control of directorate by British Government
1909	Bakhtiara Oil Co	Subsidiary of Anglo-Persian.	
1915	Tanker Co	Subsidiary of Anglo-Persian.	

Russian Concessions in North Persia

Before the war Russian political and economic influence in northern Persia was so great that no other powers considered the territory in their search for mineral land, but recent developments have made the tenure of monopolies there a matter of doubt, and the strength of any national interests will naturally depend on the outcome of the diplomatic negotiations now in progress.

The history of Russian attempt at monopolization of the mineral resources of Persia begins with the plans for railroad and highway construction made in 1874 and 1882. Both of these plans failed, but later arrangements, details of which are set forth in the following table, afforded Russian capital the opportunity to com-

plete for itself a thorough grasp on the natural resources of the northern provinces of Persia, and from the date of the first successful enterprise of Mr. Sapekhdar in 1896 the record of Russian activity is one of success. With the granting of the concessions of 1916 (see summary) the monopolization of the petroleum resources of Persia was made complete.

Concessions in Mesopotamia

European capitalists began to take active interest in Turkish mineral resources in the middle of the nineteenth century. The Crimean War, which brought Turkey into the group of larger European powers, was followed by a period of business activity in the East, during which banks were established by the English and French, and the first attempts at extensive exploitation of the oil occurrences were made. Most of the early schemes for the development of Turkish oil territory failed, and, indeed, during the entire latter half of the nineteenth century no important progress was made toward the discovery and utilization of the petroleum resources.

Between the years 1854 and 1875 a swarm of speculators entered Turkey, the absence of sound business principle in their dealings being a drawback to development, and the panic of 1875, with its attendant political unrest, made it unprofitable for foreign interests to concern themselves with Turkish prospects for a number of years. During this time several unsuccessful attempts were made by the Turks themselves to produce oil.

In the time of Abdul Hamid further political turmoil held back development and increased Turkey's dependence on outside powers. The result of these disturbances was an increase in the keenness of competition among foreign powers in their efforts to gain political control in Turkey.

In the period just preceding the recent war several companies are said to have been formed, but nothing has been heard of activity on the part of any one of them. The shortage of fuel and illuminating oil in Mesopotamia during the war brought about an attempt to increase local production, but such efforts as were made did not achieve much success.

American Interests' Activities

American interests began to try to gain a foothold in Turkey in 1910, when the "Chester Project," believed to have been sponsored privately by the Standard Oil Co., was involved in a long series of negotiations concerning the construction of a railway and the exploitation of the mineral resources, chiefly oil, on either side of the right of way; but the concession asked was not granted. French capitalists, too, became interested in Turkish oil land at about this time.

The progress of advance made by German capital toward obtaining oil rights in Turkey, which began in 1903, is not entirely clear. In 1905 the Deutsche Bank sent a commission to Mesopotamia to study the oil lands, the substance of whose report was that the occurrences appeared to be local in extent; and that there was not sufficient evidence of continuous oil-bearing horizons to warrant the large expenditure involved in drilling in so distant and inaccessible a place. They considered that it might be worth while to drill at Gajara. The most prominent members of this commission were Dr. Kissling, of Berne; Dr. Backing, of Strassburg; and Dr. Cesare Porro, of Rome. As a result of the unfavorable report of the commission the Deutsche Bank allowed the concession rights of 1903 to lapse.

TABLE II. SUMMARY OF RUSSIAN CONCESSIONS IN NORTH PERSIA SINCE 1896

Year Granted and Term	Owner	Character and Locality	Remarks
1896–99 years	Mr. Sapekhdar.	Development of oil resources in Tunekaoun, Rujur, and Kalale-stag.	
1902–75 years	Russian Discount and Loan Bank.	For the construction of a road from Julfa via Tabriz to Kasuin and for exploitation of petroleum and coal 63 9 km. on both sides.	Twenty per cent of the returns to be paid to the Persian government.
1915–99 years, beginning one year after the end of the world war.	A.M. Khoshtaria.	Purchases Sapekhdar concession for 50,000 rubles, and acquires exclusive prospecting, development, and export rights for petroleum, gas, asphalt, and ozokerite on all other state and private lands for 70 years.	Sixteen per cent of return to be paid to the Persian government, and 6,000 rubles for the salaries of Persian commissioner Advance of 100,000 rubles to the state. Royalty of one kopeck per pood. Owner has right to dispose of the concession and to form subsidiary corporations Free importation of all materials and free use of state lands.
1916	Russian Persian Oil Production & Trading Co., Repento.	Acquires Khoshtaria concession.	All preliminary investigations to be completed not later than one year after the end of the world war.

TABLE III. SUMMARY OF CONCESSIONS IN MESOPOTAMIA

Year Granted and Term	Owner	Locality and Terms	Remarks
1903–99 years	Société Imperiale ottomane du Chemin de fer de Bagdad.	Concession to build railroad from Konia to Basra with branch lines. Mining rights in territory 20 km. on either side of railroad. The company to receive 350,000 francs yearly from the Turkish government to defray expenses.	Concess on for exploitation of oil fields not settled. Commission to study [illegible] appointed 1905. Rights transferred in 1912 to [illegible] Petroleum Co., in which the [illegible] as part owner, was given [illegible] of £20,000.
1910	Ottoman-American Development Co. "Chester Project" Dr. B. M. Glasgow, representative for J. G. White & Co., New York.	Negotiations entered into concerning construction of railroad from the Black Sea to Mossul and exploitation of mineral resources 20 km. on either side of line.	Concession not granted.
1914	Turkish Petroleum Co., London	Development of oil fields in Vilayet M[illegible]	Acquired rights of concession of 1903 Originally 50 per cent British, 25 per cent German and 25 per cent Dutch.

Importance of Near East Fields to England

The economic importance of the Mesopotamian oil fields to the English, due to their proximity to the holdings of the Anglo-Persian company in Persia, is clear; and it is interesting to note that the boundary disputes, which threatened constantly to change the political control of some of the oil fields, caused the English little anxiety, as their interests were protected by the Anglo-

Persian concession as long as the territory remained under Persian control, and an agreement with the Turkish Grand Vizier Hakki Pasha (?) gave them promise of concessions in Mesopotamia which would guarantee the safety of their holdings in the event that the Turks gained the territory.

Concessions in Asia Minor, Syria, and Palestine

The isolated petroliferous occurrences of Turkey have also been the object of negotiations concerning concessions. In 1889 a company was formed in Basel, Switzerland, with a capital of 5,000,000 francs, for the purpose of exploiting oil springs at Dschebel Musa, near Antioch, and others on the Gulf of Alexandretta, but after three years of prospecting the company failed. During the years 1892-1895 the Vereinigten Deutsche Petroleumwerke drilled at Alexandretta, with no success.

The occurrences in Vilayet Erserum have been sought by several groups of capitalists. They are said to have been granted to a Turk in 1906, and later several international financiers supposedly obtained the concession. In 1914 the Standard Oil Co. sent men to prospect the locality.

TABLE IV. SUMMARY OF CONCESSIONS IN ASIA MINOR, SYRIA, AND PALESTINE SINCE 1906

Year Granted and Term	Owner	Locality and Terms	Remarks
1906	General Zeki Pasha	Oil concessions in Vilayet Erserum.	
1907	Company for construction of Hedja Ry.	Oil rights at Heraclea.	
1909–99 years	Société minière syrienne Haiffa	Oil and asphalt rights in Vilayet Damascus	Took over older concessions.
1912–99 years	Syrian Exploration Co., Ltd., London.	Took over rights of Société minière syrienne, including 60,000 acres of oil land in Vilayet Damascus.	Royalty of 10 per cent, including annual rents of 10,000 francs. Under direction of Dr. G Schumacher, Haiffa.
1913	British Ottoman Oil Syndicate, London	Negotiates with E. A. Abravanel for purchase of a concession in the village Ayghim Veran, Boyobad district.	
1913	Prince Jussuf Pasha Kamel	Development of petroleum and asphalt in the Beirut province.	
1914	Standard Oil Co., New York	Examined concessions in Vilayet Erserum.	
1915	Latakia Oil Co	Asphalt and oil production at Latakia	Purchase of older concessions.
1916	Standard Oil Co., New York	Prospecting for oil and asphalt in the Dead Sea region	Acquired seven oil concessions southwest of the Dead Sea from local owners, as well as the sulphur, bitumen, and phosphate deposits of the surrounding region.

Many attempts have been made to mine on a large scale the asphalt deposits at Latakia, but difficulties of transportation and handling the material prevented the success of the undertakings. The summary given herewith gives the essential details known of other concessions granted and operations carried out at Beirut and in the Vilayet Damascus.

In 1914 the Standard Oil Co. sent a corps of geologists, engineers, and laborers to explore the Dead Sea region, and the party had just completed organization in the field for carrying out the work when the outbreak of the war put an end to its activity.

Concessions on the Red Sea

Many English companies are producing oil in the territory fronting the Red Sea. For a long time the operations were carried out by a large number of small companies, which later led to the formation in 1911 and 1912 of three larger companies, the Fersan Islands Oil Co., the Anglo-Egyptian Oilfields, Ltd., and the Eastern Petroleum Co. The Anglo-Egyptian Oilfields, which is a branch of the Shell Trust, controls the fields at Jemsah and Hurgada, whose annual production reached 128,998 tons in 1917, and owns the refinery at Suez, which is connected with Port Tewfik by four pipe lines and has a monthly capacity of 15,000 tons. As the production of the Red Sea fields never has quite equaled the capacity of the refinery, the company has accepted crude from other fields so that it might utilize the full resources of the plant, and in the earlier days of the Anglo-Persian activity in Persia, part of the Maidan-i-Naphtun oil was treated at Suez.

The Eastern Petroleum Co., which is an outgrowth of the Sinai Petroleum Syndicate, owns three concessions on the Gulf of Suez. The Fersan Islands Oil Co. was formed in 1912 to work oil lands on the Fersan Islands, at the south end of the Red Sea.

Brief Notes on the Geology of the Oil Belt

The geological characteristics of the regions mentioned in this report are known only in incomplete details. With the exception of the region surrounding the Maidan-i-Naphtun field, which has been studied by the geologists of the Anglo-Persian Co., geologic knowledge of the Persian oil territories, being almost entirely the result of hurried examinations, is fragmentary; and even less is known of the other regions in the Near East. Over most of these countries the only regions which have been brought to the attention of the outside world as possible oil fields are those in which seepages or other showings of petroleum exist. The vast areas in which development might be successfully guided by detailed geologic information have not been touched, and a comparison of the sum total of geologic exploration here with that of any of the great producing fields of today shows at once the tremendous opportunity offered by the practically unknown territories of southwest Asia.

In the Mesopotamian-Persian belt the oil occurrences are situated in the low hills skirting the main mountain ranges, in a zone about 1,200 miles long, parallel to the general direction of the Persian Gulf. The mountains, which in places attain elevations well above 16,000 ft., are formed mainly of older rocks overlain by Cretaceous and Tertiary sediments, and the slope from the mountain wall to the valley of the Tigris and Euphrates, on which most of the oil seepages have been found, is formed mainly of Tertiary beds.

In Mesopotamia, Maidland has distinguished four anticlines, all parallel to the general trend of the belt. The largest extends from a point northwest of Mendeli to the Tigris and thence northward to Hammam Ali. A second extends from Khanikin to Altun-Kopru; a third lies parallel to the Kara Dagh, and the fourth extends to the northwest from Suleimanje. The surface formations of this region are all Tertiary, and are apparently chiefly Miocene in age.

In the Maidan-i-Naphtun field the chief petroliferous beds are members of the Fars series, of Miocene age. A portion of the Tertiary section of this region is as follows:

Bakhtiara series, Pliocene, 15,000 ft.	Upper.	massive conglomerates.
	Lower:	clays, sandstones, shales, conglomerates.
Fars series, Miocene, 7,200 ft.	Upper (arenaceous):	clays, shales intercalated red and brown sandstone.
	Middle (transition):	clays, shales, intercalated gypsiferous limestone and sandstone.
	Lower (gypseous):	massive gypsiferous shale, clay, and intercalated limestone. *Main oil zone.*

The oil occurs chiefly in detrital vesicular limestones of the Lower Fars series. There are seepages from the Middle Fars at places, but the only locality at which it has been tested by drilling is at White Oil Springs, where a show of white, naturally refined oil was encountered. The Upper Fars is in general considered unpetroliferous.

The structure at Maidan-i-Naphtun is anticlinal, with many minor modifications and faults. There is also an anticline at White Oil Springs.

Along the coast of the Persian Gulf, in the southeastern extension of the Mesopotamian-Persian oil belt, most of the seepages issue from the Nummulitic series of the Eocene and Oligocene, with a few occurrences in the Fars. As a whole, the region does not appear as promising as does the Bakhtiari country, but in the absence of detailed knowledge no intelligent prediction can be made. The presence there of members of the oil-bearing series, together with surface showings and a series of anticlinal structures along the south coast, will undoubtedly offer sufficient encouragement to warrant thorough investigation within the next few years.

On the Island of Kishm, at the narrows separating the Persian Gulf from the Gulf of Oman, there is a series of gentle domes lying along an axis whose strike is E. N. E.-W. S. W., and extending the length of the island. The Upper Fars beds form most of the island, but there are outcrops of the Hormuz (Upper Cretaceous) series, and of the Tersai (Pliocene) series.

Conflict of Geological Opinion

The geology of the north Persian area, the possible belt along the southern shore of the Caspian Sea, is not only imperfectly known, but there is a difference of opinion among the men who have thus far reported on it. In the region between the Caspian Sea and Lake Urumiah the formations are apparently chiefly Tertiary in age, with some areas of Carboniferous rocks. At Ardabil, extensive shell beds are found resting on Pliocene sediments similar to those at Baku. The structure is apparently complicated, with much folding and faulting. To the east of Tabris are Mesozoic formations, with deposit of rock salt and gypsum, and about Serab carboniferous shales are found.

To the south of Serab is a long anticline, along which oil and gas are said to escape at places. The question as to whether this general region is geologically a continuation of the rich Baku field has given rise to disagreement among the geologists who have visited it. Tiehe thinks it is not to be connected directly with the Baku area, and others apparently believe that it is. Beyond the fact that locally, at least, a similarity to the Baku geology has been reported, not enough is known of the region to justify definite statement of conditions.

In the Dead Sea region the asphalt, which is undoubtedly the product of the evaporation and oxidation of petroleum, occurs in Cretaceous dolomites and to some extent in Pleistocene deposits. On the Red Sea a Miocene series which has been correlated with that of the Mesopotamia region is present. Oil is produced from the horizons on the Egyptian side, but so far more is known on the Arabian coast of the sea.

TABLE V. SUMMARY OF CONCESSIONS AND CORPORATIONS ON THE RED SEA SINCE 1907

Year	Owner	Conditions, Locality, Capitalization
1907	Anglo-Saxon Petroleum Co., Ltd., London	Total capitalization to 1914, £18,000,000. Subsidiary of Shell-Royal Dutch combination.
1907	Egyptian Oil Trust	Took over shares of Cairo Syndicate and later in part absorbed by Anglo-Egyptian Oilfields.
1909	Eastern Petroleum Co.	Oil concessions on the Jubal Islands. One concession on the Gulf of Suez sold to the Suez Oil Co.
1910	Suez Oil Co., London	Formed to buy twenty-five square miles of oil land on the Gulf of Suez near Anglo-Egyptian properties from the Eastern Petroleum Co., the Jemsah Syndicate, and the Isthmian Oil Co. Also obtained four concessions at Jemsah from the Egyptian Government.
1910	Red Sea Oilfields	In part absorbed by Anglo-Egyptian Co.
1910	Sinai Petroleum Syndicate, London	Purchased from the Cairo Syndicate twenty-five square mines of prospective oil lands on the Gulf of Suez.
1911	Anglo Egyptian Oilfields, London	Absorbed many minor companies. Egyptian government represented on directorate and owns shares. Properties at Memsah, Hurghada, and on Gulf of Suez.
1911	Asiatic Petroleum Co. (Egypt), London	Selling organization of Anglo-Egyptian.
1912	Fersan Islands Oil Co., Ltd., London	Purchased from the Turkish government concessions on the Fersan Islands, at the south end of the Red Sea.

Pipe-Line Construction in Poland

Work is proceeding on the construction of an oil pipe line from Drohobycz to Danzig, 621 miles in length, according to *Kurjer Warszawski*. Some time ago a pipe line was constructed from Baku to Batum, a distance of 683 miles. This pipe line has as object the pumping of petroleum directly from its sources to the Polish littoral and its exportation thence in foreign bottoms, supplying on its way the different Polish towns.

Oil and Coal in Costa Rica

The Sinclair Oil Co. has spent about $50,000 in drilling for oil in the Pacific slope area of Costa Rica, but the results have not been encouraging. The company still holds a government concession, but has allowed some of its private land contracts to lapse. There are indications of oil also on the Gulf of Mexico slope, and though options have been taken there, no work has been done to explore in this part of the country.

In the gulf slope region, coal has been discovered, and efforts are being made to interest American capital in its exploration. It is claimed to be a bituminous lignite and to be fairly high in carbon, with a high volatile content and no sulphur. As practically no coal is used in Costa Rica, owing to the climate and the great abundance of cheap electricity, the market will have to be found outside, either at Panama or in Cuba.

NEWS FROM THE OIL FIELDS

July Production in Coastal Fields Shows Gain

Other Districts Increase—Wildcat Wells in Eastland County, Tex., Heavy Gassers

From Our Special Correspondent

The coastal fields made a large increase in production during the last week in July. No. 1 Abrams well of the Texas Co., at West Columbia, Brazoria County, the big gusher, has increased its flow to 26,000 bbl. of oil daily. This is being made, too, with the drill stem and bit in the hole. It is impossible to set screen against the tremendous pressure, and some concern is being felt lest the sand coming up with the oil cuts out the casing before the top pressure subsides enough to permit removing the drill stem and setting an oil string and screen. Another big well in this field is the most easterly of the Humble Oil & Refining Co., flowing 10,000 bbl. daily.

An important completion at Hull, Liberty County, is the No. 14 Phoenix of the Gulf Production Co., which came in at 2,600 ft., making 4,000 bbl. of oil a day.

In Stephens County the production has also fallen off a little. New wells are being brought in frequently in the Breckenridge town site field, and apparently this district will develop into a larger producer than at present. In the Caddo field of this county the American Oil Engineering Co. has worked over its Standard No. 2 well, securing an initial production of 2,000 bbl., and which it is believed will stabilize at about 2,300 ft. A pipe line was completed last year, making 4,600 bbl. a day, and subsequently went dead.

Two wildcat wells of great interest were completed in Eastland County recently. One, the Terry Jacobs well of the Rising Star Production Co., is two and one-half miles northwest of Rising Star. This well is making a small production by flowing by heads from a depth of 2,460 ft. It is also gassing heavily. Storage capacity is being built before testing the well out further. The other wildcat well is the Prewett of the Pittsburgh Western Oil Co., half way between Carbon and Sipe Springs. It is making a small flow by heads from about 2,300 ft. A pipe line is being built.

The Texas Pacific Coal & Oil Co. has brought in a big gas well, the Riebe well, eight miles north of Strawn, Palo Pinto County. This well is said to be making thirty to forty million cu.ft. of gas daily from a depth of 3,700 ft. The Garner well, also a big gas producer, southeast of Strawn, is also owned by this company. It is believed that the district may develop into a large gas producer.

Oil Placer Claims Take Precedence Over Homesteads

From Our Special Correspondent

Homesteaders who have recently been filing on oil-shale lands in Garfield County, Col., are facing the loss of their homesteads if those who have previously filed placer claims avail themselves of their rights under the law. It appears that considerable land north of the valley of the Grand River in Garfield County have been designated as oil-shale lands, and are to a large extent covered with oil-shale locations. These lands are also being entered under the homestead law, resulting in conflicting claims between homesteaders and placer claimants.

As to the rights of the respective claimants in a situation such as this the Commissioner of the General Land Office at Washington has advised the local field division of the U. S. Land Office that the placer law as to oil shale is repealed by the leasing act of Feb. 25, 1920, since which date no further placer claims may be initiated for oil-shale lands. However, as to oil-shale placers located prior to the leasing act, if same were lawful, complete, and perfected by discovery prior to the act, the land being vacant and open to location at the time the location was made, such claims would operate to segregate the land. The claimant of such a claim would doubtless prevail in a contest against a conflicting subsequent agricultural claimant. In such a case the placer claimant should proceed to protect any interests he may have, as the land department has no record of mining locations in the absence of an application for patent. In case the land is covered by a mineral application for patent no other application should be allowed, but if the agricultural entryman is prior in time to the placer locator such location would be ineffectual unless the agricultural claim was an entry under the grazing act, which reserves all minerals subject to appropriation under the existing mineral laws.

High Prices Stimulate Formation of New Companies in California

The high price of crude oil has led many interests in California to form new companies during the last few weeks. The majority of the companies plan to develop the southern sections of the state, having in view the country about Orange, San Diego, and the Imperial Valley. Much work in the southern fields has been held up from lack of materials. The Shell Co. plans spending several hundred thousand dollars in the development of the new oil field in the Buttonwillow district, thirty miles west and a little north of Bakersfield.

Large Gas Well in Barren County —Other Kentucky Fields

From Our Special Correspondent

A gas well said to be the largest ever found in Kentucky, and estimated at a production of 50,000,000 cu.ft. of gas daily, was brought in on the B. L. Smith farm, in Barren County, last Wednesday by Merry Brothers. Oil men of Louisville who have discussed the report seem inclined to accept it as an accurate estimate.

Stockholders of the Old Dominion Oil Co. during a recent meeting voted for the consolidation of the company with the Superior Oil Corp. to form a new syndicate belonging to the Atlantic Refining Co. The deal has been pending since May 3, and has been reported "closed" and "off" several times. The meeting today ended negotiations. The price was announced as $5,923,007.25. The company owns extensive holdings in Lee and Estill counties.

In Warren County three fair-sized wells were brought in on the T. G. Sledge, Bailey, and Potter leases. These wells will produce between 300 and 500 bbl. daily, it is estimated. No. 3 on the Sledge lease was brought in last week, estimated as 25 to 30 bbl. The Houston Coal & Coke Co. shot a well on the farm owned by William Davenport's heirs, estimated at 30 bbl. per day. Haskell & Kerstatter, owners of the Perkins lease, shot No. 2 last week.

Calcasieu Parish, La., Active

From Our Special Correspondent

At Edgerly, Calcasieu Parish, La., the old No. 29 Bright-Penn well of the Gulf Refining Co., which was worked over and brought in July 27, making 15,000 bbl. of oil a day, has been reduced to 1,000 bbl. daily by the encroachment of water. This well when first completed several months ago made only 75 bbl. of oil daily, but deeper drilling recently induced the larger flow.

In this same field the White Oil Corporation and Mrs. L. H. McMullen, of Dallas, Tex., have begun drilling on the 950-acre lease of the Union Sulphur Co. south of the present field.

At Vinton, Calcasieu Parish, the largest completion recently was the No. 7 Gray well of the Rescue Oil Co., pumping 500 to 600 bbl. daily. The chief operating companies in this field are the Gulf Refining Co., Texas Co., Gum Cove Oil Co., Rescue Oil Co., and the Vinton Petroleum Co.

Several rigs have begun drilling in the vicinity of Buffalo Gap, in the Black Hills section of South Dakota. The possibilities of oil drilling in the central part of the state will be tested before fall, as the contracts for drilling rigs have been let for a test well a short distance from Fort Pierre.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

"China—Future Mecca for Engineers"

Many Problems Await Honest Engineering Heads—Native Talent Offers Adequate Help—People Favor America

Under the above title Roy A. White writes entertainingly in *The Transit*, published annually by the College of Applied Science of the University of Iowa. "China," he writes, "today offers perhaps the greatest opportunity for the engineer of any country on the globe. A nation of four and one-third million square miles of territory, with over four hundred millions of thrifty, hard-working people. They have only some six thousand miles of railway, very few factories, and scarcely any of the modern improvements that we, in this country, deem necessary to everyday life. . . . With an area a third greater than that of the United States China has approximately one fortieth of our railway mileage; and in terms of per-capita per mile, while we have one mile of railway for every four hundred inhabitants, China can claim only one mile for every seventy thousand of its people."

Mongolia is comparable in area to our great West, and though it covers one and one-third million square miles it has not a single mile of railroad. Sze-Chuan (how many of our readers ever heard the name before?) an enormous inland province of seventy million people, also has not one mile of railroad; and in this province wheat brought 10c. a bushel during the war when it was selling for $2.50 a bushel at Shanghai!

Nevertheless, in 1918, China had 5,790 miles of railroads.

"Of this mileage 3,793 miles were classified as 'Chinese Government Railways,' 1,847 miles as 'Concessional Railways,' and, besides, there were about 150 miles of private lines in operation. There were also 330 miles under construction, and if one were to take into account all the lines contracted for the figures would reach the 100,000-mile mark with little difficulty. One who is not familiar with local conditions may reasonably ask, 'Why don't the Chinese build their own railways?' Owing to the lessons of the past the Chinese have learned not to put up money for corporation uses, for, more often than not, these funds find their way into the pockets of the officials, and the railroad, or whatever the project may be, never sees more than the first stages of construction."

Railway investments in China have been remunerative; in 1917 a net surplus for all roads of over $21,000,000 having been shown from operating revenues of nearly $64,000,000. Railways prove profitable in the beginning, being built into thickly populated districts.

"Most of the roads," Mr. White observes, "have foreign executive and engineering staffs; for instance the Peking-Han-kau line, having been built with Belgian capital, employs only Belgians on the staff, aside from the Chinese. There being no American railroad in operation, aside from a thirty-mile section noted elsewhere, there is no demand at present for American engineers. But it is hoped our financial interests will soon begin investing in that field, and then there should be a considerable demand for engineers' services. At the present time the ground is being laid for what may develop into enormous works in a multitude of fields: mining, railways, manufacturing, irrigation, forestry, and other lines."

The author points out that the Chinese in the past have accomplished great engineering feats. The canal system is thousands of miles in extent, and was begun 4,100 years ago. The Emperor Yang Ti started the Grand Canal from Shantung Province to the Yangtze River, hundreds of miles distant. During the last few centuries the canal became silted up but is now being reopened by American dredges, as a result of the researches of the American Red Cross into the causes of floods and famines.

"Another enormous engineering task which the Chinese accomplished was the building of the Great Wall. This wall has become known as one of the wonders of the world. It was built by various emperors, extending over several scores of years, and was constructed for the purpose of keeping in check the invasions of the tribes to the north and west.

"The wall starts at Shan-hai-kuan on the seacoast, two hundred miles east of Peking, and winds, in a circuitous route, westward about 2,000 miles to the northwestern corner of Kan-su, adjoining Mongolia on the north. There are many spurs to the main wall as well."

The writer observes that this great wall was built with great engineering genius, and that the lime and brick are wonderfully well preserved. He closes his article with a notable philosophic reflection:

"To the foreign well-wishers of China, who, on the one hand, see scattered all over the land such evidences of the constructive skill of that once powerful race, and on the other hand the present helpless state of affairs, a country with its customs and other taxes collected and administered by foreign powers, with its postal system and railways under the control of and built by other nations, it is a pitiful sight and one worth studying by the leaders of those countries that are all-powerful in this day and age, lest in some future generation they too shall have suffered a like fate. Had China's rulers and officials always been as efficient as her engineers, builders and workmen, we would not see the largest country in the world today the least able of any power to protect itself from grasping neighbors."

Minerals Separation Claims and Methods Explained to Utah Mining Men

George L. Nye and Gilbert H. Montague, attorneys for the American Mining Congress, who attended the Minerals Separation hearings in New York, San Francisco and Salt Lake City, were the guests of local mining men and operators at a smoker given in their honor at the Alta Club of Salt Lake City, Utah, recently. Mr. Nye and Mr. Montague gave an interesting review of the general flotation situation in connection with the methods of the Minerals Separation corporation. The point of attack is the system whereby the corporation, by claiming the right through its contracts to all improvements on the patents made by licensees, seeks to perpetuate its monopoly,—claiming also all rights to machinery inventions and to information gained in flotation operations. The company seeks an entire monopoly of flotation in as much as when over one per cent of oil is used claim is made under another patent. No objection is made to the payment of fair royalty, although the rates asked by the company are often excessive, and should be lowered. The Minerals Separation company has very complete lists of users of flotation processes, and classification is made according to whether the users are successful and in good condition for the exaction of royalty. Classification is made by states and districts, and according to what courts the hearings will come before in case the company claims infringement. An elaborate spy system is maintained so as to keep track of the operations of users of flotation processes and their methods.

Board of Regents Can License

The Attorney General of the State of New York has ruled that the Board of Regents has the right to license the prospective members of the examining board under the new registration law and then appoint them to the board of examiners. The Board of Regents had contended otherwise.

Book Reviews

The Examination of Mines in China. By E. M. di Villa. Cloth, 6x8, pp. 108. Printed by the North China *Daily Mail*, Tientsin, China.

The remoteness of China from the haunts of most mining engineers, the totally different language and customs of that country compared to those with which Americans and Europeans are familiar, and the absence of any organized geological survey, combine to make China comparatively unknown to most of us. If suddenly called to go there to examine some property many difficulties would be met. This excellent little book has been written to make it easier for those interested in mining in China to write a comprehensive report and to understand the information which a report should convey. Books of a like nature describing conditions in some other foreign countries would be a welcome addition to technical literature.

Simplicity characterizes the text. Much information is given which should be read by young engineers whose only interest in China consists in trying to persuade Charley Sing to return their laundry by Saturday night. Several pages are devoted to the basic principles of mine examination and the preparation of a report, information which applies as well to work in this country as in China. A part of the book, also of general though somewhat elementary interest, discusses ore formations and the important igneous and derivative rocks, with references to Chinese examples.

The last half of the book gives brief descriptions of the various mineral industries, separate sections being given to coal, iron, antimony, tin, zinc, gold, platinum, silver, mercury, copper, mica and oil. Representative mining costs and some valuable Chinese conversion tables occupy the last few pages.

Those who are familiar with "Mineral Enterprise in China," written by William F. Collins, and published two years ago, will find Mr. di Villa's book quite unlike the other, in that Chinese political history and conditions as affecting the mining industry receive but scant attention. We understand the edition is limited, but the author tells us he shall be pleased to send a copy to any engineer interested in China.

E. H. R.

Technical Papers

Asbestos—The Department of Mines of Tasmania has issued a thirty-one-page bulletin on "Asbestos in the Beaconsfield District." Unsuccessful operations were conducted in the Beaconsfield asbestos district, Devon County, Tasmania, from 1899 to 1901. A revival of the industry in 1916 led to active exploitation of the best deposits known, but after two years' activity the pockety nature of the deposits, and greatly increased cost of operation, led to a cessation of mining for a second time. The purpose of the inquiry outlined in this bulletin was to determine the continuity of the deposits, and the possibility of so modifying methods as to develop continuous successful operation.

The fibrous serpentine of the area consists of picrolite, a coarse splintery variety, and chrysotile, which is the commercial fiber. Although a maximum fiber length of 4 in. has been noted, the bulk of the fiber runs from $\frac{1}{8}$ to $\frac{3}{4}$ in. A discussion of the origin of the deposits is followed by a description of the mining properties. An unusual feature is the presence of certain places of abundant fibrous magnetite. The low-grade character of the deposits may be inferred from the fact that the marketable fiber in the more important deposits constitutes only 1 per cent of the rock quarried, whereas in Canada it averages between 5 and 6 per cent. The description is comprehensive, the deductions are reasonable, and in general the publication is a valuable addition to the literature of asbestos.

Manganese—U. S. Bureau of Mines Bulletin No. 173, 209 pages, (price 30c. from the Superintendent of Documents, Washington, D. C.) is possibly the most complete and authoritative book on the subject of manganese which has been published. The eleven chapters are devoted to general information; uses of manganese other than in steel making; problems involved in the concentration and utilization of domestic low-grade ores; preparation of ore; leaching of ores with sulphur dioxide; the Jones process for concentrating ores; cost of producing ferromanganese ores; production of manganese alloys in the blast furnace; importance of allocating low-ash coke to the manganese-alloy furnaces; electric smelting; and the use of manganese alloys in open-hearth steel practice. The bulletin represents the results of work done in the course of war minerals investigations and the chapters enumerated above have already been issued separately in mimeographed form. About 95 per cent of the manganese consumed in this country is used in the steel industry. The manganese deposits of the United States are, with few exceptions, irregular, pockety, and uncertain.

Mine Warnings—Technical Paper 244 of the Bureau of Mines. (price 10c. from the Superintendent of Documents, Washington, D. C.) describes experiments on the use of stenches as a warning in mines. Several substances have been used, the most favorable being butyl mercaptan, but there is no commercial source of this substance at present. However, a manufacturer is experimenting with a view to producing it. Ethyl mercaptan, butyric acid and amyl acetate are also satisfactory. These substances are injected into the compressed air line and soon permeate every part of the mine workings. In cases of fire, the unusual smell serves as a warning to the miners to come to the surface. Suitable ventilation must of course be provided to clear the mine air after using such warnings.

Recent Patents

1,347,200. Treatment of Zinc Solutions Preparatory to the Recovery of Zinc by Electrodeposition. David Avery and Rowland T. D. Williams, assignors to Electrolytic Zinc Co. of Australasia Proprietary, Ltd., Melbourne, Victoria, Australia. Filed July 25, 1918.

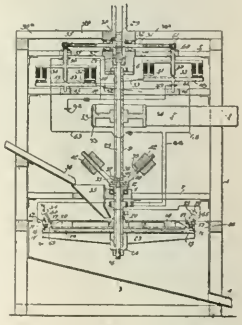
In the treatment of zinc solutions containing cobalt preparatory to recovery of zinc by electrodeposition the method of removing cobalt which comprises precipitating the cobalt by means of zinc dust in the presence of arsenic.

1,346,819. Flotation Process. Rudolf Gahl, Denver, Col., assignor, by mesne assignments, to Pneumatic Process Flotation Co., New York, N. Y. Filed Dec. 10, 1918.

A process of concentrating ores by flotation which consists in introducing additional sand substantially free from slimes into the normal pulp and subjecting the mixture to froth flotation.

1,344,519. Centrifugal Ore Separator. John Ainsworth Rice, San Francisco, Cal. Filed June 25, 1919.

In a machine for separating materials differing in specific gravity, a separating element mounted for rotation and comprising an upper member having a central inlet opening, a lower



ring-like member, a peripheral discharge opening being formed between said members, and a table between the members, and of less diameter than the members, said table extending over the opening of the ring-like member and forming with said members an annular peripheral chamber.

MEN YOU SHOULD KNOW ABOUT

Sidney Paige is engaged in an underground study of the origin of the ores of the Homestake mine.

E. O. Ulrich has just completed a study of the correlations involving Devonian and Carboniferous formations.

Kirby Thomas has returned to New York after an examination of salt and gypsum deposits in Tennessee and Virginia.

Will W. Boyer has been appointed a mineral geographer to serve with the land classification board of the U. S. Geological Survey.

F. C. Schrader, who made the original reconnaissance of the Jarbidge, Nev., district for the U. S. Geological Survey, is again in that field making an examination.

Walter L. Remick, recently assistant metallurgist with the U. S. Metals Refining Co., is now test engineer with the Research Corporation, 31 West 43d St., New York City.

D. F. Hewett has been transferred temporarily from the U. S. Geological Survey to the Bureau of Mines in order that he may make his report on Cuban War Minerals Relief claims.

Stephen Birch, president, and **W. P. Hamilton**, director of the Kennecott Copper Corporation, Alaska, are expected in New York this week. They have just finished an inspection of the Alaskan properties.

Marden W. Hayward, mining engineer, recently returned from a six-months' trip into Peru, Bolivia, and Chile, where he was making examinations for the American Metal Co., Ltd. Mr. Hayward's future address will be 263 South Clarkson St., Denver, Col.

J. C. Brumblay, Nevada representative of U. S. Smelting & Refining Co., returned to Reno July 30 from an extended trip into Inyo County, Cal. Mr. Brumblay has now left Reno for Salt Lake City, Utah, where he will take general charge of the field work for the Midvale plant.

H. W. Bell has been appointed to succeed **R. E. Collom** as head of the U. S. Bureau of Mines demonstration work in the oil and gas fields of Texas and Louisiana. Mr. Bell's headquarters will be at Dallas, Tex. He has spent the last three and one-half years as deputy supervisor with the California State Mining Bureau in the California oil fields, being last located at Santa Maria. Mr. Collom, who has temporarily been in charge of the Dallas office for the last six months, is resuming his work in the San Francisco office of the Bureau of Mines in the investigation of oil field problems.

Charles G. Yale is still in charge of the San Francisco office of the U. S. Geological Survey, where James M. Hill is now associated with him. Mr. Hill will assist Mr. Yale in statistical work for certain periods of the year and the rest of the time will act as geologist under orders of chief geologist of the Survey. It will be his duty in that connection to attend to certain geological work in Pacific Coast States, including Arizona and Nevada, to save time by prompt investigations of matters as they come up in the San Francisco office.

H. C. WANG

H. C. Wang, vice-president of the Chinese-American Industrial Corporation, Ltd., has come to this country in the interests of his company and of his native land. The corporation, which is made up of Chinese and American business men, has among its officers some of the most prominent and influential men of North China and its object is to develop direct trade relations with American manufacturers. It would also secure American co-operation in developing China's natural, industrial and manufacturing resources.

Mr. Wang is a graduate of Pekin University and a man of wide accomplishments. He was professor of mathematics at Imperial Tientsin University for five years before resigning to enter business. For four years he was in the Chinese Government Customs Service, and his services during the Tientsin flood of 1916 won him a government decoration. He was also counsellor of the Tientsin Chamber of Commerce, and for 13 years president of the Y. M. C. A. in that city.

Mr. Wang, who is probably the first native merchant of North China to come to this country, is also a gentleman of some property. He is owner of a tannery, of the Yung An gold mine, and secretary of the Kailan Mining Administration, which is the largest coal mining company in China, producing 14,000 tons daily and employing 20,000 men.

Alexander Anderson, mining engineer of Edinburgh, and representative of interests in China and Sumatra, is in the United States for a few months on a tour of inspection to study certain mining problems. He expects to visit some of the principal mining districts here, particularly the oil fields. Mr. Anderson has had an extended mining experience in Mexico and other countries.

OBITUARY

Arthur J. Ellis, a geologist of the U. S. Geological Survey, died in Washington on July 22, after undergoing an operation for appendicitis.

A. J. Sullivan, formerly general superintendent of the Chisholm district of the Oliver Iron Mining Co., died on July 7 following an illness of five years. Mr. Sullivan was born at Eagle Harbor, Mich., in 1866, and spent the earlier years of his life following mining on the Michigan ranges. In 1893 he went to Virginia, Minn., to work at the Auburn mine, and was later transferred to the Fayal and Genoa mines, being made superintendent of the latter in 1900. His authority was gradually extended, until in 1909 he was made general superintendent of the Chisholm district, which position he held up to 1915, when he was forced to give up active work by the nervous disorder which finally caused his death.

SOCIETY MEETINGS ANNOUNCED

Thirteenth Annual Conference on Taxation will be held on Sept. 6-10, 1920, at Salt Lake City, Utah, under the auspices of the National Tax Association. Among the many interesting papers promised, four bearing on the taxation of mines are scheduled for the morning session of Friday, Sept. 10. Among the speakers on that day are Governor Boyle of Nevada, Prof. William Peterson, of Utah Agricultural College, and R. C. Allen, vice-president of Lake Superior Iron Ore Association. Inquiries concerning the meeting and accommodations should be addressed to W. N. Beatty, care of Utah Power & Light Co., Salt Lake City, or to A. E. Holcomb, Secretary, 195 Broadway, New York City.

Lake Superior Meeting of A. I. M. E., the 122d meeting of the Institute, will be held Aug. 20 to Sept. 3, next, the party leaving Buffalo on the "Tionesta" and picking up other members en route. They will reach Houghton, Mich., Aug. 23 for a two-day stay. Parties will leave Aug. 24 for Ishpeming and Vulcan, and all reassemble at Minneapolis, Minn., Aug. 25. The Mesabi Range will be visited on Aug. 27, and Duluth reached in the afternoon of Aug. 28.

THE MINING NEWS

LEADING EVENTS

Number of Abandoned Claims in Mexico Large

Inability To Pay Taxes Under Old Policy and Great Accumulation of Fines the Reason

Mining agents of the Mexican government have been instructed when requested by mine owners to receive taxes one year in advance instead of quarterly only, as hitherto. Further, in the event of any district being in a disturbed condition owing to banditry taxes may be paid in Mexico City upon a proper showing.

According to the last report of the Department of Commerce and Industry there were 51,087 mining claims denounced in Mexico, covering an area of 442,225 hectares (2.47 acres in a hectare). Of this number more than three-fourths have been practically abandoned because of the refusal or inability to pay taxes and the enormous accumulation of fines. The recent presidential decree will probably result in a considerable portion of the owners reviving their claims.

The Department of Commerce and Industry of Mexico has just given out the following statement as to mines actually being worked at the present time in the Republic:

State	No. of Mines	No. of Companies
Durango	412	21
Guerrero	37	4
Guanajuato	97	48
Hidalgo	455	24
Jalisco	81	25
Mexico	110	21
Michoacan	146	42
Nayarit	42	5
Nuevo Leon	376	11
Oaxaca	8	3
Puebla	100	6
Queretaro	20	8
San Luis Potosi	244	18
Sinaloa	116	17
Sonora	316	23
Tamaulipas	28	6
Zacatecas	154	30
Lower California	12	2
Aguascalientes	71	5
Coahuila	206	25
Chihuahua	187	20
Total	3,138	365

A. S. & R. Considering Amarillo, Tex., as Possible Site for Smelter

The American Smelting & Refining Co. is studying conditions at Amarillo, Tex., with the idea of possibly locating a new smelter there. Nothing definite has been decided. The proximity of an abundant supply of gas for fuel at Amarillo is an important factor in the considerations.

WEEKLY RÉSUMÉ

Contempt proceedings, renewed by Minerals Separation against Miami Copper, were again dismissed on July 29 in the Federal court at Wilmington, Del. It is also reported that Nevada Consolidated has admitted infringing on the Minerals Separation flotation patents. A second orebody has been cut at depth in the Stewart mine at Butte by the Anaconda Copper Mining Co., causing a revison of ideas as to the probable life of the camp. In the Joplin-Miami district the United Zinc Smelting Corporation has obtained leases on 2,000 acres of land near Waco, Mo. The coal situation is reported to be easier on the iron ranges of Michigan and Minnesota, though car shortage in the East is still holding up shipments. Suit has been brought against the Inland Steel Co. for wasteful mining methods used by it at the Thompson mine, which it leases. Captain McDougall's suit against the Oliver Iron Mining Co. for patent infringement has been set for Sept. 20.

In Washington the phosphate and sodium land leasing regulations have been approved. Secretary Payne is back from Alaska and planning for the territory's development.

McDougall Suit Against Oliver Iron Co. Set for Sept. 20

The opening of the suit of Captain Alexander McDougall against the Oliver Iron Mining Co. to obtain large damages for alleged infringement of patents in concentrator construction, is set for Sept. 20 in the Federal court in Duluth. McDougall alleges that ideas that he had worked out and patented were used in the construction of the large washing plant at Coleraine, on the Mesabi Range.

Arguments in Utah Power Case Nearing Close

Arguments are being closed in the hearing before the Utah Public Utilities Commission in regard to an increase in power rates which the Utah Power & Light Co. is seeking to impose on some companies having especial contracts. The Utah Copper Co. has just ended its oral argument, in which it maintained that the rates charged under special contract brought adequate returns even under existing conditions of higher costs, etc, and that the valuation of the power company at $42,000,000 was excessive.

The power company argued that the power contracts, having been agreed upon before the creation of the commission, were subject to revision upon the date when the commission was empowered to act. It was also claimed that few of the contracts were made upon rates which today were paying adequate compensation. Other metal mining companies protesting have still to make their oral arguments.

Contempt Proceedings Against Miami Again Dismissed

Court Handles Minerals Separation Application in Record Time—Nevada Con. Admits Infringing

Minerals Separation again appeared before the U. S. District Court in Wilmington, Del., on July 26, with a renewed application for leave to file a supplemental bill charging Miami with renewed acts of infringement. Three days later Judge Morris rendered his decision, in which he denied the application, stating that he found nothing in Minerals Separation's arguments to justify him in a conclusion different from that of his recent opinion (*Engineering and Mining Journal*, July 24, p. 179,) upon the previous application in contempt proceedings which he had dismissed.

The rendering of an opinion on July 13, the hearing of another application on July 26, and the rendering of an opinion denying this latter application on July 29, all within practically a fortnight, is a remarkable record in a case that has been looked upon as of interminable length. Judge Morris' opinion, which is largely a quotation from his previous one, is, in full, as follows:

"This case is again before the court upon an application of the plaintiff for leave to file a supplemental bill charging the defendant with new acts of infringement since its discontinuance of the three processes heretofore adjudged to be infringements (244 Fed. 752).

"When considering the application heretofore made by the plaintiff that the defendant be adjudged guilty of contempt and/or that a further injunction be issued specifically enjoining and restraining the defendant from using the processes therein set forth I arrived at and stated the conclusion that 'in view of the nature of the new processes used by the defendant as charged by the petition, the questions raised thereby, and the decision of the Circuit Court of Appeals in this case (244 Fed. 752), I am of the opinion that the plaintiff must obtain the relief to which it is entitled, if any, touching the new processes, either through the proceedings now being had before the master and the decree to be entered thereon, or by a new bill, and not otherwise. Which of these procedures is the proper one under all circumstances or whether both must be resorted to, one as to some of the processes and the other as to the remaining processes, need not now be determined.'" The words 'new bill' were therein used to indicate a new original bill. I have considered the argument made in support of plaintiff's present application

and find nothing therein justifying a conclusion different from that at which I arrived when considering the petition hereinbefore mentioned. The present application must, therefore, be denied."

NEVADA CONSOLIDATED ADMITS INFRINGEMENT

The Nevada Consolidated Copper Co. has admitted openly that it has infringed that patent of the Minerals Separation North American Corporation governing the use of oil in flotation in amounts less than 1 per cent on the ore. This admission was made before Judge Hale in the U. S. District Court in Portland during discussion of a motion requesting further answers to interrogatories in connection with the infringement suit of the Minerals Separation against the mining company. The period of infringement extended from September, 1914, to August, 1917, when flotation was used in Janney machines.

The suit of Minerals Separation against the Magma Copper Co. has also proceeded another step, although the latter's motion for a bill of particulars has been denied. In this instance Judge Hale said: "It appears. . . . an attempt to force from the complainant a statement of what his endeavor is to be upon certain material allegations in the bill. . . ."

The litigation with the Magma company, as with Nevada Consolidated in the same court, has to do with two patents, one for the use of less than 1 per cent of oil and the other covering soluble frothing agents. As matters now stand each defendant must file answer to the Minerals Separation's bills of complaint before Oct. 1.

Butte & Superior Accounting Hearing Late This Fall

Hearing of the accounting to be made by the Butte & Superior Mining Co. as the outcome of its litigation with Minerals Separation is not expected to take place until late this fall, according to counsel for the latter company. It is said that it will require at least two months more for the Minerals Separation engineers to digest a ten-volume report made to the Federal court by the Butte & Superior, setting forth its side of the accounting. The defendant company asserts that if it is liable at all the damages should not exceed $451,000. The plaintiff claims damages amounting to as high as $18,000,000, asking for all the profits made by the Butte & Superior through the employment of the flotation process.

Atmospheric Nitrogen Co., formed late last year by Solvay Process Co. and General Chemical Co., with authorized capital stock of $5,000,000, has begun erection of the first unit of a plant at Syracuse, N. Y., for the fixation of atmospheric nitrogen. Buildings and equipment of this unit will be completed in about a year and will cost more than $2,000,000.

Would Remove Colorado School of Mines from Politics

Recent Ousting of Mines Experiment Station Last Straw—Prominent Men of State Disgusted

For several months prominent mining men of the State of Colorado have been smarting under the growing criticism of conditions at the Colorado School of Mines. This well-known institution has received more than its share of unenviable notoriety recently on account of the unfortunate and ill-advised action of the present administration in severing relations with the U. S. Bureau of Mines, and thus depriving the school of Federal recognition and co-operation. What practically amounts to the ejection of the Rare Metals Station of the Bureau of Mines on the pretext that the building occupied by the bureau was needed by the school, is the last straw so far as mining and metallurgical men of the state are concerned. Influential mine operators, and others who have the best interests of the Golden school at heart, are determined to devise some means to remove the institution from the control of an incompetent and irresponsible board of trustees that has committed one blunder after another in school administration.

One of the plans under consideration aims to place the School of Mines under an educational board, and probably under the management of the board of regents of the State University. In this event the school would remain at Golden, and in addition to its present functions would assume the research work now conducted by the State Geological Survey. Its work would be coordinated with that of the State University, and considerable duplication of engineering courses would be avoided. Further, an effort would be made to re-establish co-operation with the U. S. Bureau of Mines, by securing for Golden one of the new branches of the bureau, two of which are to be organized in the near future. Friends of the school realize that in order to accomplish this purpose, they must first place the school under a competent and dignified administration, and make it independent of the baneful political influences that have been such a handicap to its advancement for many years.

New Diesel-Driven Iron-Ore Carrier Completed

Cubore, a Diesel-driven ship of 11,500 deadweight tons, is about to make her maiden voyage to Cuba. Built by the Bethlehem Shipbuilding Co. for the Bethlehem Steel Corporation, she represents what is said to be the greatest advance in American marine engineering. She is propelled by a two-cycle, American designed and built, oil engine of 3,200 hp. This ship, which is 496 ft. long, 57 ft. wide and 37 ft. deep, will carry iron ore from the company's mines in Cuba consigned to steel plants in the United States.

Opening of 79 Mine in Arizona Noteworthy

Continental Commission Co.'s Efforts Achieving Interesting Results—Future Considered Promising

The first six months spent in opening up a prospect rarely show a balance on the profit side of the ledger. Mines that have paid from "grass roots" are dreamed of by prospectors but they are not often found. The record of the 79 mine in Gila County, Ariz., though lacking the spectacular features which surrounded some of the famous gold and silver boom camps, is none the less interesting.

The 79 group, consisting of 23 claims, is located in Gila County, near the Pinal County line, in the southern extremity of the Mescal Mountains. The nearest railroad point is Burns, a siding on the Arizona Eastern, about five miles distant by road. The concentrator of the Ray Consolidated Copper Co. and the Hayden plant of the American Smelting & Refining Co., in the deep valley below, seem but a stone's throw from the highest point on the wagon road leading to the mine.

The early history of the 79 mine is not unlike that of thousands of other prospects. It was originally located in 1879, hence the name. For years the principal owner was Mike O'Brien, who had a few associates. O'Brien, a typical prospector of the old school, lived on the property in a tunnel. Having placed on his interest in the property a definite cash value and having formulated hard and fast rules for a sale, the stage setting being his tunnel home, to which capitalists must come with the full purchase price in gold coin, O'Brien never saw the fulfillment of his plans. He was murdered about three years ago, presumably by Mexicans, who believed he had large sums of money with him or hidden in his tunnel.

The administrators of the O'Brien estate gave a bond and lease on the property in December, 1919, to the Continental Commission Co., of which Lee Reagan is president and Miss Alice McFaddin secretary and treasurer. At the time there was no road to the property. Everything was packed in on burros, but a start was made. A five-mile wagon road has been built, over a mile of it being solid rock work. In the meantime the company shipped 31 cars of ore, packing it all on burros to the end of the wagon road, then in wagons to the railroad. The ore, which was shipped to El Paso, returned an average of $1,126 per car after deducting the freight and treatment charges. The company's achievement during its first six months is certainly worthy of mention.

Rising slowly for nearly two miles over long hogbacks of rounded contour composed chiefly of Gila conglomerate the road reaches the older sedimentaries forming the higher parts of the Mescal Range. The mountain sides become more precipitous and the grades steeper. The underlying rock is chiefly

limestone, dipping gently to the east and southeast. The mine is 1,600 ft. above the Gila River at an elevation of 3,600 ft. above sea level in a very rugged section. Here the limestone forms steep-sided canyons, broken now and then by low scarps, which mark a bed harder than its neighbors. The limestone is a hard, compact variety, gray in color and generally magnesian. In places it is more yellowish, a characteristic which is conspicuous on some slopes when viewed from a distance. The thickness of the individual beds rarely exceeds two feet. The limestone is assumed to be the Martin limestone of Devonian age.

Within the limits of the property the only intrusive rock observed was a medium grained porphyritic to granitoid rock occurring as dikes of considerable width and great lateral extent. The rock is probably a monzonite or quartz-diorite.

The orebodies, which have a strike of N 15-20 deg. E and a dip to the south of from 35 to 50 deg., occur in the limestone. The principal outcrop, which is dark red, is very conspicuous, covering a whole hillside owing to the fact that the vein is exposed along its dip. The vein system consists of three parallel veins separated by more or less barren ground. The two outer veins are slightly over 4 ft. in thickness and the middle vein is about 28 in. thick. The ground between the veins varies in thickness from 2 to 4 ft., for the most part barren, though sometimes mineralized to a certain extent. Future development of the property may determine the extent of this mineralization and make it possible to mine with profit some portions of this intermediate ground.

The ore is lead carbonate occurring chiefly as "sand carbonates," though many large pockets of long, slender, white cerrusite crystals have been found. There are rare nodules of galena and occasional bits of copper sulphides or carbonates. The ore carries some gold and silver. The ratio of silver to lead appears to be about one ounce of silver to each 4 per cent of lead. Ore carrying copper either in the form of sulphides or carbonates is uniformly higher in silver.

Small deposits of molybdenum and vanadium also occur on the property. Of these the molybdenum deposit has received most attention because it has afforded the greater quantity of lead, as large boulders of galena occur with the wulfenite. The vanadium occurs almost wholly as descloizite and is of undetermined extent.

The development done by the Continental Commission Co. totals approximately 2,000 ft. Practically all of the material removed by this work has been ore. The company's engineer estimates that they have blocked out nearly 45,000 tons of ore. The completion of the work now mapped out will in all probability prove up as much more.

The immediate plans of the company provide for loading bins at the mine to facilitate handling the ore there, the substitution of auto trucks for wagons, and the installation of some of the more necessary mining equipment. The ore taken out by the development work proposed will probably pay the greater part, if not all, of the operating expenses for some time to come. The management is commendably cautious, proceeding on sound lines, resolved to prospect the property thoroughly before indulging in large expenditures for surface improvements and equipment. The development of the property will be watched with interest for it is confidently expected that the present efforts will produce a mine of considerable importance.

United Zinc Adding to Holdings in Joplin-Miami District

Quietly and without ostentation the United Zinc Smelting Corporation, the firm with which Charles M. Schwab is associated, has secured something in excess of 2,000 acres of leases on lands immediately east of Waco, Mo., and now has drills at work prospecting the tracts. The company also has numerous leases south of Galena, Kan., and also south of Baxter Springs, Kan., and is now preparing to put drills on these lands. The United Zinc company already owns the Manhattan mine and mill in the Picher field, and the Media and Electrical mills and mines in the old Webb City camp as well as the Coyote and Airdale mills and mines in the sheet ground section of the Joplin camp. It is conceded that should any good strikes be made on the tracts now being drilled the company would move some of its mills in the Joplin or Webb City camps to the site. The leases have been obtained and the drilling is being carried on under the management of George Moore, an ore buyer of Joplin and representative of the Victory Metal Co. in this field.

Simon Silver-Lead Mines Preparing Plans for Mill

An official report states that a mill is being designed to treat ores of the Simon Silver-Lead Mines Co. A process has been evolved by Minerals Separation which has been proved practicable by both laboratory and mill test. It is stated that two concentrates will be produced; No. 1 containing 39 oz. silver, 67.6 per cent lead, 9.6 per cent zinc, 2.8 per cent iron, and 2 per cent insoluble, and worth $125.82 per ton; and No. 2 containing 8.2 oz. silver, 3.2 per cent lead, 46.8 per cent zinc, 9 per cent iron, and 2.6 per cent insoluble, and worth $39.34 per ton. The extraction is given as 93.9 per cent of the silver, 93.7 per cent lead, and 71.3 per cent zinc. That the mine has a future is indicated by the fact that the annual report of the company states ore reserves to be 400,000 tons with an estimated profit per ton of $7.20 on Dec. 31, 1919. Favorable reports are made on developments from the 700 level which will add to reserves.

Early Hopes of Iron Operators Dashed by Car Situation

Tonnage from Lake Superior Ranges Dropping Behind Last Year's—Coal Arriving More Freely

The car situation in the East is still delaying shipments from the iron mines of the Lake Superior district and the tonnage for the season may prove to be less than that in 1919, which was below the average of the last five years, unless the ore can be moved from the lower-lake docks to the furnaces with greater rapidity. The Iron River district of the Menominee Range has sent out about three-fourths of the ore contracted for delivery in 1920. There are large stocks of ore at the mines on the Marquette Range. The Gogebic Range mines will not move the tonnage looked for earlier in the year.

The chief difficulty in the East is to keep the cars moving from docks to furnaces, and there is a shortage of rolling stock to handle the business. Some boats are compelled to tie up for a week at Lake Erie ports to await unloading. No time is lost in the mining district, there being plenty of cars, and the boats are loaded without delay. Many of the lake vessels will enter the grain trade in the fall and will not be available for carrying iron ore.

Iron ore shipments from the head of the lakes are 440,000 tons behind 1919 as of Aug. 1, the figures for this year being 21,423,110 as compared with 21,862,626 at the same date last year. The entire loss in shipments is found in the falling off by the Duluth Missabe & Northern docks at Duluth, which are now 2,820,000 tons behind last year's record. All other docks have improved the 1919 record. Below are the detailed figures:

Dock	Shipments to Aug. 1, 1919	Shipments to Aug. 1, 1920
D. M. & N., Duluth	9,821,136	7,000,222
D. & I. R., Two Harbors	3,616,110	4,121,853
G. N., Superior	4,596,179	5,726,362
Soo, Superior	649,087	647,900
N. P., Superior	235,269	320,665
C. & N. W., Ashland	2,489,673	3,066,976
Soo, Ashland	455,172	539,132
Total	21,862,626	21,423,110

The coal situation, which was fast becoming critical, has been taken in hand and if the program now under way is carried to completion the Northwest will not suffer for coal during the coming winter. Below are comparative figures of coal receipts on the Duluth-Superior waterfront as issued by Col. F. A. Pope, chief of the United States Engineers office for Duluth-Superior harbor:

	Anthracite	Bituminous
Received to Aug. 1, 1919	692,048	4,648,221
Received to Aug. 1, 1920	662,662	1,682,918
Decrease	29,386	2,965,303

Receipts will have to be maintained at an average rate of 53,521 tons per day from Aug. 1 to Nov. 30 to place on dock a reserve equivalent to that of 1919. The Federal orders regarding coal movement to the Northwest have helped relieve the anxiety of operators.

Anaconda Cuts Second Orebody at Depth in Stewart Mine

New Discovery Held To Have Important Bearing on Future of Butte District

Another new orebody has been cut by the Anaconda Mining Co. at 3,860 ft. depth in the Stewart mine in Butte in the course of shaft sinking. The other deposit recently discovered was found at a depth of 3,740 ft. and showed about 6 ft. of high-grade ore. The second shoot has a width of 10 ft., all high-grade, the ore being a heavy bornite with an admixture of "yellow" copper, and samples, it is said, ran as high as 47 per cent copper and 6 oz. of silver. Thus far this is the greatest depth at which ore has been found in Butte. The disclosure of ore at this depth has resulted in much elation in Anaconda circles, and is regarded as one of the most important the company has had in a number of years.

Inland Steel Sued for Wasteful Mining Methods

Thomas Keating, of Minneapolis, fee owner with George H. Crosby, of Duluth, of the Thompson mine at Ironton, has filed suit in the district court at Brainerd, Minn., against the Inland Steel Co. for $380,000 for alleged failure to mine ore properly from the Thompson mine under the terms of the lease. Keating owns three-quarters of the fee and George Crosby own the remaining one-quarter. The lease was surrendered by the steel company on Oct. 10, 1919. Keating alleges that more than 400,000 tons of ore was mined and removed as low-grade ore, which was not treated as provided in the lease. Some if it is alleged to have been wasted by placing sand and other material upon it after it had been dumped. The royalties asked for on the alleged wasted ore are $120,000. The complaint also alleges unskillful mining and pit work, for which damages in the sum of $250,000 are asked, and for alleged removal of mine supports, tramways, etc., from the property a further sum of $10,000 is asked.

Freight Rate Lowered on Lead

Lower rates on pig lead and bullion in carload lots from points in Idaho and Washington to Chicago and intermediate points have been ordered by the Interstate Commerce Commission, according to reports received at Spokane, Wash. The current rate is $13.10 a ton and the new rate will be $11.50, a difference of $1.60 a ton. The change will become effective about Oct. 1. It affects about half of the lead shipped from Idaho and Washington smelters. The total annual shipments from these states is estimated at 75,000 tons. Up to the time of the hearing, the rate to New York and other seaboard points was the same from Idaho and Washington as from Montana, Utah and Arizona, but to Chicago and intermediate points the rate was lower from Montana, Utah and Arizona than from Idaho and Washington. The blanket rate to New York placed all shippers on the same competitive basis, but the differential to Chicago and intermediate points forced Idaho and Washington producers to pay $1.60 a ton more than their competitors in Montana, Utah and Arizona.

Scandinavian Labor Situation at Crisis

There is every appearance that the mediation of Herr Kvarnzelius in the conflict between the miners and allied unions and the Luossava-Kirunavara Aktiebolag and the Grängesberg-Oxesund Trafikaktiebolag will shortly result in the resumption of work generally, according to advices from abroad. *Svenska Dagbladet* believes that if his decision, which has not been publicly divulged, is accepted by both parties, and there is every sign that it will be, work will be resumed in August. In Norway the result of the state compulsory arbitration has been all in the favor of the men. Alluding to it, in an interview by *Morgenbladet*, Director Paus said: "There can be only one opinion as to the result. It was in the men's favor. During the negotiations they asked for an increase of 50 öre per hour, and upheld that claim in the court of judgment, but they never were of the opinion that they would actually get it. Experience in negotiations during a conflict goes to show that a considerably larger increase in wages is always claimed above what they will accept in order that the margin can be reduced during the negotiations. Judgment being in their favor it will involve the greatest difficulties in the iron and metal industries. I do not think it at all improbable that many of these industries will have to shut down. It has already been shown that we are behind in competition with foreign undertakings."

Searles Lake Lessees Desire County Taxes Reduced

Appeal for reduction or elimination of county taxes on government leases to mineral rights in the Searles Lake region of California was recently urged before the board of supervisors, sitting as the board of equalization, by the independents who are attempting to promote plants alongside of the Trona, Borosolvay and West-End companies, all of which are operating on patented land and are therefore not involved.

Joining in the appeal for elimination of taxes, or a nominal tax, are the Merrill Chemical Co., the Nevada Chemical Co., Eagle Chemical Co., George B. Burnham, Willard W. Butler, Robert B. Phillips and W. W. Chapin. They have leased from the government on a royalty basis approximately 15,000 acres of land in Searles Lake, and Assessor E. J. Gilbert has assessed the possessory interest at $420,320. The taxes would be $10,965.

Civil Service Examinations

Those interested in the following examinations should apply to the Civil Service Commission, Wash., D. C., for form 1,312, stating the title of the examination desired.

Mining draftsman, $1,200, Sept. 8. An open competitive examination for both sexes. Examinations will be held at various points throughout the country. A vacancy in the Pittsburgh station of the U. S. Bureau of Mines may be filled from the results.

Curator, $2,400; assistant curator, $1,800; both sexes. Open competitive examination, Aug. 10, 1920. Vacancies in the division of mineral technology, National Museum, Washington, D. C., and positions requiring similar qualifications may be filled from the results. Not required to report at any place for examination.

Statistical draftsman, $1,500; both sexes. An open competitive examination, Aug. 3, 1920. A vacancy in the Bureau of War Risk Insurance at $1,500, and vacancies requiring similar qualifications, may be filled from the results. Not required to report at any place for examination.

Recent Production Reports

Phelps-Dodge Corporation produced 8,357,000 lb. copper in July against 7,552,000 in June.

Anaconda's July output was 11,700,000 lb. copper against 12,700,000 in June.

Miami produced 4,549,298 lb. copper in July compared with 4,400,000 in June.

Old Dominion's production in July was 2,640,000 lb. against 2,999,000 in June.

Chile Copper produced 7,500,000 lb. copper in June compared with 10,300,000 in May. The decrease was caused by shortage of fuel oil.

Shattuck Arizona produced in July 166,938 lb. copper, 919,886 lb. lead, 45,495 oz. silver and 505 oz. gold. Its copper output in June was 198,327 lb.

Anaconda produced 11,700,000 lb. copper in July and 12,700,000 in June.

Oriental Consolidated, Unsan, Chosen, obtained $66,000 from its July clean-up against $80,000 in June.

Inspiration Consolidated produced 6,500,000 lb. copper in July, against 7,300,000 in June.

Calumet & Arizona's July output was 3,528,000 lb. copper, compared with 3,812,000 lb. in June.

New Cornelia produced 3,522,000 lb. copper in July, as against 3,564,000 in June.

Cerro de Pasco produced 3,652,000 lb. copper in July, against 3,944,000 in June.

Backus y Johnston produced 1,458,000 lb. copper in July.

U. V. Extension produced 3,304,878 lb. copper in July, against 2,828,020 in June.

Arizona Copper produced 3,000,000 lb. copper last month unchanged from the month before.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Reno Station Must Limit Its Experimental Work

Would Otherwise Duplicate Research Being Conducted at Other Points, Says Dorsey Lyon

Some disappointment has been expressed in Nevada because the experiment station which is to be located at Reno is to confine its work to rare and precious metals. The complaint is made that the station should include research on other metals found in Nevada, as well as oil shale. This has led Dorsey A. Lyon, supervisor of stations for the Bureau of Mines, to state:

"It will be impracticable for each station to attempt to give attention to all the problems which might occur in the district in which it is located. For example, the station at Salt Lake City confines itself practically entirely to problems connected with the extraction of lead and zinc from low-grade and complex ores. There may be many problems in Nevada which are more important to the state than are those relating to rare and precious metals, but if the station at Reno should take up work on problems relating to oxidized ores of lead-silver, for instance, it would bring about a duplication of work already being done at Salt Lake City. As a matter of fact the principal work in oxidized lead-zinc-silver ores is being done in co-operation with the Yellow Pine Mining Co. at Goodsprings, Nev.

"With regard to the research on low-grade copper ores, the bureau's station at Tucson is giving its attention to such problems and, in connection with that work, has taken into consideration the possibility of treating the low-grade copper ore deposits said to exist at Mina. In fact, one of the bureau's engineers has made at least two trips to the district in order to investigate the possibility of treating Mina ores by processes developed at Tucson.

"As for oil shales, the bureau already has taken up research and investigation work at its station at Salt Lake City and is carrying on special work in co-operation with the State of Colorado at Boulder. It would be impossible to attempt to deal with all the problems met with in the mining and metallurgical industries of Nevada at the experiment station at Reno. The results of experimental work, while done outside of Nevada, are applicable to problems of that state as well. With the bureau's limited appropriations and the necessity of having specialists for each line of work it is important that the Reno station devote practically its entire time and attention to the problems arising in the mining and treatment of rare and precious metals."

Dr. Smith Breaks All Records As Survey Director

Dr. George Otis Smith, the director of the U. S. Geological Survey, has held that position longer than any of his predecessors. On August 13 he equaled the term of service of J. W. Powell. Major Powell was director of the Survey for thirteen years, three months and twelve days, and on August 13 Dr. Smith put behind him exactly the same period of service as director.

During the 41 years since the Survey was created it has had but four directors. Due to the fact that the first director, Clarence King, took the position simply with the idea of organizing the new bureau and was in office only one year the Survey, practically speaking, has been under the direction of only three men since it really began to function. That time has been almost equally divided between Major Powell, C. D. Walcott and Dr. Smith. It is a generally held opinion that the long tenure of office of the directors of the Geological Survey has been an important factor in the effectiveness of the bureau's work.

Phosphate and Sodium Land Leasing Regulations Issued

The General Land Office has issued regulations concerning phosphate and sodium leases and prospecting permits. The phosphate regulations provide that applicants for phosphate leases must file application in the Land Office of the district in which the land is situated; that the district office shall advertise the same for thirty days and forward to the General Land Office. The minimum royalty is 2 per cent of the gross value of output and the rental of 25c. an acre will be charged the first year, 50c. an acre from the second through the fifth years, and $1 an acre thereafter. Leases will be given for not more than 2,560 acres.

The sodium regulations provide for filing applications in the local office to cover not more than 2,560 acres; for issuing permits for two-year leases on a royalty and rental basis, the royalty to be not less than 12½ per cent of the value of production and the rental to be 50c. an acre for the first year and $1 for each year thereafter.

No particular forms of application are required.

Plan New Mine Rescue Truck

By far the best appointed mine rescue truck ever made is to be manufactured for the U. S. Bureau of Mines. The lessons of many years of experience with this type of equipment will be embodied in the new vehicle.

Payne Back from Alaskan Trip

Must Reduce Present High Costs There, He Says—Would Lighten Load Due to Conservation

Alaska's industrial progress is going to be stimulated if it lies within the power of the influence of the Secretary of the Interior. Secretary Payne is just back from his Alaska trip and, in a special interview with the correspondent of the *Engineering and Mining Journal*, declares that he is going to do all in his power to lighten the burden which was placed on Alaska's shoulders during the Pinchot wave of conservation. He is going to make it the first duty of a live committee to study ways and means for stimulating Alaskan activities.

Judge Payne realizes that one of the most helpful things that could happen to Alaska would be a greater incentive to mine gold. While he understands that time must be the most important factor in restoring gold to its normal buying power he believes that there is a great deal of gold in Alaska which can be mined under present conditions if capital and labor are made available and transportation improved, and other steps taken to reduce some of the unnecessarily high costs now hampering all mining operations in Alaska.

The principal purpose of the visit of Secretary Payne and Secretary Daniels to Alaska at this time was to look into the matter of the production of coal from Alaskan mines. Secretary Payne authorized the construction of a washing plant at the Eska mine, which is on the line of the Alaska railroad. The product of this mine is now being used as railroad fuel, but the coal can be greatly improved by washing. It is intended to mine this coal in quantities sufficient to meet the commercial requirements of the territory tributary to the Alaska railroad.

The Chickaloon mine, which is at the terminus of the Matanuska branch of the railroad, produces a grade of coal equal to that of Pocahontas, Judge Payne says. The vein is 16 ft. wide. There are 400,000 tons of coal which have been blocked out. There are a 600-ft. shaft and five levels on the property. Just at the present time it is not possible to forecast definitely what the future of the mine will be, as the vein is known to be faulted. It is believed, however, that it will be picked up again and its development continued. The Navy has $1,000,000 to spend in an effort to develop Alaskan coal.

Further in the interior the extensive lignite fields are expected by Judge Payne to have a decided bearing on industrial development. He also calls

attention to the fact that there are promising anthracite veins in Alaska as well.

The Secretary thinks that other industries in Alaska are going to be stabilized by the development of its agriculture. He was very much impressed with the high productivity of the soil and the large output per acre which can be had in a much shorter season than in the principal agricultural districts in the United States.

Judge Payne is very much impressed with the favorable indications of the occurrence of oil in Alaska. At his request A. H. Brooks, of the U. S. Geological Survey, is looking into the petroleum situation, with a view to making recommendations as to steps which may be helpful in encouraging prospecting for oil. Considerable prospecting is being done even under present conditions, according to reports that have been received.

Awards were recommended during the week ended July 31 by the War Minerals Relief Commission, as follows (the name of the claimant, the mineral, the amount recommended, its percentage relationship to the amount claimed are shown): Fred A. Babcock, manganese, $225.17, 10 per cent; Eleanore E. Hoeft, chrome, $5,138.30, 39 per cent; O. C. Irwin, chrome, $4,146.27, 12 per cent; Auburn Chrome Mines, chrome, $5,970.56, 30 per cent; Holbrook & McGuire, chrome, $5,905.18, 37 per cent. To date, the average percentage of the amounts claimed, which have been recommended for payment, is 30.34 per cent.

NEWS BY MINING DISTRICTS

MEXICO

Political Conditions Improved in General But Economic Conditions Still Bad

Durango

With the opening of the American Smelting & Refining Co.'s smelter at Asarco, Durango, at the beginning of this year a new impetus was given to the mining industry in this state and adjacent territory, which has been practically dead since 1912 on account of disturbed conditions and failure of transportation facilities.

Political conditions in the states of Durango, Zacatecas and Coahuila have improved materially during the last three months and there is a feeling of optimism noticeable that the improvement is permanent and further advances toward a normal condition can be expected. This is the feeling in spite of sporadic labor strikes, which have generally been adjusted satisfactorily to all concerned.

Only one or two operators were able to continue work during the worst period of disturbed political conditions, but in 1919 several others renewed operations on account of the high prices of silver, and during the present year still more have commenced work, and with the growing confidence there is something like a general rush at the present time to start development work and begin shipments from the mines already in paying orebodies.

One of the companies that is making rapid progress toward renewed operation of its mines at Tejamen, Durango, is the Cia. Minera Eureka, Melchor Ocampo y Anexas, S. A., where Theodore E. Dickel, the new mine superintendent, is installing a 100-ton mill, using table concentration and regrinding to be followed by flotation. The ores run from half a kilo to one kilo silver and some lead. It is expected that the plant will be in operation by Oct. 1. The company has about 40,000 tons on the dump and 3,000 tons of old sands to be worked up before treating newly extracted ore.

The Santa Cruz Mining Co., whose mines are located in the Otaez district, but with offices in Durango, is preparing to put in a mill to take the place of its old one, which is too small to handle the new production. This company has been notable for the quantity of high-grade ores shipped, which has been its principal production, but it is now intended to work up the accumulated dumps, which run from one to five kilos of silver per ton.

An increasing number of companies are resuming operations in the Guanaceví district, and with the encouragement given by the Government officials that a railroad will be built into that camp in the near future the prices of mining properties have stiffened considerably and many new denouncements have been made of properties previously passed over.

The three mills now operating in Guanaceví are still running on the old dumps, the mines not having been unwatered since they were forced to close down a number of years ago. The Soto Mines Co. has completed its new mill and concentrating plant and has commenced shipments.

In western Durango the Bacis Gold & Silver Mining Co. is again producing bullion and concentrates, since reopening January 1. The Ventanas mines are again working on a small scale. The Mexican Candelaria and the San Luis Mining Co., both near San Dimas, in western Durango, did not stop work during the disturbances of the last eight years.

Many of the smaller companies have resumed operations or are preparing to do so at once. L. C. Phillips has recently reached Durango on his way to start development work for the Cia. Minera Occidental, whose property is in the Canelas district.

Sonora

North Tigre Leasing Co. Ships First Concentrates

Agua Prieta—Ore shipments through the Douglas-Agua Prieta port for July greatly exceeded those for June. One hundred and ninety-five cars of ore and concentrates with a tonnage of 7,822 crossed from Agua Prieta in June, against 218 cars with a tonnage of 8,715 which crossed in July.

The estimated value of June shipments was $1,138,000, and July shipments were valued at $2,145,500. Figures for July follow:

Origin	Cars	Tons
Nacozari	179	7,160
El Tigre	22	810
Estrella	10	450
Nuevo Potosi	1	45
Palacio de Hierro	1	43
Promontorio	1	42
Belen	1	41
San Ygnacio	1	39
San Pablo	1	42
San Luis	1	43
Total	218	8,715

Total customs collections, including $528 head tax, amounted to $3,295.55.

The first car of concentrates from the North Tigre Leasing Co. is now en route to Douglas, Ariz. The company has recently put into operation a 50-ton flotation mill. The mill was built under the direction of Frank Holmes, who is manager of the property, the stock of which is held mostly in Douglas and Bisbee.

Chihuahua

Minerales y Metales To Increase Shipments

Santa Eulalia—The Cia. de Minerales y Metales is shipping to its Torreon smelter and is arranging transport to increase its shipments. The San Toy aerial tramway is being repaired and will convey all the company's ore from various leases to the standard-gage railroad which connects with the Mexican Central. The ore from the company's San Antonio Chico lease will be taken to the San Toy aerial tram in four-wheel-drive motor trucks.

The A. S. & R. Co. has installed an electric hoist and compressor at its San Antonio Grande lease, which is in the east camp and is now being managed by E. B. Butts. It is going to build an aerial tramway to transport the ore from this mine to the Velardeña-Mina Vieja tramway.

The striking miners of the A. S. & R. Co. have returned to work and shipments are again normal.

The improvements on the Chihuahua Mining Co.'s railroad are nearing completion. A switch from "Three Mile" is in operation to the smelter and the company is shipping directly there without rehandling the ore as before.

The Buena Tierra Mining Co. has installed a 1,378-cu. ft. compressor and is overhauling its main hoist.

Don Juan Rivera has installed a hoist on his Santa Rita lease.

Dr. J. M. Smith is shipping from his lease on the Coronel. A. H. Davison has examined the Central.

Guerrero

Many Claims Jumped in Recent Years

There is practically nothing doing in the state in the way of work or development. This section was pretty badly mauled during the various revolutions and uprisings since 1910 and the few important properties, such as Campo Morado, have been worked at and butchered by local bandits for their own account. Campo Morado, which has been under option for several years, waiting the dawn of peace, to an English syndicate, is still nominally in the hands of local patriots, though it is probable that the central government will take expeditious methods shortly to return the property to its owners.

During the last few years, when mines were almost entirely abandoned in this state, large numbers of properties were "denounced" or, properly speaking, "jumped." The absence of the local mining authorities and the fact that mining agencies belonging to the government were closed, created a confusion that made lawlessness quite possible. The present government has set its face against these methods, however, and under recent decrees all such irregularly acquired properties have been ordered vacated and the titles of the original owners sustained, even in the absence of the payment of taxes and other legal requirements. That is, sufficient time will be allowed all mine owners, absentees as well, to put their house in order, if they choose to do so.

The Department of Public Works has revived the concession for a railway from Toluca to the Pacific coast which will put into productivity a number of important old-time producers, among them the Inguarán copper properties belonging to the Rothschilds, which are now idle for lack of transportation. The department has also approved a plan for opening the Balsas River to navigation for about 150 miles above its mouth, thus connecting up a large area of smaller mining properties and an immense mineralized zone now practically unprospected. Preliminary work on the latter proposition has already begun.

San Luis Potosi

The Cia. Metalurgica Mexicana, owned and operated by the Towne interests, is operating only a few furnaces for copper and lead, owing to lack of transportation and scarcity of fuel oil caused by the recent strike in the oil fields.

There has been no general revival of work throughout the state although some few options have been extended to foreign concerns. Politically the state is quiet and free from brigandage, but economic conditions are very bad.

Jalisco

Larger Companies Again Shipping—Prospectors Active

Jalisco is one of the first states to recuperate after the revolution and, in fact, for some time most of the larger mines have resumed work and are shipping ores and bullion. The mineralized part of the state is being actively prospected by natives as well as foreigners and a large number of new denouncements were filed during July. Shipping facilities have been improved throughout the state and it is expected that work will be resumed this month on the Southern Pacific line from Nogales to Guadalajara. The new government is exceedingly anxious to have the road completed both as an economic and as a military measure.

Michoacán

Mining Dead and Transportation Paralyzed

Michoacán may be considered dead in the mining calendar. The transportation facilities have been completely paralyzed and no immediate effort is being made to improve the situation. There are still numerous small groups of bandits in the mountains with the result that no attempt is being made to revive work at any of the mines, except a few scattered properties near the Pacific coast and the Balsas River.

Aguascalientes

The A. S. & R. is operating only one or two copper furnaces and no lead furnaces. The recent strike resulted in an average increase of forty per cent in wages at the smelter and a reduction in the force. The company still refuses to recognize the unions, an attitude which is sustained by most of the large mining concerns of the country as well as the iron and steel foundries, oil operators and manufacturers in general.

There is some slight activity in locating new properties in the state, one recent location being a tin prospect.

Mexico

El Oro—All four of the principal mining companies in this district, namely, Dos Estrellas, El Oro Mining & Ry. Co., Esperanza Mining Co., and Mexico Mines of El Oro, Ltd., are practically in full operation.

CHINA

Rich silver mines are reported to have been discovered in China in the Province of Kirin, between Tienpaoshan and the River Tumen. The construction of a light railway for the conveyance of the ores is proposed.

CHOSEN

Unsan — Water shortage caused by lack of rain continues to cause curtailment of operations. All mills and equipment on the concessions were driven by steam power in June. Wood is also scarce. The mine air is bad owing to lack of power for proper ventilation. The June cleanup of about $80,000 was purposely low, as low-grade ore was treated, because the recovery always falls off in summer.

NEVADA

Rochester Combined Property Ordered Sold

Rochester—All the real and personal property of the Rochester Combined Mines Co., including a 350-ton mill that never treated a pound of ore, were advertised for sale on Aug. 7 to satisfy a judgment for $200,000 secured by William Adams and Nelson L. Bruck, trustees for creditors. At one time it was intended to take the Combined into the consolidation known as the Rochester Silver Corporation, but the deal was not consummated.

Divide—In the Tonopah Divide mine development on the 1st, 3rd and 5th levels, together with shaft sinking, totaled 120 ft. The shaft is now 915 ft. deep and it is intended to sink to 1,000 ft. On the 1st, or 165, level drifting on the new ore showing continues to prove ore of milling grade. On the 5th level the southeast drift was extended 35 ft. with ore of good grade showing across a width of 3 ft.

UTAH

Tintic Standard Using Scraper for Underground Loading—Judge M. & S. To Have New Office

Eureka—Ore shipments from the Tintic district for the week ended July 30 amounted to 146 cars.

The Tintic Standard is reported to be using a scraper similar to a road scraper on one of its levels for loading ore, and in this way meeting the present shortage of muckers. A small hoist has been installed and connected with the scraper by a steel cable, which both loads the scraper and hauls it up an inclined slide to the cars. Two men are required at the scraper, two loads from which are sufficient to fill one mine car. Space is, of course, necessary for this method of handling ore. In the present instance the stope is in dry siliceous silver ore on the 1,100 level. It is opened about 100 ft. west of the No. 2 shaft and has been found, as far as development has gone, to be 40 to 50 ft. wide, with ore continuing in all directions. Vertically the ore has been proved to continue to the 1,400 level. July shipments from the property are expected to amount to about 100 cars.

Park City—The Judge Mining & Smelting Co. is planning the construction of a new and modern office building to take the place of the one at present in use in Empire Canyon.

MONTANA

Neihart—Directors of Cascade Silver Mines have voted a note issue of $100,000, to bear 8 per cent and to be offered to stockholders at par. The issue is made to take care of merchandise accounts, it is explained, so that the company will not be forced to operate its mines until the I. W. W. strike, started June 1, is broken. The mines speedily can be reopened, it is stated, and the ore in sight will average $20 per ton.

CALIFORNIA

Unwatering Argonaut Rapidly—Deeper Development Planned at Kate Hardy —Juniper Still in High Grade

Jackson—New pumps have been added to the powerful plant of the Argonaut and dewatering is proceeding rapidly. It is thought that the use of compressed air caused the freezing of sections of the pumps, but this condition has now been almost eliminated.

Forest — Sinking of a double-compartment shaft from the main tunnel of the Kate Hardy mine is proceeding rapidly, the shaft following a rich ore shoot. It is planned to sink several hundred feet and to drift on the vein at several points. The property is well equipped, and the work now planned will be the first deep work ever done at the mine.

Susanville—The Juniper mine continues to show high-grade ore. The vein is said to be comparable with the bonanza ledge worked in the Juniper by the pioneers.

Bishop Creek—With $80,000 available for re-modeling its mill, the Wilshire Bishop Creek company has torn out all the old flotation machines and has installed two rougher and one cleaner machines. It is expected to have the mill handling 150 tons daily by Sept. 1.

ARIZONA

Sinking of Junction Shaft at Bisbee Started

Bisbee—Actual work of sinking the Junction shaft has been started. All preliminary work has been completed and the hoist placed on the 1,800 level. The shaft will be sunk from this level to the 2,300 level. The new ventilating shaft near the Briggs shaft had 300 ft. more to go on Aug. 1. It is expected that the shaft will be completed before the last of next month.

During July the Boras Leasing Co. shipper 1,250 tons of copper ore to the Copper Queen smelter at Douglas. The grade of the ore is about 8 per cent copper. In July the company paid its second monthly dividend of 10c. per share. The shaft has been completed to the 600 level and connection made with the stopes on this level.

The Night Hawk Leasing Co. during July shipped 15 cars of ore. Development continues on the 750 level.

Tombstone—Dr. H. H. Hugart and associates have opened the old Winters mine on the south edge of the town and have a car of good silver ore ready to ship. There is said to be considerable ore worth milling and construction of a mill is planned.

Jerome—At the U. V. Extension the 1,600 level crosscut recently cut 5 per cent copper ore. Ore has not yet been reached by development on the 1,700 level. Development on the 1,500 level has proved the ore to run 5.9 per cent copper and to have an area about two-thirds of that on the 1,400 level.

Chloride—The Dardanelles Mining Co. has installed its new pump and is pushing the sinking of the shaft to the 200 level.

NEW MEXICO

Peerless Mine Unwatered by Walnut Creek Co.

Lordsburg—Ore shipments from this district for August consisted of 95 carloads of an approximate value of $73,000.

The Co-operative Mining Co. received $2,500.41 for 37 tons of silver ore recently shipped to the El Paso smelter.

Silver City—The Walnut Creek Mining Co. has succeeded in unwatering the old Peerless mine that has not been worked for 40 years. Exploration work will begin at once. Jack Stark is superintendent.

Some very high grade silver ore has been struck in the old workings of the Telegraph mine, now being explored by W. P. Dorsey, son of the original locator.

Separ—A. J. Stockbridge has completed the erection of a Gibson pony mill at the Young Bounds ranch. This is intended to handle the free milling gold ores from the Rocky Trail property, a mile and a half east. Should this test apparatus prove satisfactory larger equipment will be installed.

MICHIGAN

Marquette Range

Shipping Graphite from Taylor Dump at L'Anse—Season Good in Cascade District

L'Anse—A shipment of 500 tons of graphite ore has been made from the Taylor mine dump to the Detroit Graphite Co.'s factory. It will be used in paint manufacture. Other shipments are to follow. The mine has been idle for years, but considerable graphite was left in stock at the property.

Palmer—Development work only is under way at the Isabella. Only ore taken out in drifting and raising is being hoisted. The results have been satisfactory. The Maitland, Richmond and Empire continue to be steady shippers. The Maitland will have the best record in its history. There seems to be a good market for low-grade siliceous ores of the Cascade district this season.

Menominee Range

Youngs Mine Now Shipping—Riverton Shaft Almost Completed

Stambaugh—The new Riverton shaft is now down 1,200 ft. with 50 ft. to go. The underground pump station is in commission. A laboratory and engine house are under construction.

Iron River—Shipments have started from the Youngs mine, recently purchased by the Florence Iron Mining Co. from the Youngs Mining Co. No time was lost in getting ready for mining after the deal was closed and shipments are averaging 150 tons daily. Considerable new machinery, including a new electric compressor, has been installed. Eventually, all of the mine machinery will be driven electrically. The power line is to be extended from the Fogarty to the Youngs.

MINNESOTA

Vermilion Range

Vermilion—Pickands, Mather & Co., one of the largest independent operators on the Mesabi Range, has organized the Vermilion Mining Co. and taken over the lease of the Zenith mine at Ely, Minn., one of the finest properties on the Vermilion Range. The Zenith was operated by the Oliver Iron Mining Co. from its opening until 1919, at which time the lease expired and the property reverted to its owners, T. F. Cole, R. B. Whiteside and associates, who have operated it themselves for the past year through the Zenith Iron Mining Co. The mine has shipped 5,620,000 tons and is credited on the Minnesota Tax Commission's records with a reserve of 2,100,000 tons. Kenneth Duncan, superintendent of the mine under the Zenith Iron Co., will remain in charge for the Vermilion Mining Co.

JOPLIN-MIAMI DISTRICT

Missouri-Kansas-Oklahoma

Iowa Mining Co. Erecting Mill—New Baker-Howell Concentrator Planned

Baxter Springs, Kan. — The Iowa Mining Co. is erecting a concentrator on a 40-acre lease on Gilmore land, two miles south of Baxter. In part the plant is being made over from the Oak Orchard Custom mill, until recently located north of Joplin. Gas engines will be used to furnish power, and the capacity will be about 150 tons per shift. The plant is to be ready about Sept. 15. Mining will be carried on at a depth of 145-ft., where several drifts have been run. About 800 tons of ore is on the dump. A. F. Place, of Leon, Ia., is president, and Fred R. Hobart, of Joplin, secretary and manager. Development has been under way for two years, there having been much water to handle until pumping by the Chanute Spelter Co., about two miles northwest, reduced it to about 400 gal. per min.

The Baker-Howell Co. is preparing to erect a concentrator at its property just across the state line in Oklahoma, two miles southwest of Baxter. The mine has been operated for some time as a hand jig plant, but recent development work is thought to warrant the erection of a mill.

Quapaw, Okla.—The West Virginia Mining Co. has resumed operations.

THE MARKET REPORT

Daily Prices of Metals in New York

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
5	18.35@18.60	45.00	49.25@49.50	8.65	8.25@9.00	7.55@7.65
6	18.35@18.60	44.75	49.50@49.75	8.65	8.25@9.00	7.60@7.70
7	18.35@18.75	44.75	49.00@49.50	8.65	8.25@9.00	7.65@7.75
9	18.35@18.75	44.50	48.50@49.00	8.65	8.25@9.00	7.70@7.80
10	18.35@18.75	44.00	48.00@48.25	8.65	8.25@9.00	7.75
11	18.35@18.75	43.75	47.75@48.00	8.65	8.25@9.00	7.75

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
5	94	96	111	283½	289	37½	37¾	42½	44
6	94½	96¾	111	283½	288	37¼	37¼	42¼	43¾
7	. . .	....	.	....	....	...	..	...	
9	93¾	95¾	111	279½	285½	36¾	36¾	42½	43¾
10	93½	95½	111	279½	286½	36½	36¾	42¼	43¾
11	93½	95½	112	276½	283½	36½	36½	42¼	43¾

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver			Aug	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
5	358½	99⅓	94½	58¼	9	361½	99¼	96	59⅝
6	362	99½	95½	59⅜	10	361½	99¼	95½	59⅜
7	366	99½	95	59⅝	11	364½	99¼	94⅝	58¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Aug. 11, 1920

Continued inactivity characterized the metal markets during the last week, tin and zinc being particularly neglected. Sales of copper picked up somewhat, and lead remains firm and scarce.

Copper

Fair buying but no concerted activity have marked the week. Domestic consumption continues good, and is probably about twice what it was before the war. United States production is slightly more than the pre-war figure. The stocks of metal, which may be around 400,000,000 lb., and the difficulty which European nations have in buying our copper, prevent the price from rising to a figure which would give a reasonable profit to producers.

Some of the smaller traders are trying to ease the increased freight rates on to consumers by quoting f.o.b. refinery, whereas, before, they quoted the same price delivered.

Spot and August delivery could be obtained during the week at 18½@18⅜c., f.o.b. refinery, September at 18¼@18.60c.; and later deliveries, nominal at 18½@18¾c.

Lead

Large consumers, particularly white-lead, storage-battery, and cable manufacturers, are very actively in the market for September lead, of which there is a pronounced scarcity. Production is not as great as producers would like, owing to the fact that labor is going into pleasanter and more remunerative work for the summer months, with the full knowledge that the mens' old jobs will be open to them in the fall. Mexican lead is coming into this country better, but a car shortage exists in that country the same as here. Lead is also coming in from England, that which has so far been imported being largely American brands. Consumers are not so anxious to take a chance on foreign metal, of which they know nothing, which probably accounts for the fact that more business has not been done. English lead has been freely offered at 7c. per lb., c.i.f., by dealers, including tin brokers who have been attracted by the lead market. This is equivalent to about 8.60c., duty-paid, New York. Lots up to 1,000 tons for August or September shipment can be obtained at this price. The quantity of the English supply is problematical. Duty-paid spot lead is obtainable at 9c. per lb.

We quote both New York and St. Louis spot lead for the week at 8.90@9c.; September at 8.75@9c., and October 8.75c. Our prices for average sales take into account the A. S. & R. price, which remains unchanged at 8.50c. New York and 8.25c. St. Louis.

Zinc

Demand continues very poor. Large producers prefer to accumulate metal rather than sell at present prices. Stocks in general are low, and consumers are probably not supplied with more than one month's production. With limited production and increased freight rates, the leading producers expect zinc to sell at 8c. in the near future. The prices which we quote are for August and September delivery. No demand exists for later deliveries.

Tin

Tin continues woefully dull, though the demand for electrolytic picked up slightly during the week, with sales at 46⅜@47⅜c. There has been 700 tons of Chinese tin on the market, which second-hands are trying to unload at 44@45c. This is equivalent to the best brands of so-called 99 per cent tin. The poorer brands of 99 per cent cannot be sold even at 43@44c.

Straits tin for future delivery: Aug. 5th, 49.25@49.50c.; 6th, 49.50@49.75c.; 7th, 49.00@49.50c.; 9th, 48.50@49.00c.; 10th, 48.00@48.25c.; 11th, 48@48¼c.

Arrivals of tin in long tons: Aug. 3d, Singapore, 100; 4th, China, 25; 5th, China, 475; London, 50; 6th, London, 25; 9th, Singapore, 35; London, 150.

Silver

The London market has been erratic for the last week, with prices ranging between 58¾ and 59⅝d., due to the fluctuations in sterling exchange, and also to buying or selling orders on a narrow market with limited supplies. The demand for the Indian bazaars continues good, with an upward tendency. China exchanges continue below the New York parity. The New York market has ruled firm on moderate demand and limited offerings.

Mexican Dollars—Aug. 5th, 71⅞; 6th, 72⅝; 7th, 72⅝; 9th, 73⅜; 10th, 72⅝; 11th, 71⅞.

Gold

Gold in London on Aug. 5th, 114s.; 6th, 114s. 3d.; 9th, 113s. 3d.; 10th, 113s. 8d.; 11th, 113s. A license is now required for the exportation of gold from Canada.

Foreign Exchange

Heavy offerings of grain and cotton bills in a market made panicky by the Russian-Polish war news have accounted for the recent upsets in the foreign-exchange market. Yesterday, francs were 7.21c., lire, 5.03c. and marks 2.14c. Argentine exchange declined to 86.5c. and Brazilian rios to 20.9c. New York funds in Montreal, 12⅛ per cent premium.

Other Metals

Aluminum—Ingot, 33c. per lb., with 32c. open market for 98@99 per cent virgin.

Antimony—Market continues weak. Spot, 7½c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7½c. W. C. C. brand, 7@7¼c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—In sympathy with platinum jumped from $80 to $100 per oz.

Platinum — Firm at $100@$105 per oz. $95 per oz. in 100 oz. lots.

Quicksilver — Market steady; $85@$88 per 75-lb. flask. San Francisco wires $85. Weak.

Ruthenium—$200@$220 per troy oz.

[1]Selenium, black, powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Other ports show gain in shipments. Shipments of Lake Superior iron ore were 9,638,606 tons during July, according to *Iron Trade Review*.

Manganese Ore — 70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum—85 per cent MoS_2, 75@85c. per lb. of contained sulphide, New York.

[1]Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 5c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo. Aug. 7—Zinc blende, per ton, high, $51.15; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50@$46; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $44.85; calamine, $38.16; all zinc ores, $44.71.

Lead, high, $102.90; basis 80 per cent lead, $100; average settling price, all grades of lead, $99.81 per ton.

Shipments for the week: Blende, 8,178; calamine, 169; lead, 1,267 tons. Value, all ores the week, $499,700.

A considerable tonnage was reported purchased on $46 basis by one purchasing agency, but others report $47.50 basis, Prime Western grades.

The purchase of the week was 9,600 tons and the shipment of zinc 8,400 tons.

Platteville, Wis., Aug. 7—Blende, basis 60 per cent zinc, $49.25 per ton base for high-grade. Lead ore, basis 80 per cent lead, $100 per ton. Shipments for the week: Blende, 1,295; lead, 101; sulphur ore, 35 tons. Shipments for the year: Blende, 43,073; calamine, 2,300; lead, 3,781; sulphur ore, 1,177 tons. Shipped during the week to separating plants, 2,263 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $25@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground.

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $7.50@$8 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30, car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, prompt delivery, $200@$225 freight allowed; last half, $200@$220; English, $195@$200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75@$80, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$8.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22½@23c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$90@$100 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $50@$55 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $45@$50. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$100@$110 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—9-in. per 1,000, $51@$55, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 10, 1920

Shipping conditions in the iron and steel industry continue to improve in general, although slowly. Some railroads are performing much better than others. There is particular difficulty in the movement of billets and sheet bars, resulting in idleness of finishing plants.

The railroad rate settlement is expected to have a favorable influence upon industry in general, but the steel industry expects no large orders in the near future. It is more anxious to see improved shipping conditions than to receive railroad orders, as the industry's other customers would buy more steel if they had better transportation.

Pig Iron—Basic is quotable up 50c. as a result of recent sales. We quote: Bessemer, $47; basic, $46.50; foundry, $46, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40, to advance about 40 per cent August 26. Pig-iron consumers are interested only in early deliveries, and furnaces, being well sold up, are making no effort to sell for late deliveries.

Steel — Several purchases of sheet bars have been made, at not over $70 in any case. A fortnight ago $75 was being paid. Several mills are anxious to sell billets and sheet bars if they can be shipped. We quote billets at $60@$65 and sheet bars at $68@$70.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

A Review of the Japanese Lead and Zinc Market

A Statistical Summary of the Activity in Japanese Mines and the Movements of These Metals During the War

PRODUCERS and smelters were encouraged by high prices during the war, according to Vice-Consul H. T. Goodier, by the hope that strikes and political conditions in the United States, Spain, Australia, and Mexico, the principal lead-producing countries of the world, would create a world-wide shortage. However, this hope does not seem to have fully materialized, and the lead market has become quiet as a consequence. Paint manufacturers, having lost a considerable share of their trade with Singapore, the East Indies, and India, as a result of renewed competition from Europe, are buying lead only for actual needs. This, together with increased cost of materials for smelting, and higher wages, has caused a considerable reduction in output as compared with 1917. If the 1919 figures were available they would undoubtedly show a still more noticeable decrease in amount and value, many of the companies being in greater financial difficulties than in 1918.

The quantity and value of the annual production of lead in Japan from 1913 to 1918 is given as follows:

Year	Pounds	Value	Year	Pounds	Value
1913	8,393,138	$308,006	1916	25,268,685	$1,872,332
1914	10,138,205	412,400	1917	35,127,077	2,822,018
1915	10,567,457	486,729	1918	23,742,236	2,070,266

Prices for lead (Australian) reached their highest in September, 1918, when 1 picul was worth $15.52 in Yokohama. The lowest was $5.85 per picul, in June, 1914. In March, 1920, the price was $13.21. The cost of production of refined lead is estimated at about $8 per picul at the smelters.

Imports of lead and lead ore into Japan from 1915 to 1919, largely from Australia (for lead ingots and slabs), are stated as follows:

Years	Lead Ore Pounds	Lead Ore Value	Lead Ingots and Slabs Pounds	Lead Ingots and Slabs Value	Other Pounds	Other Value
1915	(a)	(a)	32,279,973	$1,450,656	2,872,805	$175,860
1916	(a)	(a)	46,230,232	3,720,089	3,460,964	278,704
1917	50,520,532	$1,253,759	35,024,068	2,926,798	1,567,652	144,154
1918	7,989,466	191,130	120,283,002	7,351,379	1,447,808	153,538
1919	330,667	8,007	79,607,814	5,432,046	(b)	(b)

(a) Not known. (b) Statistics not yet available.

In 1915 Australia sold to Japan 24,599,868 lb. of lead ingots and slabs, valued at $1,102,933. The same year the United States sold to Japan 5,790,156 lb., valued at $248,307. In 1919, while imports of lead slabs and ingots from Australia had increased to only 32,366,341 lb., valued at $2,551,042, imports from the United States jumped to 27,239,280 lb., valued at $1,604,866.

In 1914 Japanese consumption of lead was estimated at 43,753,000 lb., a great share of which was imported from Australia. In 1918 the estimated consumption had reached 144,025,000 lb.

Only since 1913 has Japan engaged in zinc smelting. Prior to that time zinc ore was shipped abroad and the refined product then imported. The estimated consumption of zinc in Japan increased from 25,512,000 lb. in 1914 to 60,761,000 lb. in 1918. Consumption has, however, materially decreased since 1918.

The following table shows that the production of zinc has been steadily declining since 1913, but that the output of refined zinc increased until 1918, in which year it decreased.

Years	Zinc Ore Metric Tons	Zinc Ore Value	Refined Zinc Pounds	Refined Zinc Value
1913	34,676	$472,303	(a)	(a)
1914	14,138	140,752	13,140,265	$682,454
1915	6,121	179,845	46,958,601	6,456,866
1916	2,187	91,257	86,652,236	13,567,052
1917	163	13,576	121,596,436	13,462,153
1918	(a)	(a)	88,701,073	8,838,867

(a) Production not stated.

When the war broke out, zinc experienced a boom in Japan, due to heavy demands from Great Britain and Russia. Prices went up, and many new companies, both mining and smelting, were formed. Though there was a marked disparity between costs and selling prices, these companies all made good profits. However, with the beginning of summer, 1916, prices started to go down. With decreased foreign demands, and increased cost of production and transportation charges, many companies have had to either temporarily suspend operations or considerably restrict their activities, the latter course being taken by even several of the middle-sized companies. Much of this financial trouble noticeable among the smaller zinc operators is probably due to pyramiding subscribed capital on the basis of abnormal profits and excessive dividends.

The estimated cost of production of refined zinc at the smelters is about $11 per picul, or 8¼c. per lb. Prices of 98 per cent pure zinc per picul ranged from $6.41 in June, 1914, to $27.40 in December, 1915. Since then prices have hovered around $12 as an average. In March, 1920, the price per picul was $13.96. The margin of profit, considering transportation charges, is thus proportionately low at present.

The imports into Japan of zinc ore, of ingots, slabs, and grains, of sheets, and of waste during the past five years were as follows:

Year	Ore Pounds	Ore Value	Ingots, Slabs and Grains Pounds	Ingots, Slabs and Grains Value	Sheets Pounds	Sheets Value	Waste Pounds	Waste Value
1915	(a)	(a)	6,487,784	$637,056	1,210,100	$157,277	11,125,057	$769,465
1916	(a)	(a)	7,218,985	980,277	1,203,998	228,577	4,401,937	427,889
1917	207,450,533	$3,899,905	10,015,693	879,392	2,694,150	595,171	1,633,445	110,124
1918	133,093,068	2,433,883	5,443,656	681,263	2,981,136	759,511	1,622,656	122,903
1919	61,845,733	1,122,932	12,629,181	1,463,480	3,276,672	555,480	722,444	36,661

(a) Not known.

During 1917 and 1918 a great deal of zinc ore was imported for smelting, mostly from Australia. However, since 1918 imports of zinc ore have decreased considerably, owing to a smaller foreign demand for the refined article, thus causing many smaller smelters in Japan to suspend operations.

Although no definite statistics in support thereof can be presented, indications are that foreign refined zinc and zinc manufactures, principally sheets from the United States, will once again find a growing market in Japan, owing to transshipping and speculative activities in connection with the increased demand for plating in China.

The exports of zinc ore have shown a steady decline since 1915, when they amounted to 13,618,250 lb. On the other hand, exports of zinc ingots and slabs increased until 1917, since when they have shown a noticeable decrease. Japanese exports of zinc ore and of ingots and slabs from 1915 to 1919 are given as follows:

Year	Zinc Ore Pounds	Zinc Ore Value	Zinc Ingots and Slabs Pounds	Zinc Ingots and Slabs Value
1915	13,618,260	$179,846	(a)	(a)
1916	4,865,332	91,258	51,586,452	$9,596,461
1917	362,400	13,576	81,853,012	10,442,511
1918	11,332	234	37,739,584	4,519,766
1919	(a)	(a)	12,629,180	1,463,480

(a) Statistics not available

The principal countries of destination for the exports of zinc ingots and slabs during the last three years were as follows:

Countries	1917 Pounds	1917 Value	1918 Pounds	1918 Value	1919 Pounds	1919 Value
Asiatic Russia	16,370,736	$1,943,703				
British India			7,851,343	$931,442		
China					2,912,616	$296,935
France	13,277,885	1,777,815	15,802,908	1,753,365		
Great Britain	42,452,701	5,472,124	9,330,916	1,166,264	8,586,588	1,048,423
Kwangtung Province					357,452	30,946

In Japan, the principal uses of lead are in the manufacture of paint, cables, and piping and in producing acetic acid. The principal uses of zinc are for galvanizing and paint manufacture.

Both primitive and modern mining methods are used.

MINING STOCKS

Week Ended August 7, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	½	½	½	
Ahmeek	Boston	58	56	57½	June '20, Q .50
Alaska-B.C.	N. Y. Curb	1/16	1/16	1/16	
Allouez	Boston	23	23	23	Mar. '19, 1 00
Anaconda	N. Y.	54½	50	50½	Feb. '20, Q 1 00
Ariz. Com'l	Boston	10	9½	9½	Oct. '18, .50
Big Ledge	N. Y. Curb	½	½	7/16	
Bingham Mines	Boston	8¼	8¼	8¼	Sept. '19, Q .25
Calumet & Ariz.	Boston	57	51½	52½	June '20, Q 1 00
Calumet & Hecla	Boston	300	290	290	June '20, Q 5.00
Canada Copper	N. Y. Curb	5/16	5/16	5/16	
Centennial	Boston			11½	Dec. '18, SA 1 00
Cerro de Pasco	N. Y.	41½	36	36½	June '20, Q 1.00
Chief Consol.	Boston Curb	3½	3½	3½	Feb. '20, Q .10
Chile Cop.	N. Y.	15	13	13½	
Chino	N. Y.	29½	25½	26⅜	June '20, Q .37½
Columbus Rexall	Salt Lake	*37½	*34	*37½	
Con. Ariz	N. Y. Curb			1/16	Dec. '18, Q .05
Con. Copper M	N. Y. Curb			2⅞	
Copper Range	Boston	37½	35½	36¼	June '20, Q .50
Crystal Copper	Boston Curb	*27	*25	*25	
Davis-Daly	Boston	8½	7⅞	8	Mar. '20, Q .25
East Butte	Boston	11¼	9¼	10½	Dec. '19, A .50
First Nat'l	Boston Curb	*95	*90	*91	Feb. '19, SA .15
Franklin	Boston	*75	*50	*55	
Gadsden Copper	N. Y. Curb			*71	
Granby Consol	N. Y.	36	33	33	May '19, Q 1 25
Greene-Can	N. Y.	27	23	24½	Feb. '19, Q 1 50
Hancock	Boston	4	3½	4	
Houghton	Boston Curb			*60	
Howe Sound	N. Y. Curb	3½	3½	3½	July '20, Q .05
Inspiration Con	N. Y.	48½	45½	45½	July '20, Q 1.00
Iron Cap	Boston Curb	*9	*9	*9	Feb. '19, M .25
Isle Royale	Boston	29	28	28	Sept. '19, SA .50
Kennecott	N. Y.	25	22	23	June '20, Q .50
Keweenaw	Boston			1⅞	
Lake Copper	Boston	3	2½	3	
La Salle	Boston	2½	2¼	2¼	
Magma Chief	N. Y. Curb			*21	
Magma Copper	N. Y. Curb	27½	26	26	Jan. '19, Q .50
Majestic	Boston Curb	*16	*10	*12	
Mason Valley	N. Y. Curb			2⅜	
Mass. Con	Boston	3	3	3	Nov. '17, Q 1 00
Mayflower-O.C.	Boston	5½	4½	5	
Miami	N. Y.	20	18½	19	May '20, Q .50
Michigan	Boston			4	
Mohawk	Boston	62	59½	60	Feb. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	6	5⅝	5⅞	
Nevada Con	N. Y.	11⅞	11	11	June '20, Q .25
New Areadian	Boston			3	
New Baltic	Boston Curb			3	
New Cornelia	Boston	17½	16½	16½	May '20, .25
Nixon Nev.	N. Y. Curb			*9	
North Butte	Boston	15½	13½	14½	Oct. '18, Q .25
North Lake	Boston			*60	
Ohio Copper	N. Y. Curb			1/16	
Osceola	Boston	1½	1½	1¼	
Old Dominion	Boston	25	22	24	Dec. '18, Q 1 00
Osceola	Boston	37	36	36	June '20, Q .50
Phelps Dodge	Open Mar.	†195	†180		July '20, Q 2 50
Quincy	Boston	48	47	47	Mar. '20, Q 1.00
Ray Con	N. Y.	16¼	14	14½	June '20, Q .25
Ray Hercules	Boston Curb			*60	
St. Mary's M. L.	Boston	40	38	38	June '20, K 2.00
Seneca	Boston	15	13⅜	14½	
Shannon	Boston	1⅜	1⅛	1⅛	Nov. '17, Q .25
Shattuck Ariz	N. Y.	8¾	8¼	8½	Jan. '20, .25
South Lake	Boston			2	
South Utah	Boston			*15	
Superior	Boston	4¼	4	4	Apr. '17, 1.00
Superior & Boston	Boston	4	3⅜	3½	
Tenn. C. & C.	N. Y.	9¼	9	9¼	May '18, I 1 00
Tuolumne	Boston	*60	*55	*55	May '15, .10
United Verde Ex.	Boston Curb	31	29½	30	June '20, Q 1.50
Utah Con.	Boston	6½	6	6	Sept. '18, .25
Utah Copper	N. Y.	64½	60½	61¼	June '20, Q 1.50
Utah M. & T.	Boston	1½	1¼	1¼	Dec. '17, .30
Victoria	Boston	2	1½	1½	
Winona	Boston	*50	*50	*50	
Wolverine	Boston	14½	13½	13½	Jan. '20, Q .50
LEAD					
Hecla	N. Y. Curb	4½	4	4 1/16	June '20, QX .20
St. Joseph Lead	N. Y.	15¾	14½	15	June '20, QX .50
Stewart	Boston Curb			*16	Dec. '15, .05
Utah Apex	Boston	1⅞	1 1/16	1 1/16	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	12	11½	11½	May '17, 1 00
Am. Z. L. & S. pf.	N. Y.	45	44½	44½	May '20, Q 1.50
Butte C. & Z.	N. Y.	7⅛	6⅞	6⅞	July, '18, I .50
Butte & Superior	N. Y.	20	16½	17	Sept. '17, 1 25
Con. Interst. Cal.	N. Y.	11⅜	10⅛	10⅛	June '20, Q .50
New Jersey Z.	N. Y. Curb	186	183	183	May '20, SA 4 00
Success	N. Y. Curb	*5	*4	*4½	July '16, .03
Yellow Pine	Los Angeles	1		1 01	June '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	
Alaska Juneau	N. Y.	1⅛	1⅛	1⅛	
Carson Hill	N. Y. Curb	25½	23⅜	24½	
Cresson Consol. G	N. Y. Curb			1⅛	June '20, Q .10
Dome Ex.	Toronto	*20½	*26	*30	
Dome Mines	N. Y.	10⅛	9⅛	10	July '20, Q .25
Golden Cycle	Colo. Sprgs.	‡		*73	May '20, Q .02
Goldfield Con.	N. Y. Curb	*9	*8	*8	Dec. '19, .05
Hedley	Boston			4½	June '19, .10
Hollinger Con.	Toronto	5.55	5.50	5.50	June '20, BM 05
Homestake	N. Y.	52	52	52	Sept. '19, .50
Kirkland Lake	Toronto	*54	*50	*50	
Lake Shore	Toronto	1.14	1.14	1.14	Oct. '19, .02½
McIntyre-Porcupine	Toronto	1.87	1.85	1.85	May '20, K .05
Porcupine Crown	Toronto	*25	*25	*25	July '17, .03
Portland	Colo. Sprgs.	‡		*60	July '20, Q .01½
Reorgan. Booth	N. Y. Curb	*5⅛	*4½	*5	May '19, .05
Silver Pick	N. Y. Curb	*6⅛	*5	*5	
Teck Hughes	Toronto	*9	*9	*9	
Tom Reed	Los Angeles	1.02½	0.97	1.01	Dec. '19, .02
United Eastern	N. Y. Curb	2¼	2¼	2⅛	Apr. '20, Q .21
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q .01
West Dome	Toronto	*6½	*6½	*6½	
White Caps Min.	N. Y. Curb	*10	*8	*8	
Yukon Gold	Boston Curb			1	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*18	*15	*17	Apr. '20, M .03
Beaver Con.	Toronto	*44	*43	*43	May '20, K .03
Coniagas	Toronto		†2.50		May '20, Q .25
Crown Reserve	Toronto			*25	Jan. '17, .05
Kerr Lake	Boston	3⅛	3	3⅛	Sept. '19, 1 00
La Rose	Toronto	*33	*33	*33	Apr. '18, .02
McKinley-Dar.	N. Y. Curb	*52	*50	*50	July '20, Q .03
Mining Corp.	Toronto	1.85	1.85	1.85	June '20, Q .12½
Nipissing	N. Y. Curb	8⅛	8⅛	.8⅛	July '20, Q .25
Ontario Silver	N. Y.	6	5⅛	5⅛	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅛	1/16	1/16	Jan. '12, .10
Peterson Lake	Toronto			*12½	Jan. '17, .01½
Sil. King Ariz.	N. Y. Curb			*34	
Temiskaming	Toronto	*34	*34	*34	Jan. '20, K .04
Trethewey	Toronto	*27	*25½	*25½	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2	*1⅛	*1⅛	
Barnes-King	Butte	‡		1.11	May '20, Q .05
Bost. & Mont.	Boston			*63	
Cashboy	N. Y. Curb	*7⅛	*6⅛	*6⅛	
El Salvador	N. Y. Curb	2	1⅛	1⅛	
Jim Butler	N. Y. Curb	*14	*11⅛	*11⅛	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*5	*4	*4⅛	June '16, .05
Louisiana Con.	N. Y. Curb	⅛	⅛	⅛	
MacNamara M	N. Y. Curb	⅛	1/16	1/16	May '10, .02½
N.Y. Hood. Rosar	Open Mar.	†12½	†10		July '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	1	1⅛	
Tonopah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	July '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '19, SA .15
West End Con.	N. Y. Curb	1⅛	1	1⅛	Dec. '19, SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*19	*17	*19	July, '20, M .01
Consol. M. & S.	Montreal	25⅛	24½	25	July '20, Q .62½
Daly Mining	Salt Lake			2.60	July '20, Q .10
Daly-West	Boston	4⅛	4	4	July '20, Q .25
Eagle & Blue Bell	Boston Curb			2⅛	Apr. '20, Q .10
Electric Point	Spokane			30	May '20, SA .03
Fed. M. & S.	N. Y.	11	10	10	Jan. '09, 1 50
Fed. M. & S. pf.	N. Y.	34½	33½	33½	June, '20, Q 1 75
Florence Silver	Spokane			*45	Apr. '19, .01½
Iron Blossom	N. Y. Curb			⅛	Apr. '20, Q .02½
Judge M. & S.	Salt Lake			3.90	July '20, Q 12½
Marsh Mines	N. Y. Curb	*12	*10	*10	
Prince Consol.	N. Y. Curb	⅜	⅛	⅛	Nov. '17, .02½
Rambler-Cariboo	Spokane			*10	Feb. '19, .01
Rex Con.	N. Y. Curb	*7	*5½	*6	
South Hecla	Salt Lake	*96	*96	*96	Sept. '19, K 0.15
Stand. S. L.	N. Y. Curb	½	⅛	⅛	Oct. '17, .05
Tamarack-Custer	Spokane			2.42	Dec. '19, K .03
Tintic Standard	Salt Lake	3.42	3.35	3.40	June '20, Q 0.10
Wilbert	N. Y. Curb	*4½	*3	*4	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	17⅞	16½	17½	Mar. '19, .50
Internat'l Nick.pf.	N. Y.			81	May '20, Q 1.50
QUICKSILVER					
New Idria	Boston			5	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb	*10	*8	*8	
VANADIUM					
Vanadium Corp.	N. Y.	76½	64½	65	July '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	84	80	80	July '20, Q 1 50
Asbestos Corp. pf.	Montreal	94	94	94	July '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	57⅛	54⅛	54⅞	June '20, Q 1 00
Am. S. & R. pf.	N. Y.	88⅞	88⅛	88⅛	June '20, Q 1.75
Am. Sm. pf. A	N. Y.	73	73	73	July '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	55⅛	52	52	July '20, Q 1.50
U.S.S.R.& M. pf.	Boston	44	43	44	July '20, Q 87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly. S-A, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

INDUSTRIAL NEWS

S. E. Atkins Co., Alworth Building, Duluth, Minn., contract diamond and churn drilling, has just been organized to take over the drilling work of the Duluth Diamond Drilling Co., which is retiring from the contract drilling field.

Wilson Welder & Metals Co., Inc., formerly at 2 Rector St., New York City, has moved its general office to 253 Thirty-Sixth St., Bush Terminal, Brooklyn, N. Y. The offices of the Wilson Welding Repair Co. are now at 263 First St., Jersey City, N. J.

The Associated Petroleum Engineers, 120 Broadway, New York City, N. Y., resulted from a reorganization of The Associated Geological Engineers. It remains an association of experts. The principal difference from its predecessor is one of greater specialization in personnel and facilities for professional work in the petroleum field. The business of the organization is to furnish the services of oil geologists and petroleum engineers throughout the various domestic and foreign fields.

In the field work the more detailed and routine phases of the work are usually done by the less experienced men under the general supervision of the more experienced geological engineers. The result is economy to the clients, and increased reliability of the results by bringing to bear on a given piece of work at least two points of view.

The organization is also equipped to take charge of geological surveying, examinations, and reports on all classes of mineral deposits, metalliferous or non-metalliferous, in any part of the world. Such testing and chemical analyses are undertaken as are necessary to determine the quality or extent of any deposits investigated. Other classes of work undertaken are the examination or testing of foundations and dam sites and the supervision of borings for coal or other minerals. In fact, the same ground is covered as by any geological or mining engineering organization.

Thew Shovel Co., an Ohio corporation (F. A. Smythe, president), has acquired all the outstanding capital stock of the Thew Automatic Shovel Co., Lorain, Ohio, and the two companies have been consolidated. The former has assumed all the assets and business of the latter, together with the legal liabilities and obligations. The consolidation gives the Thew Shovel Company net assets of $2,000,000.

Reliance Weighing Machine Co., Mallers Building, Chicago, Ill., announces the purchase of the business of National Automatic Scale Co., makers of the Reliance automatic grain scale and other automatic recording continuous weighing machinery.

Suggestions to Sellers in China

Parades and Storytellers Best Ad Media

Two interesting suggestions to those introducing goods into China are made in *Commerce Reports* by Trade Commissioner J. W. Sanger and Consul Stuart J. Fuller of Tientsin. Mr. Sanger suggests that as the effectiveness of advertising in Chinese papers is somewhat nullified by the fact that their circulation is small when compared to the population, many of whom cannot afford to buy papers and could not read them if they did, the employment of itinerant storytellers and narrative parades should receive consideration, as these means have proved their effectiveness in some cases. This indicates a new field for ingenious advertisers.

Machine-Shop Trucks Keep the Fleet Moving

Slight Repairs Promptly Made Save Large Repairs Later, Avoid Long Halts and Hasten Deliveries

Moving repair shops, mounted on motor trucks, which were extensively used by the Government during the war to care for its large fleets of trucks at home and abroad, are destined to play an important part in facilitating the successful operation of the ever increasing fleets of trucks operated by large companies, contractors, and road builders throughout the country, according to C. J. Van Landeghem, transportation engineer of the Four Wheel Drive Auto Co., Clintonville, Wis. With the increasing use of fleets of trucks in various lines of business, the machine-

F. W. D. REPAIR TRUCK OPEN SHOWING COMPLETE EQUIPMENT FOR HANDLING ANY REPAIR JOB

F. W. D. REPAIR TRUCK PACKED AND CLOSED BY TURNING UP SIDE AND END PANELS

shop truck, as a flexible medium for keeping fleets of trucks in constant running order, at a minimum loss of time, will become as necessary and vital a factor for commercial use as it was during the war, is his prediction.

"The continuous operation of every truck is an important consideration with a fleet owner, and in this respect the machine-shop truck has proved itself a time and money saver through its ability to go direct to the crippled truck and put it in condition at a minimum of time" says Mr. Van Landeghem. "Mounted on the chassis is a complete equipment to handle any kind of repair job. A separate motor furnishes the power for operating the various machine tools. These embrace such mechanical apparatus as a drill press, screw-cutting lathe, electric grinder, blow torch, welding outfit, forge, and more than 1,000 other pieces of machinery and tools.

"Each tool and piece of machinery has its own place, insuring compactness when the end and side panels are up and the truck is in motion. A great number of these moving repair shops were furnished the United States Government by the Four Wheel Drive Auto Co. during the war. With the increasing tendency to operate fleets of trucks in various industries, the efficiency of the machine-shop truck will soon make it an important factor with every fleet owner."

New Colorado Zinc Oxide

By F. N. SPENCER

Due to increasing zinc oxide needs, South American and West Indian importers interested in the paint and rubber industries are informed that ores are are now being roasted in the Empire Zinc Co.'s new plant at Cañon City, Col., preparatory to actual production of the Palmerton, Pa., grade of zinc oxide. The concern is a subsidiary of the New Jersey Zinc Co. Construction work on its new furnaces at this point was started in February, but progress has since been rapid, despite serious obstacles, and full capacity production may be a fact by October.

Deister Plateau Patents Sustained

Diester Machine Co. announces that earlier this year the United States Court of Appeals at Chicago sustained its three main plateau patents. One of the main features of these PLAT-O concentrating table is the plateau covered by patents owned and controlled exclusively by the Deister Company. The plateau consists of the mineral-cleaning zone somewhat higher than the general stratifying or concentrating portion of the table, and these two surfaces are substantially parallel. Intervening the plateau and the concentrating portion of the deck there is a resistance plane or incline along a diagonal line. The ends of the riffles are slightly bevelled to conform to the slope of this resistance plane.

Oxweld Cuttings and Welding Aided Hibbing, Minn., Removal

An interesting feature of the partial removal of Hibbing, Minn., was the oxwelding of about 35,000 ft. of pipe for the new gas distributing system. This is an example of the new way in which gas-pipe lines are now installed, a continuous length of pipe being oxwelded and doing away entirely with the old threaded connections at the joints. The new process requires only the Oxweld cutting and welding blowpipes and the necessary supplies of oxygen and acetylene, which are conveniently conveyed to the work in Linde and Prest-o-Lite cylinders, the whole outfit being moved along with the work as it progresses. This is the first time that two-inch pipe has been welded in the Mesabi region. About 8,000 ft. of the new Hibbing gas piping is of this size, the rest being four-inch and eight-inch pipe. Oxwelding of pipe lines has been found satisfactory, both as to serviceability of the lines and economy of installation.

The new Hibbing will lose little by its change of foundations, and it will gain much in the way of general improvements.

Efficient Steam Power Plant Needs No Coal

The various sizes and shapes of Conneaut shovel blanks, handles, and complementary tools are now being put through their preliminary steps of shaping under the plant's own steam-generated electric power.

All the drainage from the heating systems, from the many drinking fountains that supply spring water to the men, and the condensation from the engine, goes through a filter and a heater and is used again in the boilers, making a continuous operation and in this way effecting a saving of considerable water.

By means of conveyors, shavings and waste wood are conveyed from the handle plant to the boilers and automatically fed to them. When the handle plant is running full capacity, no coal has to be bought. For emergency use, two tanks on top of the engine room, storing 180 tons of coal, feed by gravity to the chain grate stokers. This coal is elevated from the track to these bins by a conveyor. The ashes from the chain grate stokers are dropped into a pit back of the stokers and by a conveyor carried from there into an ash bin storage. One man can operate the entire plant. Only the conveyors, and other machines and gages, need to be watched.

Atlantic Smelting & Refining Works, Inc., announces the removal of their offices to room 1987-1989, Woolworth Building, New York City, ('phones Barclay 8872 and 8019). Their factory has been moved to Plum Point Lane and Doremus Ave., Newark, N. J., ('phones Market 6720 and 6721.)

TRADE CATALOGS

Armored Hose—The Sprague Electric Works, of 527 West 34th St., New York, in their illustrated pamphlet No. B-3567, list and describe the various parts of their flexible armored hose for industrial work. The highly flexible, yet steel-hard, spiral armor makes such hose both handy and durable for air or steam installations, and the perfected couplings and mending devices facilitate rapid set-up and take-down that will be appreciated by rock-drill men. The air-brake hose of this company is specially illustrated and described in Bulletin 44553.1 for June, 1920.

Still—The many commercial needs for clean pure water, whether for drinking, manufacturing, for storage batteries, or for the laboratory; and the economy today in recovering alcohol lost by water dilution. make the subject of water stills always important. The Barnstead Still & Sterilizer Co., Forest Hills, Boston, Mass., shows in its recent annual catalogue a line of proved appliances adapted to this great variety of needs. The publication aims to be exhaustive, and will be useful to anyone interested in these devices.

Ore-Handling Machinery—The Wellman-Seaver-Morgan Co. has recently issued Bulletin 41, together with several others dealing with the various types of machinery manufactured by the company. This bulletin, "Coal- and Ore-Handling Machinery," contains reproductions of photographs showing unloaders, traveling bridges with grab buckets, car dumpers, car haulages, transfer cars, boat loaders, bucket handling cranes, excavating buckets, and weighing larries. A short description of each, together with a sectional drawing, is included.

Belt Fasteners—Crescent Belt Fastener Co. has issued a new circular entitled "Modern Scientific Methods in Belt Joining." It contains practical belt-joining data for the practical man. This information is of permanent value to anyone interested in belt upkeep, and it is so designed that when opened up and tacked to a wall it presents on one page full information for joining the belt to insure its best service under all conditions of work. Copies of this illustrated circular, Form N. Y. 227, will be sent on request. Address Mining Engineering Service Department of Crescent Belt Fastener Co., 381 Fourth Ave., New York City.

Fuel Oil Burner—John Foerst & Sons, 80 West 22d St., Bayonne, N. J., have issued a catalog illustrating and describing the various types (conical and fan tail), of fuel oil burners which they manufacture. The catalogue also contains illustrations of the burners and their application to various equipment.

J. E. SPURR, Editor
G. J. YOUNG, Western Editor
D. E. A. CHARLTON, Managing Editor
A. H. HUBBELL, News Editor
E. H. ROBIE, Metallurgical Editor

Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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BENJAMIN L. MILLER
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Special Consulting Editors

Volume 110 New York, August 21, 1920 *Number* 8

Are We at War With Russia?

UNDER the above title we commented editorially on the Bolshevist menace in our issue of Jan. 24, 1920. In this editorial we observed:

Every now and then some Congressman gets up in the House and puts the above question, demanding that our engineers and their guards be withdrawn from Siberia. Similar protestations against the trade embargo against Russia are urged by various kindly and fatuous groups of lovers of all mankind.

We should be interested in psychological tests made on these Congressmen.

Very recently we hear less from these people—since the Russian-bred revolutionary plot in this country has been unearthed.

We *are* at war with Russia. Russia—a murderous outlaw—is making war on us, and winning—not here, but abroad.

Will we take as long to wake up as we did in the case of Germany? A firm and prompt policy now will save untold misery.

If there were anything in spiritualism, do you think all the powers of the air could keep Roosevelt from talking to us in this crisis?

We have been unable since then to note a statement of the relations of the United States to the Bolshevist government quite so bald and forcible till the letter of Frank H. Simonds on "The Polish Question," published by the McClure Syndicate on Aug. 12. Mr. Simonds (perhaps the clearest of analysts of current events) says: "The present hour is as critical for our civilization as that six years ago this month, when the German hosts, victorious in the battles of the frontiers in France and Belgium, rushed down toward the Marne. If it is not faced we shall lose the larger benefit of the Marne victory, and presently be forced to fight at a great disadvantage, *for fight we shall have to, in the end. Willy-nilly, we are again at war, the United States quite as much as France or Britain.*"

We are at war with Bolshevistic Russia: what are we doing? Ostrich-like, we have been hiding the fact from our vision for a year, until the smell of the powder is under our noses. The war is between the Western system of democracy and liberty, which it has taken our forefathers, since Magna Charta, seven hundred years to painfully attain, and the new and unprincipled despotism which drives forward the semi-barbarous Slavonic hordes of the East. The frontiers of American democracy and liberty lie east of Warsaw. During the Great War, it was remarked at times that our middle states showed less concern than our eastern states, as being secure from invasion; and we are suffering from precisely the same stupidity if we unintelligently watch unmoved the foe driving his frontiers nearer and nearer Washington.

The strange genius who rules in the White House, who has so often disappointed the American people, has unexpectedly sounded a true and firm note in his announcement of unchangeable hostility to the autocratic government of Russia (which has so long boldly declared its warfare on us), but friendship to the Russian people. The announcement is culpably late in coming, as was our announcement of our attitude in the Great War; but it is a sane one. Just such a conception and announcement in the case of Germany, and especially Austria, as we may recall, hastened immeasurably the débâcle of the Central Powers. It is especially heartening as against the sorry spectacle and plight of Britain, who, with the Russian tyrants' revolver at her head and traitors in her house, throws up her hands and grins a sickly friendship at an enemy that she knows has no honor. France, however, the indomitable, sounds the same true and sturdy note as America; and thus the two most advanced democracies of the world confront the latest hideous menace to their liberties.

The Shaft-Sinking Medal Of the Engineering and Mining Journal

IN OUR ISSUE of May 15 it was announced that *Engineering and Mining Journal* would present a gold medal to the crew breaking the world's shaft-sinking record, which at that time was stated to be 310 ft., this distance having been made in thirty-one days by the Crown Mines, Ltd., Johannesburg, South Africa, during July, 1919. In addition to the gold medal award, a silver medal is to be presented to each qualified member of the sinking crew. It was further announced that rules governing the award would be published at a later date.

Members of the committee who have been appointed to judge such records are as follows: George S. Rice, William Young Westervelt, and D. E. A. Charlton, these men having been designated by the Director of the Bureau of Mines, the Secretary of the American Mining Congress, and the Editor of the *Engineering and Mining Journal*, respectively.

It will be appreciated that any attempt to specify conditions as to cross-section area or shape of shaft, hardness of ground, number of men employed, or any other condition which would have bearing on the progress made in shaft sinking, would introduce complications in the judging of the contest, and such complications would undoubtedly prove to be a source of discussion and difference of opinion, to say nothing of probable dissatisfaction on the part of the contestants with the final decision of the judges. In the formulation of the rules the question of specifying weighted values to certain conditions and making the award on the greatest number of points seemed to have possibilities, but after due consideration it was deemed best to hold strictly to the first announcement in its simplest interpretation, i.e., that the medal be awarded to the crew breaking the record in footage within the time limit specified.

In order to obviate any ambiguity which may exist in view of the first announcement made, it was necessary to make a definite ruling with respect to the following consideration: Is the medal to be given to the crew sinking more than 310 ft. in thirty-one days, the distance being made (*a*) at any date; (*b*) only if subsequent to July, 1919 (the time when the present record, which according to our figures is correct, was made); or (*c*) only if subsequent to May 15 (the date of the announcement)?

After due consideration it has been decided that the date of the announcement marks the opening of the contest, and inasmuch as the record announced at that time remains unchallenged to the present date, it is presumed that this is correct. In making the award, therefore, the committee will be guided only by the following rules:

1. The footage shall have been made during a period commencing on or after May 15, 1920.

2. The footage made must involve operations in which the sinking process is carried on at the bottom of the shaft during the entire period. It is understood that this performance shall be accomplished by manual labor, with the assistance of power drills and such other mechanical appliances as are necessary.

3. Shafts must be those pertaining to, or sunk in conjunction with, metal mines, and the slope shall be steeper than 45 degrees.

4. The measurement shall include the distance sunk during any consecutive thirty-one-day period, and shall be measured with a steel tape from well-established bench marks.

5. The measurements shall be made and sworn to by three witnesses, preferably the mine superintendent, the foreman in actual charge of the sinking, and a reputable engineer.

6. Records coming within one foot of each other shall be considered a tie, in order to allow for inevitable discrepancies in measuring to the irregular bottom of a shaft in process of being sunk. Therefore the committee will not consider less than 312 ft. as a new record.

7. The award is to be made to the crew whose reported figures, exceeding the record as stated and conforming to the conditions above mentioned, are first received at the *Engineering and Mining Journal* office. Telegraphic report stating the shaft, company, distance sunk, and date will be accepted as reported at the time of the receipt by the *Engineering and Mining Journal* of such telegram, provided the rules are in due course complied with through the mails or otherwise.

The Increased Freight Rates A Benefit to Industry

BETWEEN 50 and 60 per cent of the total tonnage carried by the railroads of this country is said to be the product of our mineral industry. Mining interests should, therefore, be particularly concerned in the increased rates awarded to the railroads by the Interstate Commerce Commission. Briefly, freight rates in the so-called Western group of roads will be increased 35 per cent; on the Mountain-Pacific group, 25 per cent; on the Southern group, 25 per cent; and on the Eastern roads, 40 per cent. Passenger fares will be increased 20 per cent, and Pullman fares, 50 per cent. The present fare from New York to San Francisco, including sleeper, is $120; this will be increased to about $157.

Fair-minded persons know that the railroads deserve this increase. No industry has been more closely controlled by the Government than that of interstate commerce, a special commission for its regulation having been established over thirty years ago. The reluctance of the Interstate Commerce Commission to advance rates to accord with increased costs is well known. With general commodity and labor costs at least double the pre-war figures, freight and passenger rates have probably not averaged more than a 35 per cent advance.

We see no reason why the increases which have been granted should cause more than a temporary increase in the cost of living; in a few months they should have just the opposite effect. One reason why prices have kept up this year is that transportation conditions have been demoralized. With an increased income, suitable equipment can be provided, and delays, uncertainties, special expensive forms of transportation, carrying charges on goods in transit, and like expenses, should be materially reduced. Furthermore, the railroads have been subsidized to the extent of about $75,000,000 monthly by Government guarantees, which expire at the end of this month. This expense to the taxpayer will be eliminated, thereby partially offsetting the increased rates.

We have heard little criticism of the commission's ruling, and we believe that time will prove it just. When the cost of operation is materially reduced, as we hope will be the case in two or three years, the rates can be revised downward. This may be something which the next administration will seek to do, in order to have good campaign arguments four years hence.

The Progress of Ore Deposition Theory

ACTIONS and reactions, ebb and flow, upswings and downswings, are characteristic of many other things than the stock market. It is true of political life, of history, of our individual goings and comings. Even it is true of science. Geology—as, for example, the geology of ore deposits—first dealt in theories of abrupt action—things done with a bang.

To him who gets up in the morning and goes to bed at night, without using overmuch of observation and deduction, the most impressive thing, amid the scurry of animal life, and the rustling activity of plant life, is the immovability of the hills, the "eternal sameness" of the rocks. "Rock of Ages," sings the hymn. What more graphic symbol of unchange? When we note that the earth has been rent and torn, the primitive conclusion is that it is due to one of the catastrophes of nature—like violent storms, earthquakes, floods, hurricanes, lightning-bolts; or we imagine others of like character, of which we have no knowledge, and so conceive of as still more violent. The first geological essay is possibly in Genesis, where it is written that God created the earth in six days, and rested from His labors on the seventh.

In common conception, in fiction or travel writing, and in movie captions, we find that a canyon is commonly ascribed to "some tremendous convulsion of nature," and even a glacial moraine or a talus slope will be laid to the "sport of nature in prehistoric times."

Our early geologists followed this natural trend of thought. So also, in course of time, when geologists began to study ore deposits specially, did they ascribe similar catastrophic explanations to mineral deposits, especially to the phenomena of vulcanism.

With the growth of geologic knowledge, it became convincingly plain, little by little, that the processes which carve rocks like putty, which mix rocks like dough, are not by any means dead—that they are working today, but very, very slowly; so that the stupendous work accomplished must have gone on for an inconceivable length of time. It became clear that the rocks were not made in seven days, nor in seven thousand years, nor yet in seven million years: that erosion, uplift, and metamorphism are going on during the quietest days in June, when the rocks seem most eternal; and that the natural catastrophes, like volcanic outbursts, landslides, and tidal waves, so far from being the cause of all geologic phenomena, are only the slips and starts of an ordinarily well-oiled and effective machinery.

This discovery was applied to mineral veins. The finding out that waters in the soil and rocks were capable of dissolving and redeposition, and the proof of the efficacy of these processes, led naturally to the thought that all, or most, mineral deposits have been so formed. The formation of iron and manganese deposits in this way seemed fairly clear; and later there was demonstrated the formation of rich copper deposits out of very lean ones.

The uniformitarian theory, again, has spent its force. It went too far, as the early catastrophic theory did. Nature, it appears, in her rock work is not so much of a humdrum plodder as we thought. She has fits and starts, periods of quiescence and of relatively great activity. So in the last few decades the relation of many ore deposits to igneous rocks has been narrowly observed; next, their relation to certain phases of igneous activity. This study is furnishing an accumulating fund of more and more accurate knowledge.

Human thought on a subject like this is like a pendulum, which, on being released, swings first to one side and then to the other, far past the true direction of gravity, but tends finally to find the true position of the earth's center and to remain fixed in that discovery.

Experimenting on the Olfactory Nerves of Miners

THAT the use of volatile ill-smelling compounds is preferable to electric bells as a warning to miners of unsafe conditions such as mine fires we do not doubt. The Bureau of Mines has recently been testing the idea and has just issued a report on the subject. Electric bells cannot be heard far and are likely to get out of order. A telephone system is better, but has obvious drawbacks. Sometimes cutting off the compressed-air supply has been used as a warning, but this may bring miners to the surface when they are not wanted. Or, water may be put in the air line, and when the driller gets drenched he is supposed to give up his work and demand an explanation at the surface.

Some time ago the Butte & Superior company tried the experiment of introducing a little valeric acid into the intake of the air compressor. This is the substance we used while in the chemical laboratory at college when the devilish instinct got the better of our normal cultivated angelic character. As we remember it, the *iso* variety smells like the concentrated extract of the choicest old cheese; that is, choicest to the cheese hound. But other and more effective odors have been found by the Bureau, such as ethyl and butyl mercaptan, butyric acid, and amyl acetate. The mercaptans are organic sulphur compounds. We do not remember ever having been in the path of their fragrance, but the effect of sulphur on such inoffensive elements as hydrogen is well known and if butyric acid be used in the compound the effect can be imagined; or rather, it can't be. Butyric acid is what makes rancid butter rancid, to speak as kindly of it as possible. Amyl acetate has the odor of bananas and is pleasant to most people, and so is frowned upon by the Bureau, which says that a more disagreeable odor makes a more suitable warning.

However, the use of amyl acetate suggests to us another field for investigation. Why not surcharge the mine with pleasant odors and make working conditions there more bearable, thereby promoting the efficiency of the miners? The burning of incense near the compressor intake should be particularly efficacious in spurring Chinese miners to an honest day's work. To give European workers the proper enthusiasm, we suggest a spray of allyl sulphide, this being the business principle of garlic.

A possibility also exists of evading the Eighteenth Amendment, for we understand the law does not cover the inhaling of alcohol for commercial purposes. Think how a properly impregnated mine air would stimulate production! The only reward that we ask for this suggestion is that we be given a job as shift boss in the mine in which the experiments are made.

New York Buys Radium

THE recent purchase of two and one-quarter grams of radium by the State of New York for use in cancer research is noteworthy. All the radium produced should be reserved for this purpose until a more essential one is found, if that be conceivable. Such radium as has been recovered has not been put to the beneficent use in which it finds its most important application. Much of it, if not most of it, seems doomed to be wasted in the manufacture of luminous paint. Wasted it certainly is, for not only is such use non-essential, but the paint itself has a very short life.

The Federal Government could well improve on the step New York has taken by either purchasing the existing supply of this substance or, as we have suggested before, by placing the control of its distribution in the hands of some Federal agency, such as the Bureau of Mines, in the public interest.

Porcelain Coins—What Next?

GERMANY is using porcelain coins. After unloading upon the world large quantities of silver coins in an effort to sell the remaining vestige of tangible and maketable wealth, and contributing to the decline in the price of silver, Germany is compelled to resort to the use of "siliceous" coinage—our own classification for this type of currency. No doubt it will be easier to keep in circulation coins with negligible intrinsic value, such as copper and porcelain, than precious-metal pieces. The disappearance of silver from circulation has caused much confusion and trouble to European governments, but Germany has offered one solution.

However rife speculation may be regarding the effect of this step, we are reminded of an admonition which a waggish acquaintance was frequently wont to use as a parting shot on leaving us, and which is peculiarly appropriate for the present trend in the reorganization of some of the world's currency systems. We give it for what it is worth: "Don't take any wooden money."

WHAT OTHERS THINK

The Licensing of Engineers

Through ignorance of political engineering, and perhaps by not doing our utmost everywhere, we engineers failed to secure the nomination of our candidate for President, notwithstanding the great advantage that he was probably also the popular choice. The regular politicians would not permit it.

Unless signs fail we will soon be again lifting our voices in lamentation, this time over the passage of as many different laws relating to licensing engineers as there are states in the Union. A good start at the confusion has already been made by the passage of such laws in eleven states, mostly without the serious attention of the engineers concerned, and in some cases apparently without their knowledge.

We should be grateful for the fine work of the committee of Engineering Council on licensing engineers, but being grateful will not be enough. That particular "George" is not going to finish the job. We must do it ourselves by agreeing definitely on what we want and then going after it through our organizations.

In Los Angeles we have a joint committee of the local sections of seven national societies at work on the problem, and it is to be hoped that similar action is taking place generally and that agreement will be quickly reached on the fundamentals of a licensing law.

It seems to me that the draft of the committee of Engineering Council is the nearest approach to a law upon which we could unite, but that it has the defect of dodging a definition of the matter it proposes to regulate, that is, professional engineering.

Most proposals (and some of the laws passed) have undertaken to define the term "professional engineering" by specifying every possible activity relating to engineering of every kind, and prohibiting the practice of any of them without a license. This has come so near to a *reductio ad absurdum* that the difference is scarcely noticeable.

There is a simpler plan which I wish to urge, and upon which I think we can all unite and carry through. The simpler laws are, the better. Therefore it is suggested that a licensing law should be simply a prohibition against *advertising, claiming* or *representing* oneself to be a professional engineer of *any branch* without a license, rather than a prohibition against practicing.

In effect it is proposed to provide a means by which engineers can be licensed or registered if they want to call themselves engineers, which licensing or registration would be subject to conditions to be specified in the law (and which could well be identical with those in the Engineering Council draft), and would give licensed engineers just as much state endorsement as they are entitled to, and the public just as much protection as any law could do. The public will demand evidence of licensing as a condition of employment when it is known that such a law is in effect, and if it considers it as a protection.

This would eliminate the impossible feat of so defining the activities of an engineer as to permit other proper and necessary activities so closely bordering on and interwoven with engineering as to preclude the possibility of a sharp line of division. The licensed engineers would immediately become a "blue ribbon" class, outside of which no engineer of consequence could afford to be.

Such a law would be a preliminary skeleton, to which could afterward be added such further conditions as experience might show to be desirable.

Los Angeles, Cal. W. F. STAUNTON.

Engineering and Mining Journal Lead Quotations

As corroders of lead purchased chiefly on average price contracts based on *Engineering and Mining Journal* quotations of prices, we urge that you should continue your quotations.

Steadiness of supply of raw materials and minimum fluctuations in price afford the best conditions of production in any manufacturing business, and strongly tend toward stabilization of prices of the finished product. In the white-lead business an interval of some weeks frequently occurs between the asking of prices and the placing of orders to fill contracts for painting, during which it is desirable that prices should change very little, if at all, to prevent the evils of options or of price protection, with their consequent tendency toward speculation. Both the sellers and the buyers of white lead appreciate the benefit of the existing price policy of few changes, based on the long-swing movements of the price of pig lead, but recognize that this policy is feasible only in the absence of erratic, speculative changes in the price of pig lead.

We believe that your independent, unbiased estimate of prices is of high value in steadying the market.

Scranton, Pa. EUSTON PROCESS CO.,
Edwin Euston, President.

The Arkansas Miner

It is with considerable astonishment, not unmixed with awe, that I read the communication of George Allen, of Little Rock, Ark., captioned "Making Miners Out of Farmers," which appears in the *Engineering and Mining Journal* of July 24. My astonishment is about equally divided between the *Journal* and the Mr. Roderick mentioned—at the *Journal* for publishing such misinformation and the Mr. Roderick for his truly marvelous performance at such an advanced age. Mr. Roderick, having introduced underground mining to Arkansas, must be well over ninety years old.

I am not sure when the first mine was opened in the State of Arkansas, but in 1888 Dr. T. B. Comstock visited the Confederate shaft, and states on page five of the Annual Report of the Arkansas Geological Survey for 1888: "The history of exploration in this place (Confederate shaft), according to apparently authentic traditions, dates back more than forty years." Therefore, the Confederate shaft workings must be today

approximately seventy-two years old, and taking the child labor laws into consideration, Mr. Roderick was probably at least eighteen years old at the time he introduced underground mining at this place, which, for sake of argument, we will assume was the first underground mining in the state.

I can imagine the astonishment of our friends mining coal and zinc in the state to learn that their workings are all on the surface, in spite of the fact that they have sunk shafts to reach their deposits.

With regard to the Arkansas farmer—he is no different from the farmer of any other state. I have introduced many farmers to both underground and surface mining, and have found no greater proportion of Arkansans averse to underground mining than those of any other state.

I have no statistical information at hand, but it is probably true that the mining industry draws more extensively on the farming class than any other for its supply of miners.

The attention of the Carnegie Hero Committee should surely be drawn to this case. Because of Mr. Roderick's advanced age, he will probably not be with us much longer, and it might be well to give this tip to the directors of the Hall of Fame.

As to Mr. Allen, he seems to have made the common mistake of taking in too much territory.

Bauxite, Ark. JOHN T. FULLER.

Aids to Cyanide Plant Recoveries

A perusal of the interesting article "A Cyanide Plant Without Frills," by Leroy A. Palmer, in your issue of June 5, 1920, suggests that the low recovery of gold and of mercury may possibly be increased by agitation of the sand residues in a puddler on their way to the dump. If the use of the tube mill were continued a liner of the South African type would also probably recover much amalgam. Both these methods proved of service in South Africa. WEST COUNTRY MINER.

London, England.

Boosting the Gold Assay

The article "Stories From the Laboratory," by A. R. Ledoux, in *Engineering and Mining Journal* of July 24, reminds me of a story told by the late Prof. P. de P. Ricketts to his class in assaying at the Columbia School of Mines some thirty years ago.

A man came to him and in perfect honesty claimed that he had discovered a method of assaying for gold which gave higher returns than the usual method of fire assaying. His method was to add a definite weight of trichloride of gold, $AuCl_3$, to the charge, run the assay in the usual way, and, after weighing the parted gold, to deduct the gold added in the trichloride.

Tests made in Prof. Ricketts' laboratory showed that things worked out as the man had claimed, and the returns were higher than when no trichloride was added.

Then an investigation followed as to why. The trichloride used was suspected, so a fresh supply of c.p. trichloride was purchased and used, but still the returns were higher. Finally a definite weight of pure gold was dissolved in aqua regia and the whole amount of the resulting gold chloride was added to a charge, the assay run, and the weight of the gold used in making the chloride was deducted from the weight of the parted gold obtained. The corrected weight agreed exactly with a parallel fire assay made without the addition of chloride of gold, showing that the trichloride of gold, even the c.p. brand, contained more gold than its formula, $AuCl_3$, would indicate, due probably to the presence of lower chlorides. E. B. DURHAM.

Canonsburg, Pa.

Lead and Automobiles

In common with the production of gasoline, which is now at the point of limiting the manufacture of internal-combustion machinery, the production of lead must be considered. Gasoline and oil shortages are also the limiting factors in the design of a cheap machine for city transportation work.

To relieve congestion in cities, for the poor and other populations, so that one can easily enjoy life in the suburbs, with cheaper living conditions, some cheap invention is necessary, that will make the transportation of great populations inexpensive and practicable. In the *Popular Science Monthly* of July, 1920, occurs a description of a cheap automobile, employing electric drive, that is a step in the right direction.

This uses the storage battery, which can be easily recharged and stored, and is good for thirty miles under almost any condition of weather and service.

The battery is made mostly of lead. Edison's battery made of nickel and cobalt will do, but the first cost is treble that of lead, though with longer serviceability. Cobalt and nickel are rare in occurrence. Experts believe that lead will be the storage-battery metal for the future, for auto and isolated lighting sets. Already the consumption of lead for automobile work is alarming those who know intimately the facts of production. It begins to look as if street railways in cities are doomed to greatly curtailed operation under the competition of gasoline automobiles, and their outlet from present competitive conditions may lie through conversion to charging centers for the use of electric-current autos. Streets are due to be cleared of rails, cars, and other impediments and given up to the use of electric and other automobiles.

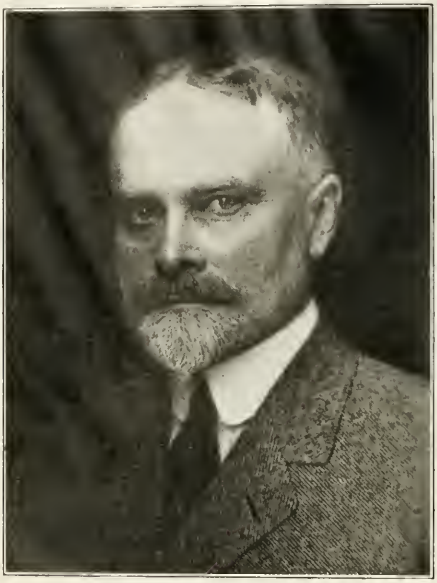
We know from study that lead production in the United States is in a bad way for the future. It could be easily and quickly overtaken by an inflated demand, due to an invention satisfying the popular need, which is precisely what the use of automobile and truck has done for the gasoline industry. The present prices of lead are indicative of the short supply, and the lack of fresh shippers for years, producing in sufficient volume to take the place of old dug-out mines, confirms the suspicion of shortage.

We have had a high tariff fence around lead, particularly in its raw form as ore, since the Windom Decision of 1882, inside of which we have depleted our supplies with great rapidity. The war pushed production to the point of exhaustion of every old dump, stope, and tailing pile, with no increase of new tonnage; coupling with this, the fact of an almost complete stoppage of development work.

We would be greatly embarrassed should a sudden popular demand occur in connection with the automobile industry, as lately befell the production of gasoline and oil GEORGE HUSTON.

Mullan, Idaho.

Arrangements Committee in Charge of the



M. M. DUNCAN

JOHN KNOX

O. C. DAVIDSON

WILLIAM KELLY

Lake Superior Meeting of the A. I. M. E.

COL. F. A. POPE

H. V. WINCHELL

[It is regretted that photographs of John E. Hodge and A. Tancig, committee members from Minneapolis, and Chisholm, Minn., did not reach us in time for publication.—EDITOR.]

THE STEAMER "TIONESTA," WHICH CARRIED VISITING A. I. M. E. MEMBERS TO THE LAKE SUPERIOR DISTRICTS

Estimates of Mesabi Range Orebodies

All Factors Which Influence the Determination of Mining Methods Are Given Consideration, Preliminary to the Development of Minnesota Open-Pit Mines—Cross-Section Method Of Estimation Permits Accurate Interpretation of Available Data

Written for *Engineering and Mining Journal*

THE initial exploration of the iron orebodies of the Mesabi Range, in Minnesota, is done with churn and diamond drills. Different systems of locating the drill holes are employed by the companies operating, depending somewhat on the part of the range to be explored and on other local conditions. A common system is to locate holes at intersections of north and south and east and west co-ordinates, spaced either 200 ft. or 300 ft. apart. Intermediate holes between these are drilled also, if necessary, to determine more accurately the outline and structure of the orebody.

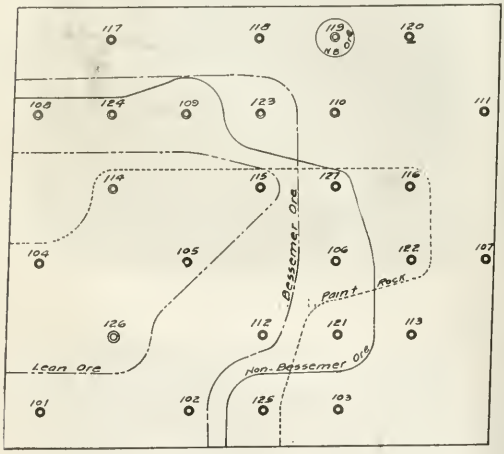


FIG. 1. MAP OF 40-ACRE TRACT, SHOWING OUTLINES OF ORE LAYERS

If the 300-ft. spacing is used, and all intersections are drilled, twenty-five holes will be required per forty-acre tract, which is the unit of property ownership. Forty-nine holes per forty-acre tract are required with the 200-ft. spacing system. Experience has proved that the latter spacing is not too close for most parts of the range.

After the explorations are completed, estimates of tonnage can be made preliminary to operating plans or estimates. Engineers in estimating ore reserves usually employ the method of average depths and the cross-section method. Inactive properties usually are estimated first by the method of average depths, and the cross-section method ordinarily is used in estimating mines which are being operated, or for which operating plans are being made.

Average-Depth Method in Ore Estimation

To use the average-depth method, the drill holes are platted on a map drawn to a scale of 100 to 200 ft. to the inch. On this map the area of the deposit is outlined by drawing a line inclosing all the drill holes containing ore. A frequent method used to locate such a line is as follows: Draw arcs on the outside of all outside ore holes, using the holes as centers, and connect the arcs of adjoining holes with straight lines tangent to the arcs. The radii of the arcs depend on the thickness of the ore in the holes. If the ore is 50 ft. or more thick, a 100-ft. radius is used; if between 25 ft. and 50 ft. thick, a 50-ft. radius, and if less than 25 ft. thick, a 25-ft. radius is used. This method is purely empirical but has proved fairly conservative, and is acceptable for ordinary reserve estimating purposes. However, if the ore samples from the drill holes are properly classified as to structural subdivisions, and if structural cross sections of the orebody are prepared, intermediate holes being drilled to determine the structure accurately if necessary, it is possible to determine the limits of the orebody between drill holes on the surface map and cross sections with a considerable degree of accuracy, much more accurately than by the use of the above-described empirical method.

Limits of Ore Analysis Differ With Various Companies

The most common classifications of Mesabi iron ores are the following:

1. Standard ores (most of which are of merchantable grade and can be shipped direct to docks).
2. Washable ores.
3. Lean, non-washable ores.

All ores analyzing above 49 or 50 per cent dry iron are classified as standard ores. Some companies use one limit, some the other. Standard ores are subdivided into bessemer and non-bessemer. A bessemer ore is one which can be used with suitable fluxes to make a bessemer pig iron. According to the current furnace practice on Mesabi Range ores, those ores which contain .00075 to .00085 per cent or less of phosphorus for each 1 per cent of iron are classified as bessemer in ore-reserve estimates. The particular ratio to be used depends on the phosphorus content of the limestone and coke which furnaces use. Actual bessemer ore shipments are graded closer to the higher ratio than to the lower. All standard ores not bessemer are classified as non-bessemer.

Washable ores are those in which fine free sand is interbedded with lenses and layers of clean ore, the classifications being made from an examination of samples, the texture and structure governing more than the iron analysis. Lean, non-washable ores are all churn-drilled material analyzing less than 49 or 50 per cent dry iron and over 35 or 40 per cent. It is the general practice to classify all the diamond-drilled material analyzing less than 49 or 50 per cent dry iron as taconite, the local name for the iron-formation rock.

From the classification and analyses of ore samples, each orebody should be divided into its structural subdivisions or layers on the cross sections (described in the following), and such layers further divided into

FIG. 2. ESTIMATE SHEET FOR ORE RESERVE AND OPERATING ESTIMATES

No. of Pit or Drill Hole	From	To	Depth of Surface	Depth of Ore	Percentages Iron	Phos.	Silica	Mn.	Alum.	Foot-Units Iron	Phos.	Silica	Mn.	Alum.
Grade														
N B.	18	370	390	20						121,960	1,340	6,575	1,990	3,660
N.B.	19	345	365	20						121,470	1,485	6,945	2,145	3,645
N.B.	20	317	337	20						113,555	1,305	15,735	2,845	4,265
				60	59 50	.072	5 23	1 16	1 93	356,985	4,330	31,305	6,980	11,570
Bess	18	390	425	35						211,370	1,325	29,855	670	2,835
Bess	19	365	400	35						213,100	1,235	27,370	755	3,600
				70	60 64	.037	8 18	20	92	424,470	2,560	57,225	1,425	6,435

Computations and Remarks

Scale of Map:

Average depth of surface in feet: Average depth of ore in feet: 20 00

Planimeter-area in square inches: 6 46. Number of cubic feet per ton: 14 80

$$\frac{6\ 46 \times 200 \times 200 \times 20\ 00}{14\ 80} = 349{,}189 \text{ tons.}$$

$$\frac{4\ 81 \times 200 \times 200 \times 35\ 00}{16\ 00} = 420{,}875 \text{ tons.}$$

RECAPITULATION

Ore Layer	Tons	Percentages Iron	Phos.	Silica	Mn.	Alum	Ton-Units Iron	Phos.	Silica	Mn.	Alum
Non-Bessemer	349,189	59 50	0 072	5 23	1 16	1 93	20,776,746	25,142	1,823,258	405,059	673,935
Bessemer	420,875	60 64	0 037	8 18	0 20	0 92	25,521,860	15,572	3,442,738	84,175	387,205
Total Bessemer and non-Bess.	770,064	60 12	0 053	6 84	0.64	1 38	46,298,606	40,714	5,269,016	489,234	1,061,140

References:

Mesabi Mining Co. ..... 19 ....

Oliver Iron Mining Co. ..... 19 ....

Signed: Mining Engineering Department.

..... Minn. ..... 19..

FIG. 4. SUMMARY SHEET FOR OPERATING ESTIMATES

Description Sub-Div.	S.	T	R.	Layer	Class	Open Pit Ore: Steam-Shovel Tons	Iron	Phos.	Sil.	Milling and Scram Tons	Iron	Phos.	Sil.	Underground Ore Tons	Iron	Phos.	Sil.	Underlying Low-Grade Ore Tons	Iron	Phos.	Sil.	Stockpiles Tons	Iron	Phos.	Sil.	Cu. Ft. per Ton	Total Reserve Tons	Iron	Phos.	Sil.	Remarks

bessemer, non-bessemer, and lean-ore layers. Areas of such layers can be shown on the plan map also. Most orebodies contain a layer of low-grade ore material, which is the alteration product of an interbedded slate layer. It is called the intermediate paint-rock layer and is not merchantable, because of its high moisture and consequent low natural-iron content. It is desirable to outline this layer separate from the ores above 49 or 50 per cent iron on the cross sections, for structural reasons.

Average-Depth Methods—The tonnage of ore in the main body is obtained by multiplying the planimeter area reduced to square feet by the average depth of the layer and dividing by the factor for cubic feet per ton. If a drill hole shows an isolated ore area surrounded by rock, a circle is drawn around this hole having a radius of 25 or 50 ft., and this volume is estimated as a cylinder. The average analysis of each layer is found by adding the foot units of all the drill holes in the layer and dividing by the total depth of ore in the holes. The several layers of ore being estimated separately, the tonnages and also ton-units of the layers of standard ore are combined. The total ton-units divided by the total tonnage gives the average analysis of the whole deposit. A map illustrating the outline of an orebody is shown in Fig. 1, and an estimate sheet in Fig. 2.

Cross Section Method—Standard cross sections are made on a natural scale of 30, 40 or 50 ft. to the inch. A convenient size of these cross sections is 18 x 42 in. for a 40-acre tract, using a scale of 40 ft. per in. They are made on plain tracing cloth and are ruled one inch vertically, and horizontally to show 100-ft. intervals. Thus, a sheet will include a distance of 1,400 of 1,500 ft. horizontally and 520 ft. vertically, drawn to a 40-ft. to 1-in. scale. They are made looking either north or west, depending on the trend of the orebody, and are taken on the north and south or east and west co-ordinates 50 or 100 ft. apart. If the strike of the orebody is not approximately north and south or east and west, the cross sections may be taken at right angles to a line parallel to the strike. On the tracings are platted profiles of the natural surface, top of ore, and annual profiles of the open pit, if the property is being operated as such. The top of ore may be shown by a dotted line to distinguish it from the other profiles. If there are any underground workings, the drifts and stopes are platted on the sections. The stopes are cross-hatched and the level numbers are given corresponding to the level maps. Drill holes and analyses of samples are shown also.

All companies have iron and phosphorus determinations made of drill samples. Some have silica and manganese analyses made also, and some add alumina. The structure of the ore body obtained from a classification of the drill samples is shown by lines drawn on the backs of the tracings. These lines mark the top of the upper slaty, upper cherty, lower slaty and lower cherty horizons and the top of quartzite and several minor subdivisions of the major ore horizons. All of these horizons do not occur in all orebodies. Their presence depends on the location of the orebody in the iron formation outcrop and the amount of erosion which has occurred from the top of the orebody.

The structure of the Mesabi ore deposits is described by J. F. Wolff in *Engineering and Mining Journal* in a series of articles beginning July 17, 1915, and in *Transactions* of the A. I. M. E., February, 1917.

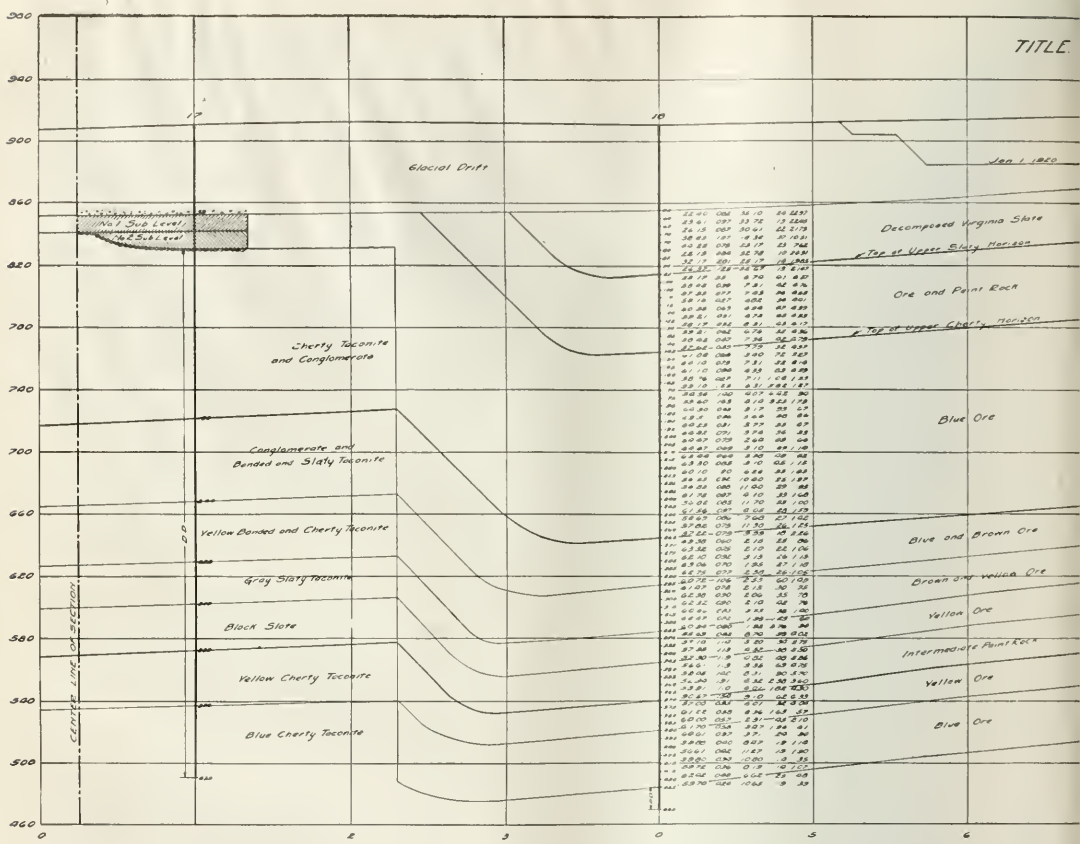
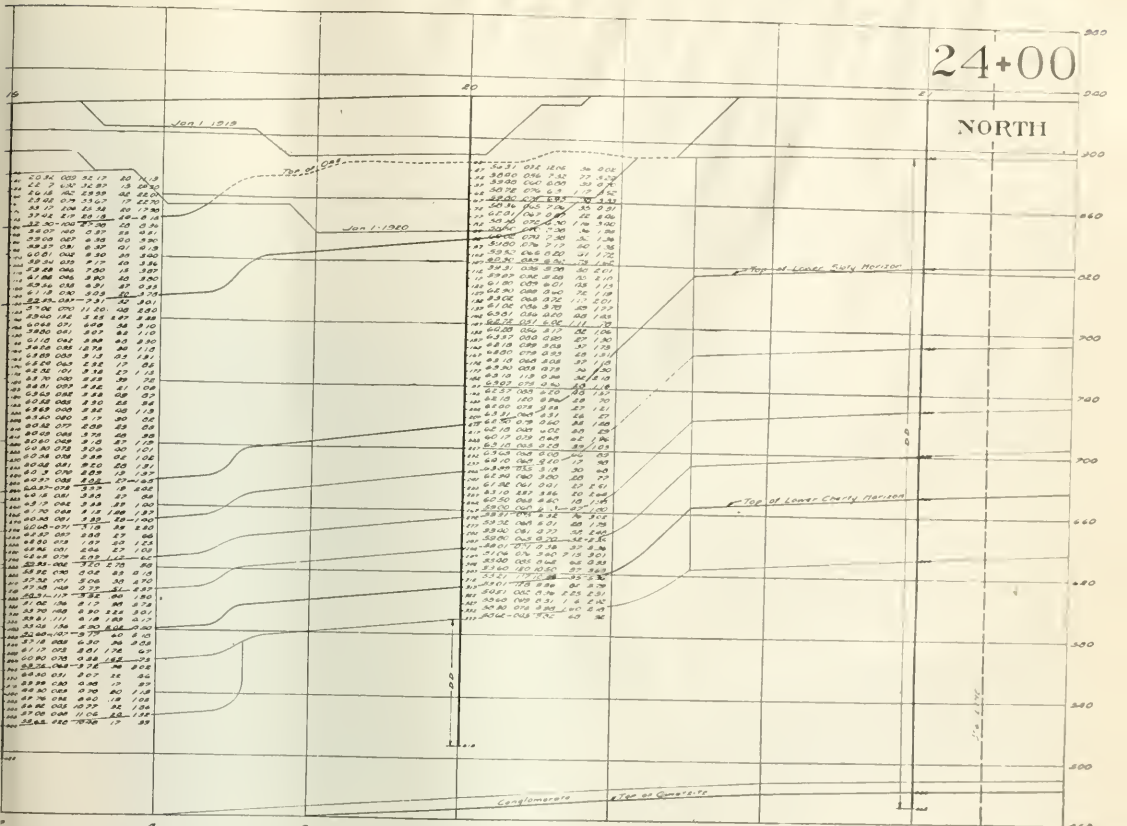


FIG. 3. TYPICAL CROSS-SECTION OF OREBODY

For purposes of determining the number of cubic feet per ton to use in the estimates, density tests are made as follows, wherever possible: A box without top or bottom is made out of steel sheeting, three-sixteenths of an inch thick. The sides of the box are held together by angle-iron pieces, to which they are bolted and should be reinforced by a narrow strip around the top. A convenient size to use is 2 ft. 6 in. square by 2 ft. deep, and this has a capacity of 12.5 cu.ft. The floor of the open pit, drift, or stope is leveled off, care being taken that no loose ore remains and the box is driven down into the ore layer to be tested until the top is flush with surface of ore. As the driving progresses the ore is dug out with a pick and shovel and weighed. If it is not possible to drive the box flush, the depth of the void can be obtained by measuring down from the top of the box. The volume of the ore in cubic feet multiplied by 2,240 and divided by the weight of the ore in pounds gives the number of cubic feet per ton. Such tests should be made in as many different horizons and parts of the orebody as possible, because the density will vary in different layers and positions in an orebody. In properties that are undeveloped, a tonnage curve is used.

Three methods of mining are used commonly on the Mesabi Range, namely, open pit, steam shovel and locomotive method; open-pit milling method; and underground mining method. Operating estimates are made to determine the best method of mining the ore on a basis of cost per ton. When part of the ore can be mined more cheaply by the open-pit method, there is usually an area around the edges which must be mined by underground methods on account of the thickness of the overburden as compared with the depth of the ore and because of the occurrence of the ore layers in taconite walls. Sometimes part of the ore is too deep to be hauled out of an open pit with locomotives and must be milled down to haulage drifts near the bottom of the orebody and hoisted through a shaft. The ore remaining under open-pit tracks must be mined by this method also. The ore in slopes of the open pit is mined by the underground or open-stope method. The ore reserve, therefore, is to be divided among steam shovel, milling and underground ore.

To outline the proposed open pit the following interpretation is placed on the data secured from each drill hole: A unit area of 27 sq.ft. is taken around each hole so that each foot in depth will then contain one cubic yard. A cubic yard of ore may be considered as equal to two tons. The cost of mining the ore under each unit area is computed by open-pit and by underground methods. Assume the following prices in making a comparison of cost by each method:



ON MESABI, SHOWING ROCK AND ORE LAYERS

Stripping surface	$ .60	per cubic yard
Stripping broken rock	1.20	per cubic yard
Stripping solid rock	1.80	per cubic yard
Steam shovel ore	.40	per ton or .80 per cu.yd.
Milling ore	.80	per ton or 1.60 per cu.yd.
Underground ore	2.50	per ton or 5.00 per cu.yd.

As an example, assume a drill hole with surface 60 ft., solid rock 22 ft. and ore 30 ft.

Stripping 60 ft. of surface at	$ .60	$36.00
Stripping 22 ft. of solid rock at	1.80	39.60
Steam shovel ore 30 ft. at	.80	24.00
Total		$99.60
Underground ore, 30 ft. at	5.00	150.00
Difference in favor of open-pit mining		50.40 = $.84 per ton

The above costs represent neither average nor any specific Mesabi Range costs, but are assumed for purpose of illustration. The engineer uses such costs as in his judgment will be incurred in each specific case.

After determining which holes are to be included in an open-pit area, an outline of the proposed pit is drawn on a map of the property on the scale of 1 in. = 100 ft. The cross-sections are used in determining such an outline, and the crest of the ore pit is located so as to include in the pit all ore for which the open-pit mining cost does not exceed the underground mining cost. In determining such a division the same comparative test can be applied at any point on the cross section which was applied to all the drill holes as above described. Attention must be given, of course, to making the shape of the open pit such as can be operated by ordinary steam-shovel and locomotive methods. Some ore may have to be excluded from the open-pit area because of inaccessibility to steam shovels and locomotives in the general operating plan which is most advantageous for the maximum tonnage in the orebody.

Outside of the crest of ore line a berm of 25 ft. is allowed to the toe of the proposed surface stripping slope. In ordinary glacial drift, composed of clay, boulders and gravel, a slope of 1 to 1 is allowed up from the toe of slope located as described. If the surface is known to be composed of gravel and sand only, and is very deep, flatter slopes up to 1½ to 1 should be used. A proper approach to the pit should be noted on the map, its location being made with regard to maximum tonnage possible to mine by steam shovel and locomotive haul, location of stripping dumps, general topography of surface, surface plant, and minimum yardage necessary to remove for such approach. A track system is planned in the ore pit next, using the map and cross sections

jointly in locating the track alignment. A map showing contours of top and bottom of ore is preferable for such use.

The following specifications are used generally in establishing track locations and grades and slopes of ore banks: For the ultimate track plan maximum grades of 3 per cent compensated on curves are allowed. Maximum curves of 15 deg. on main-line tracks are used. For final clean-up switchback tracks much steeper grades and sharper curves are and have been used. Grades as steep as 7 or 8 per cent and curves as sharp as 30 deg. have been used in actual operations. Where the depth of ore is less than 100 ft. a slope of 1 to 1 is allowed in the ore on the track side of the pit. A slope of ½ to 1 may be used in ore on the other sides of the pit, unless there be a structural rock wall of the orebody on such other sides, and in this case all of the ore up to such walls and to the limit of locomotive operations in depth is included in the "steam shovel and locomotive ore."

On ore banks higher than 100 ft. the allowed slopes should be increased to 1½ to 1 and 1 to 1 respectively. For milling pits a slope of ½ to 1 is used where the ore banks are less than 100 ft. high, and 1 to 1 where they much exceed 100 ft. If structural rock walls bound the orebody the milling ore should include all ore up to such walls, the above-mentioned slopes being used only where a wall of ore will be left exposed, such as at a property line where the orebody continues on to an adjoining idle property.

The character of material in the bank and the natural dips of ore layers in the orebody must be considered in determining slopes. Where the structural cross sections indicate marked dip of ore layers into the main ore trough, of course flatter slopes than those specified must be used to guard against slides of ore which would ruin a track system and seriously interfere with mining operations. The location and dip of the paint-rock layer, which is soft and yields easily, must be regarded with special care in locating tracks and establishing slopes.

Consideration of Wall Slopes

If the structural rock walls of the orebody are high, and any considerable thickness of them exists above the so-called "intermediate slate" layer, which is at the base of the Lower Slaty horizon, this thickness may have to be trimmed off to a slope of ¼ to 1 down to the bottom of the slate layer so as to eliminate the danger of slides of rock into the open pit from the walls above the slate as the ore is being removed from the pit. This feature should be provided for in drawing up the stripping plans so that the surface may be removed far enough back either in the first stripping work or in subsequent stripping extensions. Where something is known as to character of rock walls from operations on adjoining properties such wall-sloping can be anticipated. Walls which are somewhat decomposed, or contain fissures extending into them, must be sloped. One rock wall of some orebodies may overhang somewhat, and such walls must be sloped also. In most instances the rock walls of the Lower Cherty horizon (below the "intermediate slate" layer) are so solid that they do not require sloping.

Using the specifications and precautions given, the engineer denotes track alignments and ore slopes on both map and cross sections. On the latter the orebody is thus naturally divided according to the mining method to be applied to its different parts, i.e., (1) locomotive and steam-shovel ore: (2) milling ore, and (3) underground ore. The last classification may be divided in some cases into (a) ore which can be dumped into an open pit and hauled out by locomotives, and (b) ore which must be hoisted through a shaft.

Average areas of surface stripping, steam shovel, milling and underground ore of the several grades can be platted on the map also.

The quantities of stripping and ore, subdivided as noted, then can be estimated from the cross sections or from the map, using the method of average depths. The engineer can judge from the conditions, such as shape of orebody and open pit, which method will be more accurate. One method may be used for part of the estimate and the other for the remainder if greatest accuracy is obtained thereby. A convenient summary sheet for such an operating estimate is shown in Fig. 4.

British Columbia Mineral Production Decreased

The monetary value of the mineral output of British Columbia for the year 1919 was $33,296,313, as compared with $41,782,474 for 1918, according to official figures given in the Annual Report of the Minister of Mines, which has just been issued and now is available for distribution.

The decrease, though considerable, is not serious when placed against the greater decline in mineral production shown by returns from the various states south of the line where the mining industry is an important factor. In fact from this point of view it is indicated that British Columbia did not experience to the same extent the falling off in demand for metals following the cessation of war.

An interesting comparative table is published which, in part, follows:

QUANTITIES AND VALUE OF MINERAL PRODUCTS FOR 1918 AND 1919

	1918		1919	
	Quantity	Value	Quantity	Value
Gold, placer, oz	16,000	$320,000	14,325	$286,500
Gold, lode, oz	164,674	3,403,812	152,426	3,150,645
Silver, oz	3,498,172	3,215,870	3,403,119	3,592,673
Lead, lb	43,899,661	2,928,107	29,475,968	1,526,855
Copper, lb	61,483,754	15,143,449	42,459,339	7,939,896
Zinc, lb	41,772,916	2,899,040	56,737,651	3,540,429
Coal, 2,240 lb	2,302,245	11,511,225	2,267,541	11,337,705
Coke, 2,240 lb	188,967	1,322,769	91,138	637,966
Miscellaneous products		1,038,202		1,203,644
Totals		$41,782,474		$33,296,313

One interesting feature of the above is the increase shown in silver production, reflecting the increased quotations for the metal and, to some extent, the opening up of promising northern fields. Another worthy of note, but not of such an encouraging nature, especially from an industrial standpoint, is the marked decline in coke manufacture.

The report includes the usual detailed accounts of mining activity during the year in the several districts of the province by the resident mining engineers.

Quicksilver and Tin Mining in Bolivia

The central office of the important Bolivian silver and tin mining company, the Cia. Gallofa-Consolidada de Colquechaca, is in Sucre, says a report issued by the Department of Commerce, where most of the stock is held. A "junta consultativa," or subdirectorate, of the Chilean "Cia. Minera y Agricula Oploca de Bolivia" also has its offices in Sucre.

The Copper Ores of Lake Superior

Conglomerates and Basaltic Flows Afforded Zones for the Circulation of Powerful Ascending Mineral-Bearing Solutions During a Period of Great Volcanic Activity—Depth Of Mineralization Shows Deep-Seated Origin

By J. E. Spurr

Written for *Engineering and Mining Journal*

THE copper deposits of the Keweenaw Peninsula, in northern Michigan, have been mined for fifty years on an important scale, and show no signs of exhaustion, although several of the mines have reached a vertical depth of over 5,000 ft. These ores as described by Pumpelly and Irving, together with their associated rocks, have long formed one of the classics of economic geology; and many writers have followed in the footsteps of the early masters. I shall not attempt to summarize the voluminous literature, but will unconventionally begin by stating my own notes, taken in the course of a few days' visit to the district, in which I was guided and enlightened as to local geological conditions by Prof. A. E. Seaman, of the Michigan College of Mines. It should be made clear that my visit was a hasty one to parts of only t[illegible] of an extensive district; and, therefore, these preliminary notes do not pretend to the dignity of an article, and are presented with all apologies for inevitable shortcomings and inaccuracies.

STOPE IN THE CALUMET & HECLA

The copper-bearing formation is a thick series of intercalated conglomerates and thin flows of dense basic (basaltic) surface lavas. The upper part of each flow as a rule was vesicular, and hence by subsequent filling has become amygdaloidal. The conglomerates contain rounded pebbles of this basalt, including the amygdaloidal variety, as well as other rocks, like quartzite, siliceous igneous rocks, like quartz-porphyry, and denser (felsitic) igneous rocks. The upper surface of the basaltic flows was fissured and broken up, evidently from rapid contraction or cooling, at the surface, and sand sifted down and filled these fissures.

The copper ores occur as scales, shots, threads or masses of almost any size, of metallic copper, scattered through certain lode-like zones parallel to the upturned layers of beds of sandstone and conglomerate. The mineralized zone may be a conglomerate, as in the case of the Calumet & Hecla, or an amygdaloidal ancient basalt, as in the case of the Champion mine, both of which were visited. It is perfectly clear, therefore, that there is no special virtue in either rock—the ore is not native to either, and hence was introduced from foreign sources.

Mineralization in Conglomerate by Replacement and Impregnation

In the Calumet & Hecla, amygdaloidal basalt (I prefer to call it by this name, instead of "diabase" or "trap," as is the custom) in the foot wall of the ore-bearing conglomerate is barren; even amygdaloidal pebbles in the conglomerate itself are usually unaltered, and the amygdules (fillings of the original gas holes or vesicles by calcite and other minerals) are unreplaced by copper. One bed of conglomerate, varying in thickness from twelve feet or more down to less than one foot, has been especially mineralized, and there are many similar parallel barren conglomerates developed in the mine crosscuts. We must conclude that the lode is due to this conglomerate having afforded an especially open zone for circulating solutions—that it was either originally so (of which there is no evidence), or was made so by dynamic strain ofter becoming a part of the rock mass. Even of this latter, however, I found scant evidence.

The pebbles are not notably deformed or crushed except (according to Prof. Seaman) in certain zones where the crushing is quite marked. But that solutions passed freely through this lode-bed zone is shown by the irregular small dissolution cavities which are so common, and which are now filled with calcite and other minerals. They are often several inches long. The solutions must therefore have been powerful and they must have passed through the sandy matrix of the conglomerate while it was still open and porous; and as the dissolution cavities are mainly in this sandy matrix, they must have dissolved silica with ease.

The ore is entirely native copper, often with calcite as contemporaneous gangue. Native silver is common, and is contemporaneous, and of the same genesis. Besides impregnating and replacing the sandstone matrix of the conglomerate, it often occurs as a casing or shell around pebbles, of various sizes. In all instances which I saw the pebble had been thoroughly decomposed. Either the peripheries of certain kinds of pebbles created chemical reactions with the mineralizing solutions, which caused deposition, or the shrinkage of the pebbles during decomposition afforded a peripheral opening.

The mine workings inspected are at the vertical depth of a mile, or over 8,000 ft., on an average 34-37 deg. dip. Therefore, the mineralization was of deep-seated, and not of superficial, origin. It had nothing to do with surface water at any relatively recent period, as these lower workings are quite dry.

In the Champion mine, the lodes are parallel to the bedding, as in the Calumet & Hecla, but in a horizon hundreds of feet stratigraphically lower. In the Champion workings there is shown a series of numerous thin basaltic (diabase) flows, the average thickness of each being from 50 to 75 ft., and each flow being amygdaloidal in its upper portion. There are a number of parallel lodes, but the strongest and the only one inspected is the Baltic, which is from 25 to 30 ft. wide and is in basalt ("trap"). It is a zone of strain and fracturing generally parallel to the bedding, but not, in detail, regularly parallel. Where seen it was mainly in the dense or non-vesicular basalt, but it includes vesicular portions.

Owing, doubtless, to the greater rigidity of this rock over the conglomerate of the Calumet & Hecla, this basalt shows up the character of the Baltic lode as along a strain zone more clearly, by the frequent brecciation of the basalt and by thin, very straight, and persistent fissure veins of quartz, calcite, and other carbonates, and metallic minerals. These, where seen, were one inch or less thick. They strike parallel to the main lode, but in general dip more steeply, dipping 80-85 deg., though the lode is about 70 deg. This is, of course, a familiar type of lode. Nevertheless, relatively slight total dynamic action is indicated.

The effects of circulating waters are strongly marked, not only by the thin fissure seams, but by irregular dissolution cavities, never more than a few inches wide, especially around breccia fragments, as they are around the pebbles of the Calumet & Hecla conglomerate. These cavities are mainly filled with calcite. Solutions capable of dissolving silica and later precipitating calcite, or of replacing silica and other constituents by calcite, are indicated. The small amount of alteration of the rocks of the lode is, however, remarkable. The rock of the lode is apparently little more altered than are the wall rocks. Such rock, however, was pervious, as shown by the appearance of spots of copper away from any visible fracture. Much of the copper occurs in the rock without gangue. Where it occurs in the seam veinlets, it occupies the center, but here is intercrystallized and contemporaneous with the quartz and calcite, especially the former.

Evidences of Consecutive Deposition From Mineralizing Solutions

These thin veinlets are indeed the most direct and tangible evidence which we have as to the origin of the ore deposits; so that, although they are very minor quantitatively, as compared with the native copper impregnations in the rock, they merit special consideration. The metallic portion of the seams is generally in the center, and contains little gangue, in which quartz predominates. Chalcocite, often silver-bearing, and metallic copper are the chief minerals. They are found intercrystallized and contemporaneous, and are both plainly primary minerals.

Native silver is frequent. Other veinlets show contemporaneous bornite and chalcopyrite. Many of the veinlets show a white band of quartz (and calcite) on either side of the central metallic mineral, and the tendency to a fine comblike structure of the quartz, per-

pendicular to the wall, indicates that the crack stood open for a while, and that its walls became lined with quartz before the injection of the strong copper solutions. Elsewhere we find these seam-veinlets (mostly of native copper only) in the rock, without, or almost without, selvage or gangue. Essentially, therefore, the copper injection and deposition was without much accompanying gangue.

Besides the seam-veinlets in the Champion mine, which strike parallel to the lode, there are others at right angles to it. These have a tendency to widen the lode, and the lode is more productive where many of these parallel or cross-seams occur.

The observations in the Champion were at 1,300 ft., and here also the rocks are dry, the only water in the mine being surface water, which is caught above.

Others of these veinlets contain highly interesting minerals—domeykite (copper arsenide), smaltite-cloanthite (nickel-cobalt arsenide), with niccolite (nickel arsenide), all contemporaneous, with sparse quartz-calcite gangue.[1] What the paragenesis of these varied metallic minerals is I am unable to say. It could be decided largely by a study of the interesting collection in charge of Prof. Seaman, at Houghton; but essentially they are all part of one period, and the native copper is determined as a primary precipitation contemporaneous with the sulphides. Does not its intercrystallization with chalcocite indicate a scarcity of sulphur in the copper solution-magma? It will be noted that chalcocite has the least sulphur and the most copper of the copper sulphides—20 per cent sulphur and 80 per cent copper—while, referring to the bornite-chalcopyrite veinlet above described, bornite has 28 per cent sulphur, 55 per cent copper, and the remainder iron, and chalcopyrite contains 35 per cent sulphur, 35 per cent copper, and the rest iron. In general, therefore, it appears that the solutions contained, comparatively speaking, little sulphur or iron; that they were rich magma-solutions of copper, with a little arsenic, sulphur, cobalt, and nickel.

This preliminary examination has led me to infer an injection, at a definite period, of cupreous solution at depths which are demonstrated at present to be 8,000 ft., and which, at the time of deposition, were much greater,[2] and that the solutions therefore were presumably ascending.

The total amount of copper deposited was enormous. This has been for many years one of the most productive copper districts of the world. The attendant rocks are not thoroughly decomposed and leached; indeed, their alteration is noticeably less than we are accustomed to see in the neighborhood of ore deposits of plainly igneous-magma origin. Ground water is scanty or wanting in the deeper portions of the mines. The concentration of the copper gradually from the inclosing or surrounding rocks is an explanation so evidently unreasonable and inadequate as not to merit a second thought. The expectation, then, is that this deposit, like many others whose origin is better demonstrated, is of igneous-magma origin; and this seems plausible, as it followed such plentiful extrusions of basic rocks, and, as Irving and the other geologists have shown, both extrusions and intrusions of siliceous igneous rocks in the same great series, which is held to be about 25,000 ft. thick.

Siliceous porphyries, with and without quartz phenocrysts, are described as follows: Augite syenite, becoming granitic and granite, are found in large intrusive masses, apparently stocks or laccolites ("great irregular mountain masses," as Irving says) near the base of these Keweenawan basic rocks. There is a gradation between the granite, through the syenite to a gabbro—and the occurrence of augite, in all, even sparsely in the granite, where it has largely changed to hornblende, indicates the consanguinity of all. A magma which has differentiated in depth, of which the basalts and the intercalated siliceous rocks (rhyolites) may be considered complementary dense-textured surface eruptions, and the granite syenite and gabbro coarsely crystalline deep intrusive forms, is indicated. It is likely, by all analogy, that the ore deposition was one phase of this immense igneous activity.[3]

As to the age of this igneous activity, we only know that great series of surface volcanoes as Keweenawan, although they were formerly supposed to be pre-Cambrian, but now are considered by some as "more largely Cambrian than pre-Cambrian," as Lane says.[4] How much later the stock intrusions of granite and syenite rocks rose up into the buried base of the series we do not know, but they were in part, at least, in a rough way contemporaneous.[5] The formation of the lodes by strain —the rendering more permeable thereby, of certain beds —would appear to have been connected with the steep tilting which attended the formation of the great fault (Keweenaw fault) which limits on the east this copper-bearing zone. The fault itself is not known to be mineralized; therefore, the vein-formation followed the first slight movement in the growth of displacements, a history strikingly analogous with others described elsewhere.[6] The faulting continued, in successive stages, till after Devonian or later, according to Lane.

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[1]The following extract is from the News Section of *Engineering and Mining Journal* of July 3: "Copper arsenides have been found in a number of the Lake Superior copper mines. At present Ahmeek is producing varying quantities of algodonite, domeykite, and whitneyite, these three minerals occurring in rich pockets. In the Mohawk mine there are pockets of the same ores, and, in addition, a fourth arsenide, mohawkite. Algodonite carries 83 per cent copper and 16 per cent arsenic. It must be handled in lots that will give a smelter furnace a full charge. Domeykite ordinarily carries 71 per cent copper and 28 per cent arsenic. Whitneyite was found on surface at the old Pewabic property, at the Cliff, and at the Minnesota mine, in Ontonagon County, now the Michigan.

"The showing of this arsenical copper ore, to be distinguished from the native copper, keeps increasing at both Mohawk and Ahmeek, and is a factor in their total output. At present much of it is stocked at the smelters awaiting its special treatment. Seneca is expected to find this sort of ore in paying quantities. The Copper Range mines on the Baltice lode have opened up some of it, indicating that it is not exclusively a Kearsarge lode product."

[2]The very narrow fissure fillings may indicate great pressure, and, therefore, great depth, although I believe that in one of the mines there is a fissure vein several feet wide, which has been mined.

[3]Diverse views as to the origin of the Lake Superior copper ores have been held in the past. Pumpelly originally regarded the copper as precipitated from sea water with the sedimentaries; afterwards, carried down in solution and coming in contact with the igneous rocks, metallic copper was precipitated by the ferrous oxide of the ferruginous silicates. By Irving they were supposed to have been due to leaching from the basaltic rocks during the ordinary processes of weathering. Lane considered that they were due to leaching by sea water, while still under the sea, and that there was still some chlorolic activity going on as an after-effect of the volcanism, which would explain some of the igneous minerals. Van Hise at first believed them due to [illegible] waters, but believed the waters not magmatic, but of [illegible] origin. In a later and more exhaustive analysis of the problem in a general monograph on the Lake Superior region (1911), Van Hise and Leith emphasized the magmatic source of the ore-bearing solutions, but did not entirely exclude the possible [illegible] of meteoric waters. Smyth believed that the waters were not only ascending, but of magmatic origin, and this view has also been held by Graton, although not published. Lewis, as a result of his study of allied deposits in the New Jersey trap (basalts), came to the conclusion that the copper here was of magmatic origin, and inferentially extended his conclusions to the Lake Superior country.

[4]Bull. Geol. Soc. Am., Vol. 27, 1916, pp. 97-100: "The Keweenaw Fault," by Alfred C. Lane.

[5]Irving, "The Copper-Bearing Rocks of Lake Superior," Monograph V, U. S. G. S., 1883, p. 112.

[6]"The Relation of Ore-Deposition to Faulting," J. E. Spurr, *Econ. Geol.*, Vol. 11, pp. 601-22, October 1916.

Modern Coal-Pulverizing Plant at the United Verde

Jeffrey Breakers Followed by Ruggles Coles Driers and Raymond Pulverizers—Powdered Coal Carried to Smelter Bins by Screw Conveyors and Blown to Drier Burners With 40-lb. Air—A 750-ton Plant Cost $725,000

By J. B. Johnson
Chief Engineer, United Verde Copper Co.
Written for *Engineering and Mining Journal*

EARLY in 1918 the United Verde Copper Co. decided to build a plant for the preparation of powdered coal, owing to the increasing prices of fuel oil used in reverberatory smelting. The year previous a report on the saving through the use of coal instead of oil had been prepared by the assistant smelter superintendent, C. R. Kuzell, and the estimated economy fully warranted the construction of a plant.

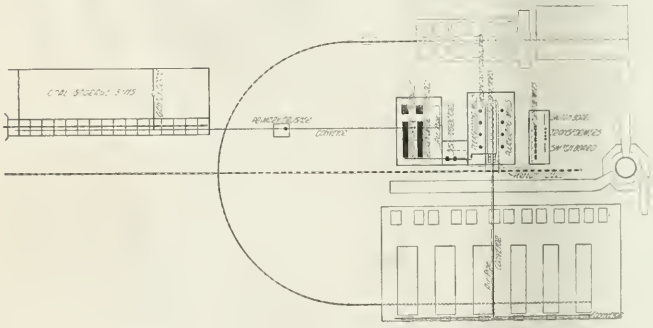

FIG. 1. GENERAL PLAN OF COAL-PULVERIZING PLANT

Two main types of plants were considered: the one in which the coal dust and air for burning are kept separate until mixed in the furnace burners, and the other type in which the air and coal dust are mixed in the coal plant and the mixture is conducted to the furnace burners in a manner similar to that employed in feeding gas. Of the two types the former was favored. The plant was designed by the local engineering department and actual construction began in November, 1918.

In general the plant consists of a 14,000-ton storage plant, a Jeffrey primary coal breaker, two No. A-14 Ruggles Coles driers, two Jeffrey coal disintegrators, eight Raymond pulverizer mills, six General Electric centrifugal 15-oz. blowers, and accessory equipment. A general plan of the plant is shown in Fig. 1.

The storage plant is divided into two parts; the main division consists of large reinforced-concrete bunkers holding a total of 12,000 tons of either slack or run-of-mine coal. These bunkers were made watertight, so that coal can be stored under water to prevent spontaneous fires. The storing as well as reclaiming is done by a five-ton Alliance gantry-type crane, which spans the main bunkers and has an overhang reaching over the railroad track which serves the bunkers. Coal is shipped in gondola cars and can be dumped directly into the track bunkers which constitute the second division of the storage plant. These smaller bunkers hold 200 tons, and when full any excess of coal shipped above the current demand can be stored in the main bunkers, such excess coal being handled directly from the cars into the main storage space by means of the gantry crane and 2½-yd. bucket.

Underneath the track bunkers, which are also built of reinforced concrete, is a conveyor tunnel and 30-in. belt conveyor fed by a traveling feeder from gates in the bottom of the bunkers. The conveyor system carries the coal to the primary breaker, designed to crush all lumps down to 1-in. size. To date this crusher has been by-passed, owing to the fact that all coal received so far has been slack or has been crushed at the mine. From the breaker a 26-in. inclined belt conveyor takes the coal to the driers, delivering to bins holding 100 tons. Feeders at the bottom of these bins supply the driers. Powdered coal is used in the driers for fuel, the ratio of fuel to coal dried averaging about 1:40, with the coal dried from 15 to 3 per cent moisture. The maximum temperature in the gas uptake adjacent to the drier drum is 160 deg. F.

From the driers the dried coal is conveyed in 14-in. screw conveyors, of the Webster make, to the disintegrators and to the pulverizers in the main building. In Fig. 2 is shown an exterior view of the plant—the drier plant in the foreground and the main mill building behind it. These buildings are of steel and brick construction—steel sash windows and steel and concrete floors throughout. The drier uptakes are each connected up to two cyclone dust collectors mounted on top of the building and a stack 50 ft. high is built on

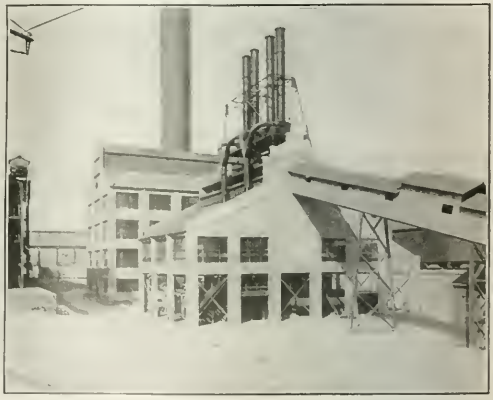

FIG. 2. THE DRIER PLANT IN THE FOREGROUND AND THE MILL BUILDING IN THE REAR

top of each collector. So efficient is this system in collecting the dust from the driers that scarcely any black smoke is visible from the stacks during the running of the driers.

The main mill building houses the eight Raymond pulverizers, exhausters, collectors, dust filter, blow tank,

FIG. 3. THE PULVERIZER MILL BUILDING. MAIN AISLE

and conveyors. Fig. 3 is a view of the main aisle, showing the pulverizer mills arranged four on each side. Fig. 4 shows the exhausters which are on the second floor of the building, one over each mill.

Each mill is driven by a 75-hp., 2,200-volt squirrel-cage motor, and each exhauster by a 40-hp., 440-volt motor of the same type. Each mill is connected through the exhauster to its own dust collector, the outlet of which is connected by means of a downcast duct to the mill, thus completing the return in the mill circuit. Each outlet is connected also to a small auxiliary cyclone collector 4 ft. in diameter, eight of these

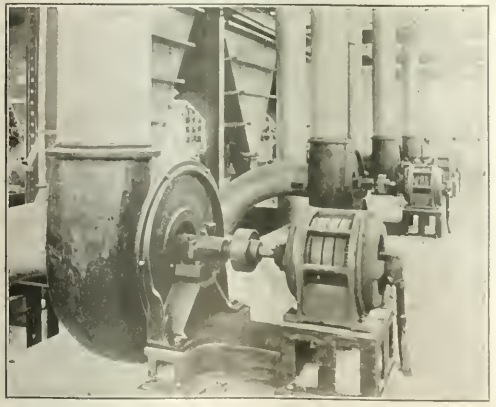

FIG. 4. THE EXHAUSTERS ON THE SECOND FLOOR

small collectors being inter-connected by means of a header which leads to the dust filter. This filter is a six-compartment muslin tube, automatic shaker type, supplied by the Dust Recovering & Conveying Co., of Cleveland. The tops of these filters are shown in Fig. 5.

An additional exhaust fan of 12,000 cu.ft. capacity at 4-oz. static pressure is installed beyond the filters, thus maintaining a slight vacuum in all of the mill circuits, which makes for an unusually clean building. The exhaust fan outlet connects directly with the main vent stack, and the efficiency of the filters so far is evidenced by the entire absence of black smoke from the vent stack. A 30-hp. motor drives the main exhaust fan. The dust collected by the filters is delivered into the main dust conveyor, and is thus utilized in the plant.

The conveying of dust into the smelter building is by means of 14-in. screw conveyors, direct connected to their respective motors through Poole turbo-gear speed reducers. This method of driving these conveyors has proved very successful, and the installation takes only a small amount of room and floor space as compared with chain drives and countershafts.

The conveying of coal dust to the driers is accomplished by means of a blow tank and transport pipe, as the tonnage involved is comparatively small. This blow tank is illustrated in Fig. 6, and was supplied by the Quigley Furnace Specialties Co. The air pressure used is 40 lb. and the tank capacity is three tons of dust. The tank is filled from a spout overhead, and

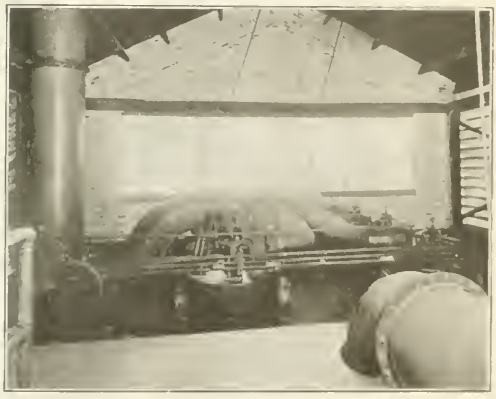

FIG. 5. TOPS OF COAL-DUST FILTERS

after the filling valve is closed the air is turned on, which shoots the dust through a 4-in. pipe to the two coal-dust bins at the driers. A specially constructed valve in this 4-in. line switches the load into either of the two bins. A cyclone air separator is mounted over each of these two bins which separates the air from the dust, allowing the dust to settle in the bins, the air being drawn through the air vent into the exhaust stacks of the driers. This transport system has given no trouble and is an excellent method of conveying coal dust. The capacity of the installation is about 10 tons per hour. With a larger tank the tonnage capacity could be increased. The feasible limits of transport distance and tonnage for this method of conveying dust are uncertain.

The coal dust as delivered to the reverberatory furnaces is pulverized to a fineness of 80 per cent through 200 mesh, and the moisture content is usually kept under 5 per cent. The burners were designed locally, and consist of the usual feed screw dropping the dust on to a jet of air supplied by the blowers.

The efficiency of the burners depends largely on that of the primary air jet in inducing sufficient secondary

air into the mixing chamber of the burner nearly to oxidize the coal during combustion. The remainder of the air required is drawn into the furnace through the furnace walls and ports. The burners were designed to feed an intimate mixture of coal dust and air into the furnaces. Several tests were conducted on burners, using different kinds of air nozzles, with a view to determining the relationship existing between different shapes of primary air nozzle and diverging air cone and to ascertain how these different factors affect efficiency. The conclusion is that the primary air pressure at the burners need not exceed 8 oz. per sq.in., and that the primary air volume (i.e. blower volume) need not exceed 25 per cent of the entire air volume necessary completely to oxidize the quantity of coal burned, provided the burners have properly designed air nozzles.

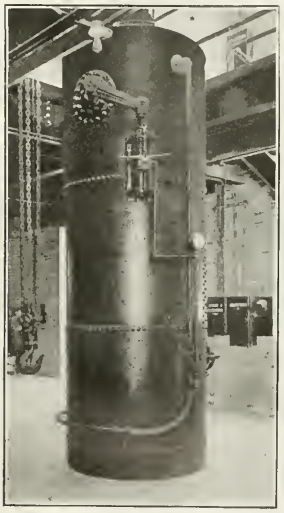

FIG. 6. TANK FOR BLOWING POWDERED COAL TO DRIER BINS

The air pressure is generated in the blower house by six General Electric turbo blowers, rated at 15 oz. per sq.in., and 10,000 cu.ft. per min. each. These blowers are Y-connected into a common header. Each blower is driven by a 75-hp. motor, direct-connected to the impeller through a solid shaft.

The capacity of the plant is 750 tons of coal dust per day, working three shifts. The dust bins at the reverberatory furnaces hold 65 tons each—enough for a maximum twelve-hour run for each furnace. The total cost of the plant, including storage plant, was approximately $725,000.

The fuel used at present is New Mexican coal from the Gallup district. This is classed as a lignitic bituminous coal, and has an average ash content of 8 per cent, and a maximum heat value of 11,300 B.t.u.

Gypsum in 1919

According to a preliminary estimate by the U. S. Geological Survey, 2,451,000 short tons of gypsum, valued at $16,000,000, was sold in 1919. This is an increase of 393,985 tons and of $4,529,146 compared with the sales in 1918.

Tin in the Malay Peninsula

The largest tin-smelting center of the world is Singapore, where the Straits Trading Co. and the Eastern Smelting Co., both British owned, and a Chinese-owned smelter, have a combined capacity of 58,000 metric tons of metal a year.

The backbone of the Malay Peninsula is composed of granite which is intrusive into limestone, shale, and quartzite. Tin has been found in place in practically all of the rock formations. Owing to the intense weathering and erosion of the tin-bearing formations, great accumulations of detritus, mixed with clay, all of which carry cassiterite, are found in almost all parts of the peninsula. The original deposits are so softened by weathering that they can be worked hydraulically.

Pahang, on the eastern side of the mountains, has many widely scattered tin deposits, both lodes and placers. The chief workings at present are in the mountains near the Selangor boundary, at Bentong, Tras and Machi. Some mining is also done at various places along the Kuantan River and its tributaries. Transportation is a serious item in working tin mines in Pahang.

The Kinta district, in the State of Perak, is the most important tin-producing area in the Federated States. A structural valley eroded in soft limestones between granite ridges is the location of most of the workings. The valley is filled with clays and boulder clays carrying tin, and the present stream channels are also stanniferous. Mining is in progress around fifteen or more settlements in this district. Most of the mining is by open cuts and dredges, but some lode mining is done on pipes in limestones. Next in importance to Kinta is the Larut district, northwest of the former. Placer deposits are the chief source of tin in the district, but lodes are worked at Selma and Blanda Mabok. In the south of Perak, at Bruseh, stockworks in schist are worked by hydraulicking, yielding about three-fourths of a pound to the cubic yard of material worked.[1]

Artificial Graphite

Graphite is manufactured by the Acheson Graphite Co. at Niagara Falls, N. Y. This company utilizes the electric power generated at the Falls to manufacture graphite from anthracite coal or from petroleum coke. This product is used mainly in lubricants, but it is also used in paints, foundry facing, preventives of boiler scale, and fillers for batteries.

Artificial graphite may be used for any purpose for which natural graphite is employed, according to the U. S. Geological Survey, except in the manufacture of large crucibles. Patents have been issued recently, however, for methods of manufacturing crucibles in which artificial graphite may be used. Artificial graphite is peculiarly adapted to the manufacture of certain graphite products, among them graphite electrodes, which are not made from natural graphite and for which the demand has greatly increased in recent years. The table below, published by permission of the Acheson Graphite Co., represents only the manufactured graphite that comes into competition with natural graphite.

GRAPHITE MANUFACTURED BY THE ACHESON GRAPHITE CO., 1915-1919

	Pounds
1915	5,084,000
1916	8,397,281
1917	10,474,649
1918	9,182,272
1919	8,163,177

[1] J. M. Hill in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Designing Mine Signal Systems

Safety, Reliability, and Maintenance Costs Should Be Considered in the Selection of Electrical Circuit Equipment—Installation and Operation Dependent Upon Existing Conditions—Expense Involved Commensurate With Service and Results Obtained

By R. H. Bacon*

Written for *Engineering and Mining Journal*

IMPORTANT as the mine-signal system is to continuous operation, safety, and speed of hoisting, it is rather peculiar that comparatively little attention has been given to the subject. Some of the newer installations might be termed modern, but for the most part the older and deeper shafts still remain dependent on the old, mechanical pull bell. Undoubtedly first cost and ultra conservatism have been the two main stumbling blocks to improved practice.

In the preliminary consideration of a system to be adopted, the first essential point in the design is to adapt it to the particular operating conditions. These vary at almost every property, and particularly in the different districts. If the shaft is a single compartment, two compartments, or one that has two hoisting compartments and a man, or "chippy" compartment, the electrical layout must be designed accordingly. By careful consultation with the operating men, the electrical department can lay out a system that will provide for every possible condition or emergency.

All systems should be designed with the following points in mind, given the weight of their numerical orders: (1) safety, (2) reliability, (3) speed of operation, (4) low maintenance cost, and (5) simplicity.

Safety Paramount in Signal Design

Safety is placed first because this is one of the weightiest arguments in favor of the electric system. It is exceedingly simple, while designing the system, to arrange the bells, buzzers, or lights so that at any place in the shaft, shaft house, or engine house it will be possible to tell what is going on, and for the sender of a signal to know that the signal was received correctly. If this is not provided for in the design one of the important features is lost. Nothing gives a greater feeling of confidence and security than to hear a signal repeated back.

Numerous accidents and consequent fatalities have been traceable to the old pull bells. I know of several, of which the following is an instance: In a shaft using dumpers the men had signaled to be lowered to the next level and were standing on the skip. Due either to a wrong signal having been given or to a misunderstanding of the right one, the engineer hoisted as for ore. The men, being totally unprepared for the sudden start, were thrown from the bail, one going down the shaft, while the others luckily managed to recover their balance and escaped injury. There have been cases where men working in the shaft, between shifts, have been crushed by the cage, due to similar errors. Repeated signals practically remove this possibility. From a cold-blooded business standpoint it is evident that such compensation saved would go far toward the first cost of a complete safety system.

Reliability is self-explanatory. Without it the system loses the confidence of the men and is a serious handicap to production if time is lost in changing over to the pull bell. Reliability can be attained only through the careful planning of all details of the equipment, as will be pointed out.

Speed of operation is essential in a busy shaft, but safety or reliability should not be sacrificed to obtain it. As a rule signals can be sent on any electric system as fast as they can be interpreted.

Rugged Equipment Recommended

Low maintenance cost is not necessarily an offshoot of reliability. Sometimes the latter is attained at the expense of high maintenance costs due to continuous inspection. To cut down the cost of maintenance a system should be so designed that reliability will be attained through rugged equipment and not by constantly going over the switches, buzzers, bells and other equipment to see that they are in good condition. Any system should operate a year without attention if properly designed and no unusual accidents, such as falling ground, occur. Maintenance costs can be reduced by laying out the system with a view of locating trouble quickly. No system will be entirely free from breakdowns, and with careful preliminary study it is possible to arrange for sectionalizing the main feeds and consequently reducing the time required to get the system back into service.

Simplicity is important because undue complications in the wiring make it hard for a new man on the job to follow. Consistent with the operating conditions to be met, a system should be as simple as possible to accomplish the purpose for which it is designed. Necessarily a wiring layout for a three-compartment shaft with two hoists is more complicated than a single-compartment shaft.

Selection of the Circuit Layout

As a typical example of how the circuit layout may be chosen, the work of the Copper Range Co. at Painesdale, Mich., with which I am familiar, is given. The work was begun in 1916 with an experimental installation in Champion No. 4, and five shafts were installed as rapidly as possible, varying in depth from 2,100 ft. to 3,500 ft. The systems were designed for 5,000 ft. of depth. The No. 4 shaft of the Champion Copper Co. at the time of the design was hoisting to practically absolute capacity, and any additional speed in signaling was therefore valuable.

In this district a lander is employed, and he does all signaling to the engineer. With the idea of relieving the lander of Sunday work it was desirable to design the system for dual operation, i.e., straight through from underground or through the lander. In each case, however, the signals were to be repeated back underground before starting the hoisting engine.

*Assistant engineering editor, *Electrical World*. Formerly assistant electrical engineer, Copper Range Co.

Referring to Fig. 1 it will be seen that the underground circuit consists of three wires and a ground return. As the shaft is two compartment, with ringing for one side (i.e., to ring the north side up ring the south side down), there is one bell in the engine house and one for the lander. The wires therefore consist of a feed, a bell wire, and a buzzer wire, using the ground return for both the bell and the buzzer circuit.

With the double-throw switch, in the lander's station, in the down position the operation is as follows. On closing the level switch buzzers on every level buzz, the lander's bell rings, and a set of green lamps light up in the landers' station. A set of four green lamps in the engine house also light up, giving the engineer a preliminary signal. On receiving the signal the lander repeats the signal to the engineer, causing the bell to

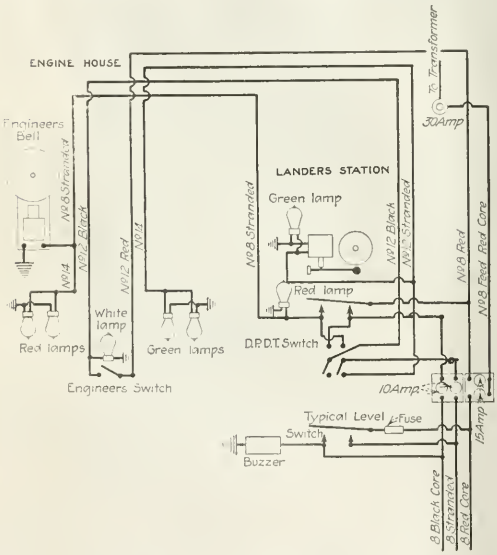

FIG. 1. DIAGRAM OF UNDERGROUND SIGNALING CONNECTIONS, CHAMPION COPPER CO.

ring and red lamps to light in the engine house. At the same time, however, the current flows back down the buzzer wire and all buzzers in the mine operate. As the lander rings the engineer's red lamps light in the lander's station, showing him that the signal system is operating correctly. The sender of the original signal knows that his signal has been correctly sent, as he hears the identical one sent to the engineer by the lander. The engineer has already had a duck signal on his green lamps, and if the signal from the lander should not agree the error would be evident. Three men are therefore on the job, and each knows what is going on. If by any chance the signal is not correct as repeated back the sender has an opportunity to stop the movement of the hoist, or if he is riding a skip he has an opportunity to jump off.

If it is desired to ring direct from underground to the engineer the double-throw switch in the lander station is thrown in the up position. In this case as soon as the switch at the level is closed the current flows up the bell wire directly to the engineer's bell, lighting the red lamp in the lander's station and also the red lamps in the engine house. It will be noted that in this contingency the green lamps are entirely cut off, as the circuit is open when the switch is thrown into the up position.

By following up the buzzer wire and passing through one pole of the switch it will be found that this wire also goes to the engine for a white light. As the buzzers operate underground this light illuminates, showing the engineer at once that the signal on his bell came directly from underground. By using the switch on his stand he repeats the signal back. While the engineer thus has definite knowledge that the system is operating direct from underground the lander always notifies him of the throwing of the switch making the change.

It might seem that there would be a loss of time in the repeating of signals, but in the handling of men a time interval must be allowed invariably, and in this case there is an actual saving of time, due to the fact that the men underground know exactly when their signal has been received. The engineer has been able to cut his time of waiting on that account. For hoisting ore there is a possible loss of time, but it is almost infinitesimal.

In this layout the telephone system has no part, as it is entirely independent. In some installations the telephones are a part of the circuit system, the wires running in the same conduit or cable. It is the belief of the electrical department of the Copper Range Co. that the two systems should be entirely independent and have no related functions. Though additional expense is involved in such a scheme it does away with the possibility of electrical troubles on the signal system, which might place the telephone service out of operation. In the telephone system of this company it is possible to talk from any surface location to about every third level in all shafts.

In the Butte district operations are carried out in a different way than in the Michigan copper country. A typical example of a more complicated system is shown in Fig. 2, which outlines the plan followed at the Pittsmont mine of the East Butte Copper Mining Co., Butte, Mont. There are in this case two distinct types of signals: (1) The signals that the station tenders use to connect with the hoisting engineer and top man, which none in the mine except the station tenders are supposed to use, and (2) a system of buzzer signals that are used by others in the mine for the purpose of getting the station tenders and in connection with the mine telephones.

As shown in the wiring diagram in Fig. 2 there are ten wires, as follows: East shaft compartment; west shaft compartment; "chippy" compartment; top man; telephone, (2); buzzer system, (3), and common return wire.

Each compartment of the shaft has a separate bell located in the engine house, and all pull switches operating in their respective compartments are in multiple. The buzzer system used for signaling station tenders and top men, and also as a call for the mine telephones, consists of one buzzer on each level, one at the surface, and one in the engine room. All buzzers operate when any buzzer switch is closed.

A system for a two-compartment shaft with a separate bell for each compartment is shown in Fig. 3. This system is in use at the Butte & Superior mine, Butte, Mont. From the sketch it will be seen that the general wiring scheme comprises one wire, No. 2, as a

common return wire, wires No. 1 and No. 3 as bell wires, and No. 4 and No. 5 taking care of the buzzer circuit. Pull switches are placed upon each level and in skip pockets within easy reach of the cage tenders. There is also a buzzer and push button on the engineer's stand. In case of a misunderstanding of signal the engineer can call for the signal to be repeated. The buzzers are independent of the hoist signals and are used for signaling cage tenders or by the engineer, as stated.

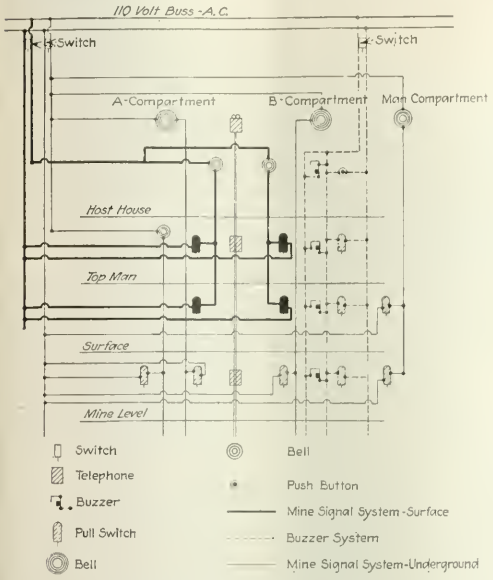

FIG. 2. DIAGRAM OF WIRING FOR MINE SIGNAL SYSTEM, EAST BUTTE COPPER MINING CO.

At the Ahmeek and Osceola mines of the Calumet & Hecla Mining Co. a system has been in use for a number of years that employs relays for the closing of the bell circuit. The system is operated on 220-volt direct current furnished by motor generator sets. The bell circuits are closed through relays, the shaft wires carrying only the current to operate the relays and the lamp in each switch box. These lamps, however, show only the flashes of the sending signal.

Having chosen the circuit layout, the most difficult part remains—that of selecting the equipment and the proper installation. Though designing the circuit on paper and determining what it is to do is important, the problem of meeting the severe operating conditions is the real stumbling block. The next logical step is the selection of the voltage and deciding whether alternating or direct current is to be used.

Numerous systems are operating on direct current through motor generator sets or storage batteries or both. There are some advantages to be gained, but on the whole the use of ordinary standard 60-cycle, 110-v. lighting current simplifies the problem. With the large systems electrified as they are, continuity of service is essential to other operations as well as to the signal system. This point may be dismissed as not so important as it might seem. Unless batteries are used, nothing is gained from the standpoint of service interruptions by using direct current. In mines that do not use the pull bell as a standby, but have an auxiliary electric system for emergency, the point should be considered more carefully. In such a case the system can be designed to operate on either current, storage batteries being used for emergency.

Single-stroke bells seem to be far more preferable to signaling work of this class than the vibrating type. The strokes being distinct and easily read, code signals with slight time intervals can be used. In the Michigan district the half bell is used extensively, in which case the hoist is moved slowly until the switch is released and the bell plunge or core drops back. The Copper Range Co. has developed a powerful engineer's bell of this single-stroke core type, with an 18-in. gong.

Reliability of bells is desirable and should not be left to guesswork. It is a simple matter to run a life test on a bell by devising a motor-driven circuit-closing apparatus. It is possible to produce in this way the effect of several years' operation in a week. The mechanical defects may then be corrected in the design, or the bell discarded entirely and another type tried. A bell should stand service for a year without repairs or inspection.

Buzzers suitable for mine use have been developed within recent years. They should be rugged and as near waterproof as possible. No adjustments should be required, and the life of the tongue should be as long as possible. The tone should not be unpleasant.

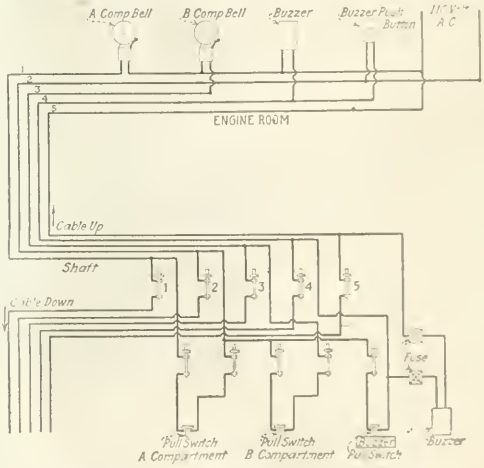

FIG. 3. WIRING DIAGRAM FOR TWO-COMPARTMENT SHAFT, SHOWING ONE METHOD OF LOOPING CABLE INTO JUNCTION BOX TO FACILITATE TROUBLE SHOOTING

Rugged types of switches for mine signal use have not been developed extensively. In the Butte district the switch developed by the Anaconda Copper Mining Co. has given good service. In the design of the Copper Range Co. a rugged oil switch has been built for this work. As shown in Fig. 4, this switch and the buzzer are mounted on a creosoted 2-in. plank as a standard station unit. The switch may be held in the closed position by means of the latch *A*. This is used by the dumpers to prevent the skip being rung away. While the switch is in the closed position all of the buzzers in the mine are sounding as a warning that the skip is being held. It would not be possible, however, to signal

the engineer by closing any other switch in the system.

Oil switches are used for several reasons. There is always a certain amount of arcing connected with breaking a solenoid circuit and in time this arcing burns through the contacts. The oil eliminates this source of possible trouble. The oil also lubricates the bearing surface of the plunger and prevents dust from making the switch sluggish. In case the switch is not operated for long periods the oil protects the contacts and spring from corrosion.

All of these items of equipment are important, and no thought should be spared in working out the design to obviate all possible defects. There will be breakdowns of various kinds, but if the mechanical details are

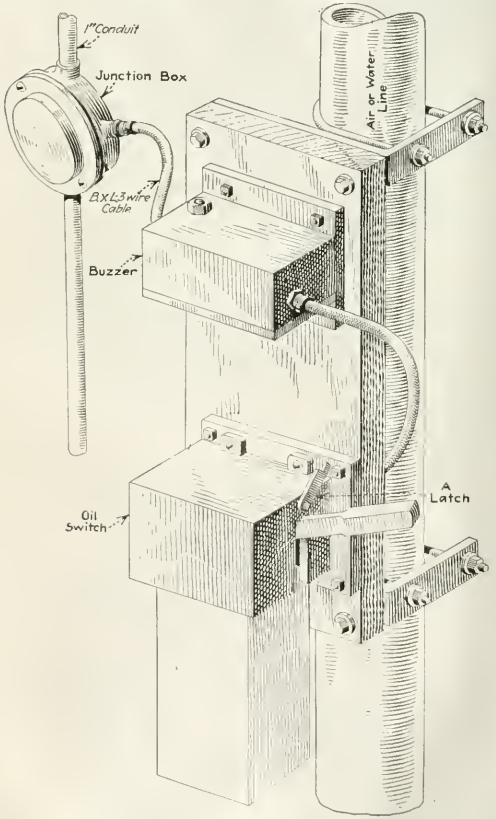

FIG. 4. GENERAL ARRANGEMENT OF OIL SWITCH AND BUZZER UNIT USED AT ALL LEVEL STATIONS AT MINES OF COPPER RANGE CO.

as perfect as possible the next source of trouble will be in the circuit.

Two methods of installation are in use for placing signal circuits in the shaft, one lead cable and the other conduit. In either case all wiring should be totally inclosed from the engine house to the last shaft station. Lead cable has the advantage of being waterproof, providing the entrances to junction boxes, buzzers, and switches are also watertight. Conduit circuits have given good service in many cases, and afford an easier method of pulling out a section for repairs. In the Butte district the practice has been to favor the lead cable for signal use. In the Michigan mines conduit is used. By placing junction boxes at every level with a conduit union above the box sections can be taken out easily in case of grounded circuits. Mechanical strength is essential, and partly for that reason No. 8 rubber-covered wire in one-inch conduit has been used in the system of the Copper Range Co.

To facilitate the location of troubles arrangement should be made for sectionalizing the line. In Fig. 3 this is done by the use of single-pole knife switches in the junction boxes. Each wire may be disconnected from the lower levels and by another switch from the circuit on the level. In Fig. 1 terminal lugs are used instead of switches for this purpose. In case of a ground on a wire in a 3,000-ft. shaft the line is opened at the 1,500-ft. level. If the trouble remains it is evident that the location of the ground is in the upper half. By repeating the sectionalizing the point may be located within a few levels, and by climbing the ladders and making an inspection of each station the trouble can usually be found quickly.

From an operating standpoint this is important. Cages and skips are for production use, and not for electricians to ride in looking for trouble on a signaling system. It is manifestly unreasonable to ask a wireman to climb several thousand feet looking for circuit troubles. By using the cage and sectionalizing half an hour is usually sufficient to locate the trouble within a comparatively short section. After this is done it is simple to climb the few hundred feet necessary to make the final examination.

Fuses should be so arranged that protection will be had on all parts of the circuit and in such a way that a blown fuse will indicate which wire is grounded.

First cost of a system is usually indicative of careful thought and may be the most economical expenditure in the course of time. The system of the Copper Range Co. showed a cost of approximately $1,985 for a 3,000-ft. shaft, including all possible items. All bells, buzzers, and switches were built in the shops of the company, and all materials were of the best. There has been practically no maintenance expense since the installation. The following table details the costs:

COST OF SIGNAL SYSTEM INSTALLATION FOR 3,000-FT. SHAFT

Underground Feed:		
3,000 ft. 1-in. conduit at $170 per 1,000	$510 00	
9,000 ft. No. 8 R.C. wire at $33 per 1,000	297 00	
30 PRX junction boxes at $3.48	104 40	
Fiber cleats, 30 at 20c.	6.00	
Labor (timbermen on conduit and boxes), three men at $4.75, two shifts	28.50	
Labor (electrician pulling main feeds), three men at $4.25, two shifts	25.50	
		$971.40
Underground Stations:		
Switch and buzzer units, twenty-nine at $26	$754 00	
Labor of installing at $1.25 per unit	36 25	
		790 25
Lander's Station:		
Material (wire, small switches, and necessary equipment)	$3 00	
Signal switch (already installed)	12 00	
Lander's bell	25 00	
Labor, two men, two shifts, at $4	16.00	
		56 00
Engine House Wiring:		
100 ft. 1-in. conduit at $17	$17 00	
300 ft. No. 8 R.C. Wire at $3.30 per 100	9 90	
Signal switch	12 00	
Engineer's bell	30 00	
Material, miscellaneous	5 00	
Labor, two men, five shifts, at $4	40 00	
		113 90
Line Work Between Shaft House and Engine House:		
500 ft. No. 6 W.P. wire	$20 00	
2,000 ft. No. 8 iron wire	26 00	
Labor, two men one day at $4	8 00	
		54 00
Total		$1,985 55

Mining Engineers of Note

Robert Matthew Raymond

THE eminent professional standing of Robert Matthew Raymond is largely due to an unusually wide experience in mining and metallurgical matters and the rare personal qualities that are his. In the apt words of a close friend and a fellow engineer of Mr. Raymond's, "Whatever his task, whether directing practical mining operations, examining and reporting on mines, acting as managing director in a foreign country, or the expert adviser of boards of directors, his executive ability, resourcefulness, personal initiative, good sense and tact have brought him success and distinction." His career is an illustration of the globe-trotting exactions of the mining profession, and there is not a continent which has not been the scene of his activities at one time or other. South Carolina Montana, Arizona, Australia, South Africa, China, Mexico, London and New York indicate the wide range of his fields of activity and the mining conditions with which he is acquainted. Mr. Raymond was born in Norton, Province of New Brunswick, Canada, and educated at the University of New Brunswick and the Columbia University School of Mines, interspersing his education with practical mining work. In fact, it was due to several years' experience as assistant assayer in the assay office of the State of Maine, and four years at the Haile gold mines, in South Carolina, under the late E. Gybbon Spilsbury, after his graduation in New Brunswick, that a definite decision to make mining his life's work matured. Graduating from the School of Mines in 1889, he immediately, as an assayer, entered the service of the noted metallurgist, Anton Eilers, who had built the Montana Smelting Co. plant at Great Falls, Mont., afterward becoming assistant to Robert Sticht, superintendent of the company, receiving valuable training under the guidance of these two able metallurgists.

R. M. RAYMOND

From 1891 to 1894 he was superintendent of the Diamond R. Mining Co. in Neihart, Mont., and then for two years general manager of the Harquahald Gold Mining Co. in Arizona, operated by an English company, in whose interest he next traveled to West Australia. It was during his stay in Australia in 1898 that he was engaged by the Exploration Co., Ltd., of London, a successful and well-known British mining enterprise and a syndicate which has been identified with large mining operations in all parts of the world. This connection is still maintained. Leaving Australia, Mr. Raymond was sent to South Africa by the Exploration company, where he remained for two years engaged in deep mining upon the Rand. The next jump landed him in central and western China, where he made some important examinations for his company. In 1902 he became general manager of the El Oro Mining & Railway Co. of El Oro, Mexico, one of the largest gold-mining properties in Mexico and controlled by the Exploration company, where the first cyanide plant in Mexico was erected. This successful installation paved the way for the general introduction of the process throughout Mexico and in many other parts of the world. Mr. Raymond gives much of the credit for the success of this work to Mr. A. F. Main, later superintendent of the El Oro company. In 1913 Mr. Raymond was promoted to managing director of the El Oro company and the Exploration Co. of England and Mexico, a subsidiary of the parent company, to reside at Mexico City, where he exercised not only the functions of an engineer but also those of a diplomat in the troublous and dangerous revolutionary periods.

Were it not for the fact that strong representations were made upon Mr. Raymond to accept the chair of mining in Columbia University left vacant by Prof. H. S. Munroe in 1916, and had he not been allowed to retain his connection with the Exploration company, it is doubtful whether he would have accepted the professorship tendered him.

Professor Raymond is a vice-president of the A. I. M. E., a member of the Mining and Metallurgical Society of America and the Institution of Mining and Metallurgy of London. In his retiring way, he requested us not to consider him in any biographical sketch—which modesty seems to us to constitute all the more reason for our directing the limelight this week in his direction.

BY THE WAY

New Mexico

Residents of New Mexico have started another move, it is said, to change the name of the state so that Easterners may really be convinced that New Mexico is part of the United States and not situated south of the Rio Grande. The promoters of the scheme hope to carry it to the state legislature. This is really very foolish. Since Villa raided Columbus everybody knows where New Mexico is. Incidentally, some are wondering, now that Villa has gone and got religion and a coat of whitewash, what we are going to do about it. New Mexicans who really want to prove that they are Americans might introduce a bill at Albuquerque providing that the sessions of the state legislature be conducted only in the English language. Some one told us some time ago that Spanish is practically as "official" there as English. Just as charity should begin at home, Americanization movements may well begin in state capitols.

Mining in Petticoats

The Seven Sisters Mica & Gold Mining Co. is reported by the press to have been organized by seven women who desire incorporation in Alabama for the mining of gold. This project is based upon the reported discovery of bits of gold in Cleburne County. Those who scoff can give no good reason why the venture should not succeed. Many men have fallen down on "Southern gold"; the ladies cannot do worse. Perhaps some day a successful mine will be opened in one of the districts that has a black eye today. These ladies will not be the first of their sex to enter into mining. Chloride, Ariz., has a new company opening up a promising body of silver ore, which has been very successful in its brief existence to date. Its president is a woman. The radium-bearing ore recently discovered in the White Signal district of New Mexico is said to have been recognized as such largely through the work of a woman. It is mill operation to which we would like most to see the ladies turn. We imagine they would be perfectly at home in the midst of a slopover. Would they clean out the launder first or run for a scrubbing brush? During the war, when many women entered industry usually monopolized by males, it was reported from one camp that the "lady mill-workers" showed a great fondness for cleaning house. There is more than one mill so carelessly and slovenly managed that the employment of a woman operative or two might be of benefit.

He Can Locate Deposits Of Platinum or Whiskey

A correspondent who claims to have phenomenal powers that enable him to read earth's secrets writes us as follows:

I have made some small mistakes due more to my enthusiasm than anything else, but we all have to learn our lesson, and I have much yet to learn, but I have also learned much that others would give a great deal to know, and one most positive feature of my method is that I need waste no time studying the mineralogical or geological formations first, but I can very quickly determine whether there is anything there of value and be on my way.

I claim and am ready to prove that I can locate and determine platinum and most all minerals of value from platinum down; also coal, oil, and gas. The only doubt that I have in regard to oil is the possibility of getting oil shale, but conditions would go far toward a determination. Gas gave me much experimenting, but I succeeded and can prove it. I have a general coal locator and one each for anthracite and bituminous coal that have proved entirely satisfactory on coal of both kinds received and sold here by several coal dealers.

I find most positive evidence of what I think must be a great deposit of coal that probably extends from the central states across Massachusetts and on into the provinces. This coal changes from anthracite to bituminous near the Massachusetts coast.

I have attractors for diamonds and other precious stones, and if you are yet sceptical and consider that I am an imposter I will come to New York and demonstrate my system, and I hope you will have a few gems that you will put up against my ability. We will go to any metal-supply house, and I will locate the different metals and outline them from any floor above them. I also forgot to say that if you have any alcoholic liquor in your building to beware, as I might be tempted to get on the trail.

I can locate fire and determine the extent of it. This, I think, may be useful in case of fires in mines. I also have an attractor for sugar, but have not yet made an effort to determine between sugar and molasses.

I am now experimenting to determine both hard and soft deep water streams. I am very sure now that I am right, but I will thoroughly prove that I am right or not by testing several hard and soft water veins that have been driven into near Boston.

A human body I can locate anywhere, but it would be rather difficult to determine the body of a baby from any other animal body unless it was known that a baby was buried there, but I can get the shape or position of a body and in that way I can tell the difference between a human body and an animal body.

All deep water streams run a few degrees east of north and a few degrees west of south. Do you know in which direction they flow?

I find two substances in connection with coal and oil and three substances in connection with coal and gas. Who knows what they are?

Also I would like nothing better than to meet a few of the best mining engineers that the country can produce and we will each be allowed one-half hour to find any faulted vein that you may know of, and if a reward can be offered let the one who finds it within the time limit take it (of course I mean the reward and not the vein).

No chance of passing a lead quarter on this gentleman, and as for gold bricks the gilt would not deceive him for a minute. Like all others of his kind, however, he keeps his secret to himself.

Municipal Oil Wells

It is reported that two oil wells were opened in Los Angeles in the last week in July by one of the minor earthquakes that have recently been disturbing the peace of mind of that city's inhabitants. Both of them, fortunately for the municipality, are on city property. One is said to be gushing great quantities of oil over the paved roadway, though the number of barrels produced per day is not mentioned. If this would happen more often earthquakes might lose some of their ill repute. There would also be something else to boost and boast about to visitors. With every shock, too, the secretary of the Chamber of Commerce or the Chamber of Mines can now be heard, no doubt, to murmur, "Another fault fissure opened," and then seen to rush his optimism into print in predictions of the city's future greatness. The skeptic might ridicule, but that would never affect the right kind of a secretary of a chamber of mines and commerce.

CONSULTATION

Delivered-Copper Quotations

"As operators selling our metals subject to quotations we would appreciate information on the change you have made in quoting copper prices. In your market report of April 10, 1920, under the subject of 'Metal Markets,' and under heading of 'Copper Markets,' you say: 'The prices obtained for actual large sales were fairly uniform at around 19c. delivered, or 18.80@18.85 net refinery, which we quote.' We presume this was the basis of quotations from April 1 to April 7 inclusive. On the first of this year we made selling arrangements for our copper for which we receive settlement as per terms and prices made by you at that time. We understand your quotations since April 1, or at least since April 10, are calculated at 0.15c. per lb. less than those of January; in other words, operators selling under the terms of your January quotations would be underpaid 0.15c. per lb. for April, May, June and July when settled on quotations given since April 10. In your Market Report of May 8, 1920, you mention 'delivered price.' Where is copper required to be delivered to receive this price and from what points or refineries are prices 0.15c. less than the New York delivered price?"

In the issue of April 3 the explanation of the deduction of 0.15c. from the average delivered price of copper as reported to us by the producers was first made. This deduction had been made before that; in fact, has always been made in making up the *Engineering and Mining Journal* quotations, and the matter was only explained so that those who followed these quotations would understand that the price was not the delivered price. Copper is usually sold nowadays by the producers on a "delivered" basis. Also, the price charged to the consumer is the same, regardless of the distance of the consumer from the producer's refinery; that is, a buyer in New York would be charged the same price for copper as a buyer in Massachusetts, although the former had his plant right alongside of the refinery. It is assumed that this delivery charge amounts to 0.15c. on the average, and this deduction is made to arrive at the net price which the producer receives. The confusion in the interpretation of the significance of the price arises solely out of the mistaken premise that the *Engineering and Mining Journal* has changed the basis upon which the copper quotations are recorded. This assumption is not true.

Zinc Oxide Literature

"Can you let me know where I can obtain some information on the subject of zinc oxide? A cursory examination has not enabled me to find any literature on the subject. Do you know of any book treating its occurrence, production and market? It does not appear to be quoted in the section of the *Engineering and Mining Journal* dealing with such subjects. If you can give me any brief general information as to its price, markets and distribution this would be much appreciated."

An extensive and authoritative article on zinc oxide appeared in the *Transactions* of the American Institute of Mining Engineers, Vol. 57, 1917, entitled "Zinc Oxide," by George C. Stone. This is the most valuable contribution to the technology of the subject of which we know. The U. S. Geological Survey records statistics of production and consumption and a communication addressed to that body will elicit information in that regard. The *Engineering and Mining Journal* does not quote prices for zinc oxide, as it is a chemical product. Furnishing such information would also involve quoting upon very many other chemical products in the same category. Although zinc oxide is commonly supposed to be used chiefly in paints, rubber compounds consume the largest quantity. Thus in 1919 about 60 per cent of the consumption was used in rubber manufacture, or about 71,000 short tons. There was sold 117,639 tons, in 1919, an increase of 17,363 tons from 1918, due to the larger demand from the rubber-tire industry. Present prices of zinc oxide are between 17c. and 25c. per lb. in carload lots.

The Ferromolybdenum Market

"I am anxious to get some up-to-date information on the present status of the ferromolybdenum industry. Any assistance you can give me as to the sources of information will be much appreciated."

Quietness characterizes the situation in the ferromolybdenum industry at present. This is due, according to one of the leading producers, to the slowness with which the alloy is finding application in steel manufacture—not to any shortcomings in the physical properties of molybdenum steel but rather to the newness of the introduction. It will take some time, according to this producer, before the use of molybdenum steel becomes more general. Substantial improvement in the near future is not looked for; instead, a gradual betterment and wider application in the use of molybdenum steel is anticipated. Comparison of this situation is likened with that when chrome and vanadium steels were introduced—an introduction that took many years before it could be called commercially successful and which required time for the alloy steel consumers, such as automobile manufacturers, through their own experimental work, to become thoroughly familiar with these two special steels so as to be able to use them to advantage. Although many exaggerated claims have been made regarding the properties of molybdenum steel, some of which no doubt have done more harm than good to the industry, this alloy steel has more than measured up to expectations.

The Climax Molybdenum Co., of 61 Broadway, New York, has issued a valuable booklet upon molybdenum steels which contains the records of much experimental data upon the behavior of this alloy steel.

As to sources of information, both the U. S. Bureau of Mines and U. S. Geological Survey may be able to give you production data and technological information. Then there are the producers and consumers of the metal itself, who in certain cases seem willing to supply information; but sometimes a narrow policy leads to unwarranted and unhealthy secretiveness. A suggestion would be to communicate with the sources mentioned, and accumulate a bibliography on the subject, which will help greatly in the work.

THE PETROLEUM INDUSTRY

Oil Possibilities in the Dry Piney and Big Piney Districts, Lincoln County, Wyo.

BY G. B. MORGAN*

ALTHOUGH oil has been discovered so far only in Secs. 1 and 12—28—114, of Lincoln County, Wyo., prospect wells are being drilled six miles north, eight miles south, and ten miles southeast of the proved area. The results obtained in these wells will determine whether or not there is just one structure or a system of north and south parallel folds or anticlines containing oil in the Cretaceous formations, which structures are practically concealed by the overlying Tertiary beds.

The Dry Piney field proper is about sixty miles north of Kemmerer and about the same distance from Opal, Wyo., both on the Union Pacific Ry. The structure covers about 1,000 acres in Secs. 6 and 7—28—113, and Secs. 1 and 12—28—114. The topography is characterized by a high north and south ridge, called the La Barge Ridge, on or near the crest of which the oil wells are situated.

Structurally, the La Barge anticline presents some rather unusual features in the Dry Piney field. The coal-bearing Adaville formation, of Montana Age, is exposed on the surface in a narrow strip through Sec. 12—28—114 W, and Secs. 7 and 18—28—113 W. These rocks are sharply flexed, dipping at an angle of about 25 or 30 deg. on each side of the axis of the anticline, which axis bears about N., 30 deg. W. Immediately to the east of the axis the Knight formation, of Eocene (Tertiary) Age, is found resting uncomformably on the Adaville, but dipping also to the east at an angle of about five degrees. On the top of the ridge in places and on the western flank the overlying rocks are pre-Carboniferous and consist of limestone, quartzite and conglomerate. They were pushed up in that position by the same forces that caused the folding, and the result is a tremendous overthrust fault of probably 20,000 ft. displacement. Much older rocks are thus over-riding the Cretaceous formations, and on either side of the ridge the younger Tertiary formations are resting unconformably on the Cretaceous to the east and the Cambrian to the west. The Tertiary beds are slightly arched, coincidently with the older formations. This arching in the Tertiary beds over the pronounced anticlines in the Cretaceous and older rocks, especially in this field where oil has been found, has given rise to the theory that slight folding in the surface beds of the Tertiary indicates underlying structures in the Cretaceous and possible oil reservoirs. A number of operating companies are working on this theory and have found several such structures, in which they are drilling test holes.

The oil in the Dry Piney field is found at a depth of about 1,000 ft. in a sand of the Hilliard formation, which probably corresponds to the Pierre or Steele shale of central and eastern Wyoming. The sand is reported to be 43 ft. thick in one well and much thicker in another, and is believed by some to be a lens rather than a sheet sandstone. The belief held by some geologists is that the Hilliard contains a number of such lenses which are more than likely oil-bearing, and, if so, the oil-bearing possibilities will not be so much governed by structural conditions for the reason that lenses are generally sealed off by inclosing shale beds. Above the sand there is a sandy shale which gives up a small amount of shale oil and contains a thin water sand. The Hilliard, as measured by Schultz, is about 3,000 ft. thick and is underlain by the coal-bearing Frontier formation. The Frontier in central Wyoming is the principal oil-bearing formation and is not coal-bearing. It is not improbable that the Hilliard will be found to contain the producing oil sands in this district.

More systematic and deeper drilling in this field should produce good results. More care should be taken to shut off the water before entering the sand in drilling shallow wells. Also, if proper precautions are not soon taken to shut off the water from the sand in the producing wells, the production from the first sand will be greatly impaired in this field.

*Abstract of Bulletin 9, Wyoming Geological Survey.

Drilling Activities in Arkansas

It has been announced that work will begin at once on drilling two wells for oil in Bradley County, Ark. The Southern Lumber Co. has entered into a contract with the Caldwell Oil Co., of Oklahoma, to sink five wells on the lumber company's holdings. A crew from Shreveport, La., has erected two derricks, one in the southern end of the county, near Morobay, and the other near Blue Springs.

The Southern Lumber Co. and the Arkansas Lumber Co. have a contract with the Standard Oil Co. by the terms of which the Standard will take over 10,000 acres owned by the lumber companies in the vicinity of Vick. The contract stipulates that the first well is to go down in the Vick vicinity within 120 days from the date of contract.

Petroleum in Bolivia

Interest is being manifested in the petroleum field of the Province of Azero, Bolivia, according to a report issued by the Department of Commerce, and indications seem to show that there exists in this region a substantial basis for the development of the oil industry. Vast concessions of lands in the area have been acquired and serious reconnaissance work has been carried on. A local company organized in Sucre and known as "Sindicato de Sucre" holds 65,000 hectares in the provinces of Azero and O'Connor and has a nominal capital of 1,000,000 bolivianos and a paid-up capital of 550,000 bolivianos. It posseses two drills, with which it intends to bore five or six wells. On the basis of the results which it anticipates from these wells the promoters of the company plan to organize a larger company to work their holdings.

NEWS FROM THE OIL FIELDS

Texas Co. Increases Capital Stock

From Our Special Correspondent

An amendment to its charter has been filed at Austin by the Texas Co., increasing its capital stock from $85,000,000 to $135,000,000. This is the formal filing of the amendment, although the stock increase was made at a regular stockholders' meeting last autumn. The stock was paid up 30 per cent Jan. 9, 30 per cent April 9 and 40 per cent July 9.

The Texas Co. gusher at West Columbia, Brazoria County, continues to flow at the rate of 25,000 to 30,000 bbl. per day, according to the last report. This well has caused the prices of leases in and near the field to increase tremendously. A one-half royalty on two and one-half acres is said to have sold for $15,000. Leases on many other tracts have sold for from $3,500 per acre down to several hundred dollars, depending on location. One tract of twenty acres, a considerable distance from the gusher and near which a dry hole was drilled some time ago, brought $600 per acre with a one-eighth royalty held out.

The Gonzales Creek Oil Co., which owns twelve acres within the city limits of Breckenridge, Stephens County, brought in a well recently which made an initial production of 1,500 bbl. daily, and later increased to 7,500 bbl. Considerable oil was lost before the big flow could be handled. The company was organized four months ago, and is capitalized for $90,000. The larger part of the stock is said to be held by Breckenridge men.

Extensive wildcat drilling is being done in the western part of Lampasas County. Possibly a dozen wells are being put down, and seven of them range in depth from 1,200 ft. to over 2,000 ft. Though no producing well has yet been completed it is claimed good oil and gas showings have been found.

Red River Boundary Case Holds Hearing

From Our Special Correspondent

Taking of evidence in the Red River boundary case between Oklahoma and Texas has begun in Oklahoma City before Special Commissioner Frederick S. Tyler, of Washington, D.C. Attorney General Prince Freeling, of Oklahoma, and Attorney General C. M. Cureton, of Texas, are present. Several hundred witnesses have been summoned, and it is expected that it will require over two weeks to take the testimony. The first witness for Oklahoma was Judge George S. Marsh, of Madill, Okla., whose testimony was supported by old Spanish treaties and by a diary of President Adams regarding the boundaries now in dispute.

Tar Sands in Alberta To Be Tested for Oil Recovery

From Our Special Correspondent

The Canadian government has withdrawn from sale, lease, or settlement approximately 55,000 acres of land along the Athabasca River in Alberta, subject to leases already issued under the petroleum and natural gas regulation. This action is taken because representations have been made to the Department of the Interior that as the result of investigations recently undertaken it is confidently expected that a successful process will soon be evolved for the extraction from the tar sands of the Athabasca River of oil, bitumen, and other hydro-carbons in commercial quantity. In 1913, Dr. Bosworth, of the Imperial Oil Co.'s research laboratories, estimated that sufficient oil could be obtained from the Athabasca tar sands to supply the world demand for many years. Before the war Germany sent a number of chemists to make surveys of the tar sands, to obtain a supply of oil and gasoline. One of these chemists had secured a lease in 1913, but died on his return voyage to Germany. Attempts have been made to compute the amount of the tar sands available for reductions, but the nearest estimate that can be at present made runs into billions of tons. The one drawback to development is the scarcity of fuel to withdraw the oils for which heat is necessary, but there are hopes that this can be overcome by the finding of natural gas at McMurray.

The Canadian government has granted tar sand rights to 1920 acres to General William Lindsay, who claims that investigations conducted on behalf of himself and associates have resulted in the discovery of a successful process for the extraction of the oil, bitumen, and other hydro-carbons contained in the tar sands.

During the last two weeks the U. S. Geological Survey has required an average of only four days for passing on the geological features of permits under the Mineral Leasing (Oil Lands Leasing) Law. The work has been so systematized that little delay now results in establishing whether the permit applies to an area within or without a geological structure of a known oil field.

The Midwest Co. is sinking a new well north of Boulder, Col. Plans call for sinking the well to a depth of 4,200 to 5,000 ft., with the view of putting it through the Benton shale. The hole is started with a 20-in. diameter. The Midwest holds drilling contracts on about 500 acres of land adjoining the tract on which they are now working.

Kentucky Production Decreases

From Our Special Correspondent

Production in Kentucky decreased considerably last month. Wells completed number 189, a falling off of 107. New production was 7,529 bbl., a decrease of 559 bbl. Work under way totals 979 wells.

Whittle No. 1, a small well on the Bailey farm near Bowling Green, Warren County, has suddenly developed into a sensation, for conservative Kentucky. When the tools were pulled on Aug. 13, the flow from the well increased to 100 bbl. per hour, or about 2,000 bbl. a day. The tools had been left in the hole six weeks ago when there was a fire at the well. Whittle No. 3 is expected in early next week, and has practically the same formations and other indications as No. 1, according to O. F. Whittle, the owner.

The big gas well found two weeks ago on the Smith farm near Temple Hill, Barren County, by the Merry Brothers, has settled down to a production of 15,000,000 cu.ft. daily, according to the mercury test. The well is characterized by experienced oil and gas observers from Louisiana as the best one north of their own fields. Merry Brothers already have begun another well across the creek, and intend to put down four others as soon as possible.

James & Watkins of Chattanooga, owners of No. 2 on the Perkins lease on the Barren River Pike, report that the well is pumping 200 bbl. a day, which has continued for two days.

The Hugh Potter gusher brought in a short while ago seven miles south of Bowling Green, is now rated at about 700 bbl. production daily.

Japanese Oil Discoveries

Although a number of wells sunk in Formosa have proven failures or disappointments, one well recently sunk in Kagi Prefecture, Formosa, is reported as producing 400 gal. of oil an hour, from a depth of 400 ft., while another bore on that island failed entirely. It is reported that a new gusher had been struck at Kami-Shin-jomura, Minami Akita-gori, after boring to a depth of over 667 ft., which yielded about 3,400 gal. of oil per hour. Due to a shortage of vessels to transport the oil, large reservoirs are being dug in which to store it.

The Pomona Oil Co., which is owned largely by Riverside, Cal., interests and which is drilling its first well south in the hills of that county, is now down 1,700 ft and is being utilized by the management for the fires under the boring and water boiling machinery.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Demurrage Claim on Frozen Ore Shipments Valid

U. S. Supreme Court Allows Charge of Pennsylvania R.R. Against Kittaning Iron & Steel Co.

In the demurrage case of the Pennsylvania R.R. Co. vs. the Kittaning Iron & Steel Manufacturing Co., the Supreme Court of the United States has reversed the judgment of the Supreme Court of Pennsylvania. Mr. Justice Brandeis delivered the opinion of the court.

It appears that the Uniform Demurrage Code was duly published as a part of the freight tariffs of the Pennsylvania R.R. prior to Nov. 1, 1912. On various dates from Nov. 1, 1912, to April, 1913, the Kittaning Iron & Steel Manufacturing Co. received from the railroad an aggregate of 227 cars of iron ore, all interstate shipments; and on them the railroad claimed $1,209 for demurrage. The company refused to pay these and other demurrage charges, and this action was brought to recover the amount. The trial court disallowed the claim and the judgment was affirmed by the State Supreme Court.

Before the ore cars were received the Kittaning company had entered into an average agreement with the railroad, as provided in Rule 9 of the code. The aggregate number of days' detention of these cars after they reached the company's interchange tracks (in excess of the free time under the average agreement), was 1,209; and the demurrage charge fixed by Rule 7 was $1 per day, or fraction thereof, that a car is detained after the expiration of the free time. The ore of these cars was frozen in transit; and the company insisted that this detention of the cars beyond the "free time" had resulted from this fact, and claimed exemption from demurrage charges under Rule 8.

"When shipments are frozen while in transit so as to prevent unloading during the prescribed free time, this exemption shall not include shipments which are tendered to consignee in condition to unload. Under this rule consignees will be required to make diligent efforts to unload such shipments."

The Kittaning company had at its plant a device for thawing cars of frozen ore through "steaming." By this means it was able to unload as much as five cars of frozen ore a day. The daily average number of cars of frozen ore received during the period involved was far less than five cars. On some days only one or two cars were received, though on others as many as thirty-five arrived.

The railroad contended that the determination in any case whether a detention was due to the fact that the contents of a car was frozen could not be affected by the circumstances that a large number of such cars happened to have been "bunched"; and that, as each car, considered separately, could have been unloaded within the free time, the consignee must bear whatever hardship might result from many having arrived on the same day, unless relief were available to him either under the "bunching rule" or under the "average agreement." The question presented, says the court, is that of construing and applying the frozen-shipments clause.

The purpose of demurrage charges is to promote car efficiency by penalizing undue detention of cars. The circumstances of the particular shipper was not considered in fixing the free time of the Uniform Code. When the framers of this code prescribed forty-eight hours as the free time, they fixed the period they considered reasonable for the average shipper to unload. In many cases more time would be required, and, in many, less.

In applying the allowance of free time and the charges for demurrage the single car was treated throughout as the unit, just as it is in the making of carload freight rates. The effect on the charges of there being several cars involved was, however, provided for by two rules: (1) The bunching rule, under which the shipper is relieved from charges if, by reason of the carrier's fault, the cars are accumulated and detention results. (2) The average-agreement rule, under which a monthly debit and credit account is kept of detention, and the shipper is relieved of charges for detaining cars more than forty-eight hours by credit for other cars which have been released within twenty-four hours.

From the hardship resulting from excessive receipts of cars even where shipments are not frozen, either the bunching rule or the average agreement ordinarily furnishes relief. If the company had not elected to enter into the average agreement the bunching rule might have afforded relief under the circumstances which attended the deliveries here in question. As any one of the 227 cars on which demurrage was assessed might have been unloaded within the forty-eight hours free time, the undue detention was not the necessary result of the ore therein being frozen, but was the result of there being an accumulation of cars so great as to exceed the unloading capacity. And the court thought that the frozen shipment rule did not depart from the established policy of treating the single car as the unit in applying demurrage charges as well as in applying carload freight rates.

The judgment of the Supreme Court of Pennsylvania was reversed.

Public Use of Tract on Grand Canyon Affirmed

Cameron Denied Title to Claims About The Head of Bright Angel Trail, In Colorado

The Supreme Court of the United States has affirmed judgment in the case of the United States against Ralph H. Cameron and others, enjoining the defendants from occupying, using for business purposes, asserting any right to, or interfering with the public use of, a tract of land in Arizona, approximately 1,500 ft. long and 600 ft. wide, which Cameron was claiming as a lode mining claim.

The tract is on the southern rim of the Grand Canyon of the Colorado and embraces the head of the Bright Angel Trail. Since 1908 all but a minor part of it has been a part of the Tusayan National Forest reserve. This was withdrawn from operation of the public land laws, except the mineral land law, but therein was a saving clause in respect of any "valid" mining claim theretofore acquired. The court herein holds that Cameron's mining claim is not valid.

This claim is known as the Cape Horn lode claim, and was located by Cameron in 1902, after the creation of the forest reserve, and before the creation of the monument reserve. To make the claim valid, or to invest the locator with a right to the possession, it was essential that the land be mineral in character, and that there be an adequate mineral discovery within the limits of the claim as located (Revised Statutes, No. 2320), and the discovery must have preceded the creation of the reserve.

Cameron also had sought patents for other claims embracing other portions of the trail into the Canyon. Protests to his claims were made, charging that the land was not mineral and that there had been no supporting mineral discoveries. After a hearing the Commissioner of the General Land Office held the claims were not valuable for mining purposes, and therefore invalid. The matter was appealed to the Secretary of the Interior, who said, among other things:

"With that possible exception (in the case of the Magician lode claim), the probabilities of such deposits occurring are no stronger or more evident at the present time than upon the day the claims were located. The evidence wholly fails to show that there are veins or lodes carrying valuable and workable deposits of gold, silver, or copper, or any other minerals within the limits of the locations. Sufficient time has elapsed since these claims were located for a fair demonstration of their mineral possibilities."

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Society of Economic Geologists Organized

New International Society of Geological Engineers Will Advance Geology as Applied to Mining and Other Industries

As the result of a movement which began in December, 1919, a special society for professional practitioners of applied geology, or geological engineers, has just been organized. The objects of the society, as stated in the preamble to the constitution, are:

The advancement of the science of geology in its application to mining and other industries; the diffusion of knowledge concerning such application; the advancement and the protection of the status of the profession; the definition and maintenance of an adequate professional standard; and the formulation and maintenance of a code of professional ethics.

The name of the new society will be the Society of Economic Geologists. This was selected as the result of a ballot in which the names Society of Applied Geology and Society for Geological Engineers were also balloted for.

The following officers have been elected:

President R. A. F. Penrose, Jr., Philadelphia, Pa.; vice-president, E. S. Bastin, Chicago, Ill.; secretary and treasurer, J. Volney Lewis, New Brunswick, N. J. The other directors are W. H. Emmons, Minneapolis, Minn.; Hoyt S. Gale, Washington, D. C.; Waldemar Lindgren, Boston, Mass.; A. C. Veatch, New York City; and H. V. Winchell, Minneapolis, Minn.

The official organization meeting of the society, which will begin its first official calendar year, will be held in Chicago, Dec. 28 to 30, 1920, at the same time and place as the meeting of the Geological Society of America. The new society is intended to be not only national but international in its scope, and for this reason the word American has been omitted from its name.

The organization was effected by a selected committee of sixty from among the most prominent geological engineers of the country. However, the constitution provides that the charter members shall be those elected during the first year of the society.

Extracts from the Constitution follow:

Membership

The society shall comprise members, who, by knowledge, experience and honorable standing are qualified to advance the objects of the society, and who shall be elected to membership as hereinafter provided.

It may also comprise associates, who shall have the privilege of attendance at meetings, presentation of papers, and receipt of proceedings, if any.

A candidate for membership must have had eight years' professional experience, including not less than five years of work principally devoted to geology applied to mining or other industries, of which three years must have been in positions of responsibility. Graduates in geology or engineering of approved schools shall be credited, as to the eight years, with one-half of the time prescribed for graduation. Geologists or engineers who have rendered signal service in application of geology to mining or other industries may also be eligible.

A candidate for associateship shall have been engaged in studying or practicing the science of applied geology for at least two years. The object of the associate class is to open the advantages of the society to students and younger workers.

Officers and Directors

The affairs of the society shall be managed by a board of directors, who shall be elected annually by letter ballot in the manner hereafter prescribed.

The board of directors shall consist of the officers of the society named below, and five other directors. The officers of the society shall consist of a president and vice-president, who shall be elected annually as hereinafter provided, and a secretary and treasurer, who shall be elected by the board of directors. The offices of secretary and treasurer may be combined in one person by vote of the board of directors. The term of office of the other directors shall be two years. At the first election five directors shall be elected, three to serve two years, and two to serve one year. In the event of a vacancy in the board of directors the remaining directors of the board may elect a successor to fill the vacancy until the next election. Directors are permitted to vote by proxy.

Stated Meetings

There shall be two regular meetings at times and places to be decided on by the board of directors.

Admissions

A candidate for membership must be proposed by three members; and if approved by the board of directors, shall, after investigation, then be elected by a direct ballot vote of all the members of the society, subject to final confirmation by the board of directors. In the election of members by the society three-fourths of all votes cast shall be be required to elect; provided that if ten votes be cast against the candidate he shall be considered rejected. A candidate for associateship must be proposed by three members, and shall be elected by the board of directors. In the confirmation of membership and election of associates by the board of directors a majority vote is necessary for acceptance; provided that two adverse votes in the board may defer the acceptance, in which case the board may again consider the candidate and vote on him for acceptance at any meeting after the lapse of one year.

Annual Dues and Life Membership

The annual dues of members shall be $5. The annual dues of associates shall be $5. Life membership shall be $75.

Nominations

A feature of the by-laws of the society is in regard to nominations and elections:

In all elections of officers, members shall be provided with tickets containing the nominations of at least three candidates for each office.

In advance of the annual meeting the board of directors shall appoint a nominating committee of three members, not more than one of which shall be a member of the board. This committee shall nominate three candidates for each office to be filled by election at the ensuing annual meeting, and these nominations will be sent to the members at least ninety days before the time of the annual meeting. To this ballot shall be added any further nomination which is proposed and supported by ten or more members. Such further nomination must be received by the board at least sixty days before the date of the annual meeting, and the nominating committee shall send out ballots containing a complete list of nominees at least forty-five days before the meeting. Votes to be counted must be received by the committee of tellers on the day previous to the first day of the annual meeting.

A plurality vote shall elect.

Another feature provides for the retirement of the officers if their actions are not approved of by the society.

Vote of Confidence

The board of directors by a [illegible] fifths vote of the directors or upon the request in writing of 20 per cent of the members of the society shall submit any question upon which they have passed to the membership for a vote of confidence. Such vote must be inaugurated within fifteen days after action for a vote of confidence has been passed by the board or a request in writing by 20 per cent of the members of the society has been received by the secre-

tary; and the majority of votes received within thirty days after the mailing of a ballot shall decide. In case such question is decided against the board, the members thereof shall forthwith resign office, their resignations to take effect on election of their successors, and a new election of the whole board shall be immediately ordered to be conducted as provided in the bylaws.

Interest in and Utilization of Liquid Fuels in France

The following from *Echo des Mines et de la Métallurgie* is a summary of a recent address by M. Dumanois, chief engineer of the Marine, before Société d'Encouragement:

Before the war, coal formed France's chief source of fuel. Her coal production, which was becoming deficient, had been further diminished by subsequent conditions, and attention has now turned to the possibility of substituting liquid fuels, especially petroleum and its derivatives. Some delude themselves with the belief that liquid fuels can permanently replace coal and that their use can end the fuel crisis. In the first place, petroleum is an imported product which, under unfavorable exchange, at present is procurable at a high rate, and this condition is likely to continue.

Since abandoning their rights in Upper Mesopotamia and in Kurdistan, no oil source is under the control of French interests and their domestic and colonial production is insignificant.

But France has to fear a crisis in quantity rather than in price of liquid fuel. The world production of mineral liquid fuels is really notably less than the world's consumption. The United States, which furnishes 70 per cent of the world's total supply, while consuming 85 per cent, must import oil (e.g. 5,000,000 tons of Mexican oil in 1919), and drew more than 3,000,000 tons from their reserves in both 1918 and 1919. Their consumption in 1918 amounted to one twentieth of their underground reserves.

In 1918 the world's production of crude oil was less than 80,000,000 tons, which is the equivalent of annual consumption in coal of France. If one considers the great excess in calorific power of gasoline over coal, and its better thermic utilization, it is seen that to replace only 20 per cent of the French coal consumption by gasoline they should have to absorb more than one-tenth of the world's oil production. The fuel crisis is world-wide, however. One may say, then, that in the near future, France will be altogether without petroleum and its derivatives.

Nevertheless it is of the first importance, for the national defense, that France have a supply of liquid fuel. M. Dumanois, therefore, is of the opinion that liquid fuel, being the fuel de luxe, should be specially reserved for Diesel engines, and that modifications in existing installations should aim at improving both the rational use of solid fuel and the technical efficiency of the personnel in charge.

In closing the speaker pointed out the value and interest of the following: Searches for oil in France and her colonies; the development of the bituminous shale (shale oil) industry, and of winning oil from coal. He was quite in agreement with Barbet as to the possibility of securing cheap and adequate supplies of alcohol from the colonies, e.g., of banana alcohol, and stated that it was possible to secure supplies of castor oil from the colonies to take the place of mineral oil lubricants. Such a measure would insure France against future needs and enable her to decrease importations of petroleum and its derivatives.

Robert W. Hunt Medal Committee Proposes Portrait of Medallist

The Robert W. Hunt Medal Committee of the A. I. M. E. was organized for the purpose of raising funds for the Robert W. Hunt Medal, but the partners and employees of Robert W. Hunt & Co. insisted on presenting these funds to the Institute, and therefore raised and paid over a fund of $7,500 in addition to the $1,000 paid for designs and die-cutting. Its proceeds provide the annual medal and money prize. The committee, therefore, now proposes to the members of the Institute that a fund be raised by subscription among the members for the painting of a portrait of Captain Hunt to be presented to the Institute and placed in its Members' Rooms along with the portraits of Dr. Rossiter W. Raymond and others. Captain Hunt has been twice president of the A. I. M. E. He has served for several years as a member of its governing body. He was also the recipient of the John Fritz Medal.

It is desired that the tribute be made as popular as possible by having a large number of members subscribe. Sums of $1 or less will be gladly received. The excess over the $25 subscribed by any individual will be returned, provided the necessary amount for the portrait is oversubscribed. Checks should be made out to the Robert W. Hunt Fund and addressed Secretary, American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City, N. Y.

Engineers' Club of Duluth Elects New Officers

At the annual meeting this year The Duluth Engineer's Club elected W. S. Heald, president; O. B. Bjorge and Ray S. Huey, vice-presidents; Geo. C. Olmsted, secretary; and A. U. Shipman, treasurer. Other members of the board of directors will be A. M. Frazee, Frank Hutchinson, W. J. Mathews, and Col. F. A. Pope. The club's representative on the Minnesota Joint Engineering Board will be W. H. Woodbury, the former secretary; and ex-director J. L. Pickles was elected delegate to the organization Committee of the Minnesota Federation of Engineers.

Federated Engineering Societies Invites Others To Join

Joint Conference Committee, Acting Ad Interim, Sends Cordial Letter

It has been frequently insisted that the recently organized "Federated American Engineering Societies" should be spoken with the accent on the last word—the federation does indeed aim to unite societies into an effective union. In furtherance of this ambition the Joint Conference Committee of the A. S. C. E., A. I. M. E., A. S. M. E., and A. I. E. E., acting under the authority of the Organizing Conference, is mailing the following invitation to the engineering and allied technical organizations of the country.

THE FEDERATED AMERICAN ENGINEERING SOCIETIES
JOINT CONFERENCE COMMITTEE
29 West 39th Street, New York
July 26, 1920.

My dear Sir:

The Joint Conference Committee of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, acting as the Ad Interim Committee in accordance with the authorization of the Organizing Conference held in Washington, D. C., June 3-4, 1920, extends to your organization a cordial invitation to become a charter member of the Federated American Engineering Societies, and to appoint delegates to the first meeting of the American Engineering Council, of which due notice will be given, to be held in the fall of this year.

There has been previously sent to you an abstract of the minutes of the Organizing Conference, at which there were in attendance 140 delegates, representing seventy-one engineering and allied technical organizations. It was the unanimous opinion of the conference that there should be created an organization "to further the public welfare wherever technical knowledge and engineering experience are involved and to consider and act upon matters of common concern in the engineering and allied technical professions," and that this organization should consist of societies or affiliations, and not of individual members.

On the basis of these fundamentals the attached constitution and by-laws were unanimously adopted by the conference.[1] These contain full information concerning the Federated American Engineering Societies, the American Engineering Council, its executive board, and of the various officers and committees. The basis of representation therein stated for the American Engineering Council is one representative for from 100 to 1,000 members and an additional representative for each 1,000 members or major fraction thereof.

At the gathering in Washington, which was the greatest event in the history of the engineering and allied technical organizations in this country, steps were taken which created "The Federated American Engineering Societies," which will have a far-reaching influence on the future of these professions. The fact that this action was taken without a dissenting vote indicates that the psychological moment had arrived and that there was a unanimous desire on the part of the representatives of these professions for the organization formed.

The Joint Conference Committee, the Ad Interim Committee, would ask each organization invited to take favorable action in the matter of membership in the organization at the earliest possible moment and to advise the committee promptly of the names of the delegates who will attend the first meeting of the American Engineering Council in November of this year.

The Joint Conference Committee is confident that with the universally acknowledged need for such an organization there will be a prompt affirmative response to this invitation. Very truly yours,

JOINT CONFERENCE COMMITTEE of
American Society of Civil Engineers
American Institute of Mining and Metallurgical Engineers
American Society of Mechanical Engineers
American Institute of Electrical Engineers

[1] See *Engineering and Mining Journal*, June 12, 1920, pp. 1323-1324.—EDITOR.

Book Reviews

The Magnetite Deposits of the Eastern Mesabi Range, Minnesota. By Frank F. Grout and T. M. Broderick. Bull. 17, Minnesota Geological Survey. 54 pages.

This bulletin deals with the eastern end of the Mesabi Range, where the iron-bearing formation has undergone metamorphism, resulting in a notable change of the iron into magnetite and the development of silicates, such as amphibole and pyroxene, especially close to the intrusive (Keweenawan) gabbro, which has been the cause of metamorphism. The immediate incentive to the study was the possibility of commercial magnetic concentrations of the low-phosphorous magnetic ores. The results of the study indicate that the metamorphism has not modified the iron distribution, the concentration having been antecedent; and that most of the beds showing iron concentration are conglomeratic. These are valuable observations, as is the separation of the iron-bearing formation (350-500 ft. thick) into a number of separate beds which have different economic importance, and so form valuable aids in prospecting. Even intrusive diabase sills may serve as markers.

Amphibole (mainly actinolite) is abundant, intergrown with quartz and magnetite and probably resulted from metamorphism of the glauconite mineral greenalite. Metamorphic minerals also include fayalite and garnet. Greenalite was found in the western part of the area, but is metamorphosed near the gabbro. The authors have checked the low alkali content, which is like that on the western Mesabi.

"Most of the rocks are derived from an original sediment containing granules that may have been greenalite, but the greenalite is so altered in most specimens that the name greenalite-rock is applicable to very few." "The so-called 'cherts' are derived by alterations from the rocks with granules like those of greenalite." "For the rocks of the east Mesabi there are several reasons why the name chert is not very satisfactory" (p. 14). All this, though we believe true, is not new, though it is stated here apparently as an original proposition. The original mineral of the Mesabi iron was discovered and described by Spurr in Bull. X, Minn. Geol. Survey, as an alkali-poor glauconitic mineral, and the nature of its disintegration into iron oxide and so-called "cherty silica," as shown with exemplary clearness under the microscope, was described; further the segregation of these products into separate bands or masses, producing the so-called banded "jasper and iron," was fully followed and described. These conclusions were accepted and followed by Leith and Van Hise, who called the glauconitic mineral greenalite. The discussion in the bulletin under review does not add to the clarity of the conception; indeed it would be difficult for the uninitiated to form a clear idea of the genesis of the iron and silica from this bulletin. The Lake Superior geologist suffers under the same handicaps of provincialism and inherited dogma as does the Mississippi Valley geologist: and in the Lake Superior district it appears to be impossible to break away from the hazy and mazy conception of original precipitation of "cherty siderite and sideritic chert," the like of which was never seen on sea or land. This conception antedated the discovery of the glauconitic mineral greenalite on the Mesabi, where Spurr showed that the "cherty siderites and sideritic cherts" was one phase resulting from the disintegration of the original iron silicate; and the attempt to embrace the new knowledge, without giving up the conclusions from the old data, leads to a great burden of confusion. Thus some beds of this Mesabi iron-bearing formation, which altogether is only a few hundred feet thick, are apparently conceived of by the writers of the bulletin under review as direct chemical precipitates of silica and iron—in this case assumed to have been mainly limonite (p. 4)—whereas others are believed to have yielded the same products of silica and iron oxide from the disintegration of the green iron silicate. Other and younger glauconitic formations in other regions, which are agreed to have formed under analogous conditions, offer no warrant for the theory of the primary precipitation in sea water of banded colloidal or cryptocrystalline silica, and iron carbonate or oxide; and we are inclined to regard the theory as unwarrantably imaginative.

As an example of a flight of fancy we may quote the following: "This assumption of leaching of silica in a sea where silica was accumulating does not appear plausible unless, as was true in this case, some alternative of conditions is indicated. In a shallow sea the contribution of iron and silica from magmatic or other source may furnish plenty of material for deposition. But at a distance from the source any addition of fresh water, *say from a heavy rain on the adjoining land*, would crowd back the depositing solutions and replace them by water that would dissolve and oxidize the deposits, until diffusion and convection again brought in the stronger solution." We are tempted to fall back on the desperate remark of the hero of Booth Tarkington's "Seventeen," and say "Ye Gods!"

An interesting and valuable contribution is the discovery, in certain beds of the iron-bearing formation, of markings apparently representing algae (seaweeds) which grew in the accumulating sediment and which are similar to those observed by Dr. E. S. Moore in the iron formations near Hudson Bay, and very much like those described by C. D. Walcott from the Pre-Cambrian in Arizona and Montana. J. E. S.

Nickel Smelting—The August Bulletin of the Canadian Mining Institute (503 Drummond Building, Montreal) gives a complete description (pp. 40) of the International Nickel Co.'s smelter.

Technical Papers

Accident Prevention—In 1916, five of the largest mines in the Butte district had 630 fatal and serious accidents underground in 4,893,258 shifts worked. "At this rate, if the miner should average 300 underground shifts a year, the chances of a fatal or serious accident happening to him would be at the average rate of one in 26 years." This is quite often enough, it seems to us, particularly if the accident should be one of the fatal kind. However, a lot has been accomplished in the Butte district in making conditions safe. Educational and social service work also come within the province of the safety department. Those interested should send 10c. to the Superintendent of Documents, Washington, D. C., for Bureau of Mines Technical Paper 229, "Accident Prevention in the Mines of Butte, Montana."

Earth Temperatures — The U. S. Geological Survey has just issued Bulletin 701 (price 20c. from the Superintendent of Documents, Washington, D. C.), entitled "Geothermal Data of the United States." All available data on the rate of increase of temperature with depth in this country is presented. The information is given by states and no general average is attempted. The rate of temperature increase varies with the conductivity of rocks, underground tension, mineralization, volcanic influences, movement of underground waters, the presence of large bodies of surface water and possibly with variations of radio-activity.

Research—The problem of research has generally been conducted in a somewhat hit-or-miss system in this country. Recently the National Research Council has been formed to assist in meeting some of the needs of scientific organization. "The Development of Research in the United States," by James R. Angell, states broadly some of the problems to be solved. This address may be obtained for 25c. from the National Research Council, 1201 16th St., Washington, D. C.

Concrete Mine Shafts—With shafts sunk in porphyry, considerable trouble often occurs from "swelling" due to air and moisture altering the rock structure. This seems to be prevented by a comparatively thin coating of concrete. The shaft is also made safer and more permanent. It is fireproof, and the ingress of water is easily controlled. In the *Salt Lake Mining Review* of July 15, (Salt Lake City, Utah; price 15c.) the method of concreting the [illegible] compartment No. 2 shaft of the Chief Consolidated, at Eureka, [illegible] described.

Storage Batteries—We advise any of our readers [illegible] paint... storage-battery trucks or tractors [illegible] sent free, to the Superintendent of Documents, Washington, D. C., for Bureau of Standards Circular No. 92, 74 pages. It is devoted to the operation and care of vehicle-type batteries.

MEN YOU SHOULD KNOW ABOUT

E. P. Mathewson, mining enginer, has gone to Arizona on a professional engagement.

D. S. Dean inspected the Menominee and Gogebic range mines of the Keweenaw Association August 7 to 11.

William J. Deavitt has been retained by the Manta Mining Co., of Chihuahua, Mex., as consulting engineer.

J. M. Brocks, Jr., has succeeded **Paul Steger** as manager of the Santa Eulalia unit of the Cia. Minerales y Metales.

H. S. Gale, who recently returned from South America, has resigned from the Geological Survey to enter private employ.

A. E. Drucker, mining engineer, is examining copper mines in the Olympic Range of Washington, for Aberdeen, Wash., interests.

David H. Collier, for the last two years engaged as a mining engineer in Burma, is temporarily in New York, where he recently arrived from London.

Dwight E. Woodbridge, mining engineer of Duluth, Minn., has recently returned from an extended trip into the Hudson Bay country, where he has been exploring for mines.

Stewart Thorne, manager of the Trethewey mine, Gowganda, Ont., has resigned on account of ill-health. **Murray Kennedy** formerly with the Beaver mine, Cobalt, succeeds him as manager.

Dr. Waldemar T. Schaller has severed his connection with the Great Southern Sulphur Co., Inc., of New Orleans, La., and has returned to the United States Geological Survey, Washington, D. C.

Frank M. Manson, president and general manager of the Western Ore Purchasing Co., was in Nogales recently, and is now in Mexico, seeking a suitable location for an ore-buying agency in Sonora.

D. C. Jackling has been in Salt Lake City, Utah, in conference with **C. B. Lakenan**, general manager of Nevada Consolidated Copper Co., and **G. L. Hinckley**, general manager of the Nevada Northern R.R., of Ely, Nev.

George A. Laird, consulting engineer, who has recently returned from Mexico, has been appointed general manager of Guiana Development Co. and will leave for South America about Sept. 1. His present address is in care of R. T. Wilson & Co., 120 Broadway, New York, N. Y.

S. W. Stratton, director U. S. Bureau of Standards, sailed for Europe recently to attend the session of the International Bureau of Weights and Measures at Paris during September. Dr. Stratton will be the official representative of the United States at the session.

Allen Murray Yonge, of Staunton, Va., returned at the end of July from his trip to the West Indies, and is now in Washington, where he will open an office as consulting engineer in mining and economic geology. He may be addressed at Buckingham Hotel, Washington, D. C.

Freeman F. Burr, M. A., geologist to the Maine State Water Power Commission and to the Central Maine Power Co., Augusta, Me., is spending much of his time this summer investigating

FREEMAN F. BURR

mineral deposits in Maine with a view to their development by means of electric power. At the same time he also has to pass judgment on the suitability of rock structures at prospective power sites and search for construction materials. His geologic work for the past six years, under the State Water Storage, Public Utilities and Water Power Commissions, has taken him into nearly every part of Maine and he is probably more familiar with that state's geology and mineral resources than is any other person today. His special studies in the character and distribution of peat and of feldspar have been of special value to Maine, and were based on preparatory work in geology and botany at Lawrence Scientific School, Cambridge, Mass., from which he graduated in 1900, at Columbia University from which he received the M. A. degree in 1913, and at other schools. Mr. Burr has had field experience in all the New England and some of the Middle Atlantic and Central States. In view of the above it was quite proper to elect him a member of the Association of State Geologists, although Maine herself has not yet seen fit to follow the lead of many other states and establish for her own benefit an adequate modern survey of her mineral and other natural resources.

John Borg, of New York City, was recently elected president and chairman of the executive board of the Callahan Zinc Lead Co., to serve the unexpired term of the late John A. Percival. Charles H. Borg, of New York, brother of the new president, was elected to the vacancy on the board of directors, and **Gust Carlson**, of Duluth, was elected a member of the executive committee.

Carroll R. Forbes is still professor of mining at the head of the mining department of the Missouri School of Mines and Metallurgy at Rolla, Mo. Prof. **Charles H. Fulton**, who recently resigned from the Case School of Applied Science, was appointed to the directorship of the University of Missouri School of Mines and Metallurgy at Rolla and does not supplant Professor Forbes, as our note of Aug. 7 seemed to indicate.

OBITUARY

J. George Leyner, inventor of the Leyner drill, and founder of the Leyner Engineering Works, died in his 60th year on August 5 at his home in Littleton, Col., from injuries received in an automobile accident on the Denver-Littleton road August 3. Mr. Leyner was the first white child born in Boulder County, Col., and had been in business in Denver for nearly 40 years. When a young man he invented the rock drill which bears his name and which was responsible for the success of the J. George Leyner Engineering Works, later taken over by the Ingersoll-Rand Co. At the time of his death Mr. Leyner was president of the Leyner Engineering and Manufacturing Co. For some time he had been working on the invention of a farm tractor. The plans were completed before his death, and the Leyner tractor is now in process of construction at the Vulcan Iron Works.

SOCIETY MEETINGS ANNOUNCED

American Chemical Society will hold its fall meeting with its **Chicago Section** at Chicago, Ill., Sept. 6 to 10, inclusive. Hotel headquarters will be at the Congress Hotel, Michigan Boulevard and Congress Street, where registration will begin Sept. 7, and an information bureau located. The Division of Industrial & Engineering Chemistry, H. E. Howe, Woods Hole, Mass., secretary, plans for its second session a symposium on fuels, arranged by A. C. Fieldner of U. S. Bureau of Mines and including eleven papers. Prof. W. A. Noyes will deliver the presidential address on the evening of Sept. 8, and the banquet ($4.00) will be held on Sept. 9 at the Congress Hotel. Secretary Chas. L. Parsons is at 1709 G St., N. W., Washington, D. C.

THE MINING NEWS

LEADING EVENTS

GENERAL VIEW OF FLIN FLON PROPERTY ON FLIN FLON LAKE, NORTHERN MANITOBA. SHOWING PLANT UNDER CONSTRUCTION AND HEADFRAMES AT TWO SHAFTS ABOUT 1,000 FT. APART. THE SMALL HILL BETWEEN SHAFTS IS A HORSE IN THE OREBODY

Pushing Flin Flon Development

Keen Interest in Results on Which Depend Railroad from The Pas—Lead-Silver Strike at Herb Lake

Development work at the Flin Flon property in northern Manitoba is progressing rapidly, No. 1 shaft now being down 200 ft. and No. 2 100 ft. Drifting and crosscutting are being done on the orebody in No. 2 shaft at the 100-ft. level and encouraging results are reported. Considerable interest is being taken in this property and the present work being done because on the results of development will depend the building of a railway from The Pas to the property. This line, if built, will also tap several other districts where promising orebodies are under development. Inasmuch as a good part of the line will go through the heart of Manitoba's mineral district, prospecting and mining are being vigorously carried on in the sections affected. Diamond drilling is still going on at the Gordon claims at Copper Lake. These are the claims that were staked last season on a promising discovery of gold quartz, resulting in a rush of prospectors to the Copper Lake district. It has been stated that the owner, J. P. Gordon, will spend $50,000 on the claims.

A recent discovery on the north side of Herb Lake, in northern Manitoba, is attracting considerable interest. Here a body of silver-lead ore has been found, the first one of such ore to be found in this district. It is understood that the body is very large. The indications, judging from the surface capping, would suggest that it is about 100 ft. wide and about 1,000 ft. long. The assays from surface samples run about 12 oz. silver and 20 per cent lead, with only slight recovery in gold values.

WEEKLY RÉSUMÉ

Development of the Flin Flon property in Northern Manitoba is progressing rapidly. A plan for refinancing the Canada Copper Corporation has been put before the stockholders. Reports from Quebec indicate that the asbestos industry continues to thrive. The Premier, near Stewart, B. C., is said to have cut new ore. In Idaho, control of the Kill Buck property has been obtained by the Interstate Callahan. In California, high costs have forced the shut-down of the Shawmut mine. In New Mexico, Phelps Dodge has started its new Burro Mountain concentrator. In Arizona, the San Carlos Reservation is to be opened to prospectors. The Crater Mining Co. is prospecting for a huge meteor in the crater near Winslow, Ariz.

At Washington, witnesses were heard by Secretary Payne on August 10 in regard to war powers relief. The Bureau of Mines has formed a division of non-ferrous metallurgy. A new mine-rescue car has been destroyed by fire in the N. Y. Central shops.

Valuation of Mexican Industry Announced

The total valuation placed on three industries in Mexico by the Mexican government is 1,230 million dollars Mexican, according to a recent official announcement in *El Universal*, Mexico City. The oil industry, including 1,100 wells, railroads, pipe lines, machinery and capital invested, is valued at $660,000,000. The mining industry, including 3,136 mines, railroads, machinery and capital invested, is second, its valuation being $400,000,000. The textile industry is third with $170,000,000, this including the value of 190 factories, railroads, machinery, power plants and capital invested. The textile industry is the one that yields most revenue to the Federal Government. How it is possible to arrive at such figures at the present time is not known.

To Reorganize Canada Copper

Company Seeks To Raise Half Million —Fifty-Cent Assessment Levied— Defaults on July Interest

The Canada Copper Corporation, whose 2,000-ton concentrator has been standing idle at Allenby, B. C., ever since its completion late in 1919, is to be reorganized. It is understood that the erection of the plant cost considerably above the estimate. The company is a Virginia corporation capitalized at $10,000,000. A plan proposed by a readjustment committee composed of August Heckscher, Colgate Hoyt and Lucius W. Mayer provides for reorganization under Canadian laws, the capital and number of shares to be the same as at present. The new company will acquire all the property and assets of the old and will assume all its obligations. Stockholders are to be permitted to exchange the stock of the present company for that of the new company share for share upon paying an assessment of 50c. per share. Without such payment a stockholder will obtain only one new share for three of the old issue. The company has defaulted interest, due July 1, on its first mortgage bonds. The total sum needed by the company is $500,000, which is wanted for the following purposes: July 1 bond interest $75,000; bills payable $175,000; readjustment expense $25,000, and working capital $225,000.

"The original plan called for the operation of the plant in July, 1919," says the company's statement, "at which time the railroad and power facilities to be provided by the Canadian Pacific Railroad were also to be ready. The program covering the work under our control, viz., development of the mine and the construction work in connection with the mine, as well as the

construction of the mill, was well maintained until it became obvious that the interests building the railroad and power lines would not have them completed in the time specified. The delay of over a year's duration has been caused by circumstances over which your company has had no control, and is due entirely to the failure of the railroad and power companies to complete their construction. During this period of enforced inactivity your company has been burdened with heavy overhead charges, though every economy has been practiced, including reduction and in some instances discontinuance of salaries of your officials. Certain necessary expense to maintain the property, such as the maintenance of a skeleton organization, insurance and other overhead charges, could not be avoided. The necessity of hauling materials by truck to the mill and mine incurred another considerable unanticipated expense. Had the railroad and power lines been completed on schedule, the plant would now be in operation and the company receiving income. The mine has for some time been ready for extraction of ores, and since the concentrator is completed, the plant can be placed in operation as soon as the railroad can deliver ores to it. We are now advised that the railroad will be fully completed in September and the power line shortly thereafter, so that extraction of ore and the transportation thereof to the mill may be expected to commence during October, and the company's product should be available for disposal immediately thereafter."

Anaconda and Clark Interests Effect Compromise

Details of the compromise agreement between Anaconda and the W. A. Clark interests whereby Anaconda gives to the latter a portion of the Emily vein under the surface of the Pilot-Butte claim have not been disclosed, but it is said to be a victory for the Clark interests. A vein apexing in the Elm Orlu claim, the prior location, was found to unite with the Emily on dip at about the 2,400-ft. level of the Pilot-Butte, where the orebody has a width of about 50 ft. with the grade ranging up to 6 per cent copper with some silver.

Anaconda years ago instituted suit against the Pilot-Butte, claiming the Pilot-Butte's chief fissure, the Emily, on the ground of extralateral rights, purchasing the property later for $1,125,000. This sum was later alleged to be insufficient by certain interests who had been connected with the Pilot-Butte.

To Open San Carlos Reserve

The San Carlos Indian Reservation is to be opened at once for prospecting. The western section is known to be especially rich in asbestos, generally found in localities so rough that airplanes or dirigibles have been suggested as means for bringing out the ore.

Prospecting for a Buried Meteor at Winslow, Ariz.

Newly Organized Mining Company Drilling on Edge of Famous Crater, Over 4,000 Ft. Across

It is reported that the famous Meteor crater, west of Winslow, Ariz., is to be drilled by a new corporation, the Crater Mining Co. Two Standard drilling rigs have been purchased and will be erected near the inner edge of the pit, which is 4,100 ft. wide. The theory is held that the celestial visitor sought plunged into the earth at an angle from the vertical. Exploration was conducted for a period of years within the pit by a Philadelphia company that found almost insuperable the difficulty of handling the quicksand that filled in the great hole. Drilling discovered fragments of the meteor, however, though it is believed that the main mass has not been located. The metal, as shown by analyses of the fragments within and around the pit, shows a very high percentage of nickel and will possibly be of considerable value if it can be handled. It has been estimated that the meteor need not have been over 500 ft. in diameter to have made the crater, but it is hoped that there will be found a mass from 1,000 to 2,000 ft. in diameter. Specimens of the metal, generally labeled as from the Canyon Diablo Meteor, are on exhibition at many Eastern museums, the largest of the pieces being at the Field Columbian Museum in Chicago.

Homestake Co. Holds First-Aid Contest

In the first-aid and mine-rescue contest held on Aug. 8 at Lead, S. D., in the Black Hills, between teams from the Homestake Mining Co., Team 1, composed of E. English, captain, L. B. Wright, J. B. Chastain, T. G. Houston, J. R. Treweek and T. V. McNally, took first place. This team will represent the Homestake company at the Bureau of Mines meet in Denver early next month. Team 3, captained by Abe Aladalo, was awarded second place and Team 2, W. S. Primrose, captain, was third. The company gave cash prizes to the three winning teams as follows: $150, $120 and $60. The contests were in charge of B. W. Dyer, engineer in charge of Bureau of Mines Rescue Car No. 5.

New Producers in Arizona

The following new properties were added to the list of producers in Arizona in 1920: Arizona Asbestos Association, valuation $119,060.50; Pierce & Gardiner property at Patagonia, assessed at $20,908; Leadville Mining Co., in Cochise County, assessed at $42,261; Copper Basin Group, formerly the Senator Group, in Yavapai County, assessed at $48,544; and El Tiro Leasing Co., in Pima County, assessed at $183,148. The Arizona Copper Co. asked a decrease of at least $1,000,000 from the tentative estimate.

Quebec Asbestos Industry Still Thriving

Contract System Has Offset Labor Scarcity—U. S. Alloys Mill Started in Chrome District

Industrial conditions have been particularly active in the asbestos business this season; the working companies have been aiming at maximum production and all potential sources are being exploited for raw material. Companies with low-grade propositions are striving to earn dividends and the high-grade properties are using up some of their excess profits to effect betterments in their working plants as well as to stabilize their capital account, both of which were seriously neglected during the lean years of the industry.

Labor conditions have been very satisfactory, the shortage in men being largely overcome by the adoption of the contract system in the mines, thereby increasing the tonnage per man to a point where the net cost per ton of ore hoisted was not materially increased. The result has been a marked increase in the efficiency of the miners and a considerable influx of labor which has been drawn from the surrounding industries. The Bell Asbestos Mines have recently adopted this system, leaving only the Johnson company employing the wage system. The old argument that under any form of contract work it is impossible to sort the ore properly in the pit is well founded, but at a time when the best tonnage obtainable is insufficient for the growing needs it is generally agreed that a small loss in the high-grade crudes may be overlooked in the effort to keep up with the demand. Undoubtedly when the market for the shorter grades has been met it will again be the proper policy to obtain a maximum saving of the crude asbestos.

Properties changing hands or being reopened under new conditions are as follows: At East Broughton the Poulin mine has been sold to the S. W. Cohen interests at Montreal, with G. P. Angus as superintendent; the Boston property, part lot 13, R./V, has been leased to J. A. Jacobs under the name of the Asbestos Mines, Ltd., H. W. Edmondson, local manager; and the Montreal property, lot 13, R./VIII, has been purchased through H. B. Lee for the Mutual Chemical Co. This company has added this asbestos holding to its present large holdings in the chrome district in the Black Lake-Coleraine district. Work was undertaken on the property in 1910 but lack of capital prevented the plant from being put into operation. The present intention is to complete equipment for operation as soon as possible.

In the chrome district, the 200-ton mill of the U. S. Alloys on the Belanger property on Caribou Lake has been started, and the "Old Red Mill" of the Black Lake Asbestos & Chrome Co. is being re-equipped to handle a large tonnage of low-grade ore which has accumulated from underground operations of the last two years.

Discovery at Nixon Fork, Alaska, Cause of Excitement

Promising Claims Being Worked by Alaska-Treadwell—Little Quartz Previously Discovered

BY J. G RIVERS

Flat, Alaska, June 26—There has been considerable excitement of late in connection with a discovery of a conglomerate ledge on the Nixon Fork, which is one of the tributaries of the Kuskokwim River and about 60 miles northeast of the town of McGrath. This ledge extends along the ridge between the head of Ilidden and Ruby creeks, both of which have shown placer prospects, and several mineral locations have been made and some development work done on this ledge. On one claim the ledge is said to be 24 ft. wide and on another claim a shaft 60 ft. deep has shown good values to that depth, the ledge averaging about 6 ft. in width.

Last summer Thomas P. Aitken took an option on the property and during the winter of 1919-20 sacked enough ore for shipment to pay for his development work but as his assayer did not give out any information there is no telling what the mine run will average. It is reported that some of the best ore assays around $200 per ton and from that down to $20 and that the average is well over $100 per ton. However, this is not authoritative. The ore is said to carry gold, silver and copper, free gold being visible in the samples seen by the writer.

Aitken allowed his options to lapse this spring and the owners of the ground have let options to the Alaska Treadwell Gold Mining Co., which now has a crew at work doing development work. This company has paid $20,000 on the option price of the property which is approximately $1,250,000, the balance to be paid in installments distributed over a period of four years.

It is significant that the payments already made were made solely upon the strength of the showing of Aitken's development work without any additional development by the Alaska Treadwell, which would indicate that the latter is very favorably impressed with the proposition.

If this goes through it will mean a great deal to this part of Alaska as heretofore no quartz worthy of mention has been discovered. It will stimulate prospecting and may be the means of getting the Government to extend a branch of the railroad to the headwaters of the Kuskokwim River.

New Rail Rates May Affect Steel Mills Adversely

Readjustment of rail rates between upper Lake ports and the seaboard so as to make Lake transportation of grain more profitable may have an adverse effect on the iron and steel industry, it is pointed out, in that it will take ships out of the ore-carrying trade at a time when it is desirable to increase iron-ore stocks at steel mills.

Australian Notes

Settlement of Broken Hill Dispute Sought—Commission Reports on Health of Miners

From Our Special Correspondent

Melbourne, July 19—The New South Wales Government called a compulsory conference of the parties to the labor dispute at Broken Hill under the chairmanship of Mr. Holme, State Commissioner of Conciliation. It was agreed to submit the whole matter to an independent tribunal consisting of a judge or other chairman (to be selected by the Prime Minister and the Premier of New South Wales) and five representatives of each side. They further agreed to bind themselves to abide by the decision of this tribunal, it being understood that where they, through their representatives, fail to agree, the judge or chairman shall decide the question.

REPORT ON HEALTH OF MINERS

An interim report to the Premier by the technical commission of inquiry of the Board of Trade, appointed by the government to inquire into the dust conditions and health of the miners at Broken Hill, has been issued. As a result of an examination of about 2,800 workers the report sets out that ankylostomiasis (hookworm) is not present at Broken Hill; that no person suffering from tuberculosis should be permitted to work in the mines, either on the surface or below ground; that compensation should be given to all persons found to have been affected with progressive tubercular disease of the lungs; that some scheme for providing employment for those persons withdrawn from the mine should be prepared so that no obligation is thrown on the mine worker removed from the mine to find himself a fresh avenue of employment; that individuals affected with pneumoconiosis and withdrawn from work on the mines should be kept under observation; that should they become affected with tuberculosis they should receive compensation, since it will be only a question of time before a fatal termination is reached.

The majority of those who work in the mines at Broken Hill, continues the report, have shown no signs of the accumulation of dust in their respiratory organs. If a resumption of work should take place at Broken Hill the remaining 3,500 men, who have not been before the commission, should be subjected to immediate medical examination. The commission is of the opinion that a thorough investigation of the ventilation and dust conditions of the mines should be undertaken when the mines resume work. The operation of mining can be carried on at Broken Hill with complete safety as far as any material injury to the lungs of the mine workers is concerned.

NEW WESTRALIAN COMPANY ORGANIZED

The Knowna Red Hill Mining Co., with a nominal capital of £100,000, has been formed to work an area at Knowna, Western Australia, which has been favorably reported on by D. L. Doolette, promoter of the Bullfinch gold mine, Southern Cross, and son of G. P. Doolette, chairman of the Great Boulder Proprietary.

MT. MORGAN EXPERIMENTS CEASE

Experiments have been proceeding for some time in roasting, leaching and chlorinating certain types of Mt. Morgan ore, but have now been discontinued, the conclusion having been reached that the extra recovery gained would not justify the large capital outlay required for treatment plant. The industrial court granted increased wages to the employees during the half-year ended May 30, that involved an additional annual expenditure of £32,-800. Further claims amounting to £24,-000 per annum are now being heard.

Recent Production Reports

Utah Copper produced 8,500,000 lb. copper in July, against 10,000,000 in June.

Chino Copper's July output was 4,360,932 lb. of copper against 4,010,-069 in June.

Ray Consolidated's production in July was 4,500,000 lb. copper as against 4,520,000 in June.

Nevada Consolidated produced 4,650,-000 lb. copper in July, the same as in June.

Granby Consolidated M. S. & P. Co. produced 2,400,000 lb. copper in July, compared with 2,079,000 in June.

The Rand's gold output in July was 736,000 fine ounces, against 715,000 in June, 699,000 in May and 686,000 in April.

Shipments of domestic copper ore from Alaska to the United States in July totaled 8,510 gross tons, containing 5,797,645 lb. valued at $1,107,969.

Greene Cananea in July produced 3,500,000 lb. copper, 130,750 oz. silver and 770 oz. gold.

North Butte produced 1,505,079 lb. copper in July compared with 1,616,822 in June.

Kerr Lake produced 52,228 oz. silver in July against 52,831 in June.

Research in Metallurgy of Iron Successful

Investigations carried on by Prof. Alfred Stansfield of McGill University, Montreal, into the reduction of iron ores by gases at low temperature and with the electric furnace, are stated by the Advisory Council for Scientific and Industrial Research to have been attended with satisfactory results. On some of the findings patents have been applied for to permit of the commercial development of methods that will enable the utilization of Canadian low grade iron ores. The investigation was assisted by a grant of $1,[illegible] from the Advisory Council.

The American Metal Co. is reported to have purchased the smelter of the Arkansas Zinc & Smelting Corporation at Van Buren, Ark. The plant has 3,200 retorts and has been in operation for several years.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

War Mineral Relief Arguments Heard by Secretary Payne

Witnesses Object to Commission's Interpretation of Law—Right of Appeal Claimed

Before a large gathering on August 10 of those interested in the War Minerals Relief Act, the Secretary of the Interior heard the arguments of witnesses presented by the American Mining Congress. Objection was made to the manner in which the War Minerals Relief Commission is interpreting various phases of the Relief Act and it was urged that the Secretary of the Interior make it clear that he is not opposed to an amendment which will permit claimants to appeal their cases to the Court of Claims. The point was made that the law specifically provides that the Government may have this right of appeal and, as a consequence, it was contended that it was inequitable for the other parties concerned not to have a similar privilege. This is particularly glaring, it was held, from the fact that the War Department claimants, given relief in the same act, have the right to appeal to the Court of Claims.

Secretary Payne stated at the hearing that he has no objection to the enactment by Congress of a measure giving the claimants the right of appeal to the Court of Claims. He agreed also to choose, with the consent of the claimants, typical cases covering contested points which he would hear personally with the idea of establishing precedents which should be followed in decisions in similar cases.

The principal argument for the American Mining Congress was made by Herbert Wilson Smith. Henry R. Harriman and Edgar Watkins, attorneys for certain claimants, also spoke, as did James F. Callbreath, the secretary of the American Mining Congress. Senator Shafroth, the chairman of the War Minerals Relief Commission, presented the commission's side of the case.

During the course of the hearing, Secretary Payne characterized the work of the commission as having been very diligent. He also called attention to the fact that he gives individual attention to many of these cases.

In his arguments Mr. Watkins, who had assisted in presenting the claim of the Chestatee Pyrites & Chemical Co., declared that the commission has assumed the rôle of prosecutor for the Government rather than serving as an impartial tribunal interested alike in the equities of each party to the case.

Awards recommended by the War Minerals Relief Commission, during the week ended August 7 aggregated $15,225.99. The recommendations were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): J. F. & J. W. Barneberg, manganese, $11.117.27, 54 per cent; the Kromore Company, chrome, $2,645.50, 24 per cent; L. C. Chrome Co., chrome, $1,035.22, 61 per cent; Schwartz & Geisendorfer, chrome, $428, 4 per cent.

Bureau of Mines Forms Division of Non-Ferrous Metallurgy

A division of non-ferrous metallurgy has been created in the U. S. Bureau of Mines. It will be under the immediate direction of A. E. Wells, who will have the title of chief metallurgical engineer. The headquarters of the division will be maintained in Salt Lake City. Mr. Wells just has taken up work for the bureau again, after having been on detached duty with the Anaconda Smoke Commission.

Mine Rescue Car Destroyed

One of the new mine rescue cars of the U. S. Bureau of Mines was destroyed by fire last week while in the shops of the New York Central R.R. for minor repairs. It will be replaced by the railroad company. Owing to the rapidly increasing demand for this type of equipment, the loss of this car will curtail the bureau's work to an important extent during the nine months which will be required to construct a new car.

Question of Smelter for Alaska To Be Considered

With the idea of stimulating mining activities in Alaska, an intensive study of mining and metallurgical conditions in that territory is being conducted jointly by the U. S. Bureau of Mines and the Geological Survey. At the special request of the Secretary of the Interior, A. H. Brooks has been looking into the oil situation in Alaska and now, in co-operation with O. C. Ralston, of the Bureau of Mines, he will study metallurgical problems. One of the questions to receive immediate attention is that of determining the advisability of establishing a smelter in Alaska.

Federal Power Commission Completes Plans

The Federal Power Commission has perfected its internal organization plans. It will be sub-divided into engineering, accounting, statistical, regulatory, licensing, legal, and operation divisions. The country has been divided into five districts, each to have a branch office as follows: No. 1, Washington; No. 2, St. Paul; No. 3, St. Louis; No. 4, Denver; No. 5, San Francisco.

Few Technical Men in Training for Government Work

Number of Graduates Entering Survey or Bureau of Mines Small—Better Salaries Elsewhere

Apprehension is felt in the U. S. Bureau of Mines and other Government bureaus as to the outcome of their work a few years hence, as few new technical men are being trained in the work of these bureaus. At present the initial salaries of $1,200 to $1,500 paid by the Government are not attractive to the young men who are being graduated from engineering schools. A survey of the class graduated this year at one of the large schools shows that these graduates are readily absorbed by private industry at salaries ranging from $2,000 to $3,000.

The tendency in the Government's technical bureaus is for the men in the more important offices to pay less attention to offers of higher salaries in private employment. Although the turnover is much smaller among such men the positions must occasionally be filled by some one who has a thorough understanding of Government practice. Some years ago, when Government salaries were more attractive to engineers who just had completed their education, a considerable number of such young men were absorbed by the bureaus each year. These men eventually became the successors of the division chiefs and the more important executive technical specialists. Now that there is no new class being trained the fear is expressed that vacancies in the more important positions cannot be filled with the same type of men as in the past.

Quicksilver Dropped This Year

No field work in quicksilver will be undertaken by the U. S. Geological Survey this season. F. L. Ransome, who is in charge of that subject, will remain in Washington to continue work on his report on the geology and ore deposits of Arizona as a whole.

Many Prospecting Permits Under Mineral Leasing Act Sought

Applications for prospecting permits under the Mineral Leasing Act now number 2,000. The General Land Office, on receipt of the application, sends them to the land application board of the Geological Survey for report. These applications are given a preferential status, with the idea of facilitating exploration and development under the new law.

Purchases of silver by the Bureau of the Mint under the Pittman Act totaled 10,603,354 oz. on Aug. 10.

NEWS BY MINING DISTRICTS

MEXICO

Many Companies Preparing To Operate Under New Regime

Mexico City—An immediate improvement is reported as a result of the recent decree removing fines for failure to pay mining taxes throughout Mexico during the last six or seven years. Large numbers of mine owners, particularly in the northern states, are responding and the Department of Commerce and Industry reports that to the end of the first week in August 400 smaller properties in the State of Chihuahua alone had availed themselves of the conditions of the decree and are preparing to begin operations. Seventy-seven applications were made in the State of Jalisco, eleven in Zacatecas, thirteen in the State of Mexico, twenty-two in Hidalgo, nine in Guerrero, and thirty-four in the State of Guanajuato.

The surrender of Villa has also had the effect of starting some work going in the State of Chihuahua, where the depredations of this particular bandit have paralyzed the mining industry for the last four years.

The Xacualpam district is returning to some of its oldtime, pre-revolution activity. Eleven American companies have resumed work during the last two months and are shipping high-grade ores, mostly to the Minerales y Metales smelter at Monterrey. Considerable money is being expended in reopening roads and putting the camp in shape.

In the district of Temescaltepec several of the larger mines have begun work again and others are preparing.

The Sultepec district remains rather quiet. Two of the old properties have resumed but the major portion of the companies find themselves short of funds. Labor conditions in all these camps are bad, that is, labor is scarce and every available man is being secured.

Querétaro

The Amoles Mining & Reduction Co. at Pinal de Amoles, district of Jalpan, is developing two of its principal properties by running large working tunnels in from the ravine and cutting under all the old workings for the purpose of drainage and cheaper extraction of ore. One of the tunnels is to be 420 meters and the other 700 meters long. The company is running one stack steadily at present and the silver and lead bullion is being shipped to the A. S. & R. smelter at Aguascalientes. As soon as the rainy season is over a second furnace will be blown in.

El Doctor mine, belonging to the Braniffs, in the same district is running its smelter and shipping two cars of bullion per week. It has just acquired a new Holt Caterpillar and Troy wagons which haul 15 tons each trip over a distance of 150 kilometers to railroad.

Oaxaca

Tavichi District Coming To Life

The old Tavichi district, most important in the state, after being absolutely abandoned for four years is again showing signs of life. George Huston has struck a parallel vein in the old Escuadra mine and is making weekly shipments to Aguascalientes.

The Vichachi mine, property of the Hamiltons, has been unwatered and is taking out shipping ore.

The Juanita has begun work and is sinking a new shaft near the San Juan shaft. The latter property is still in litigation and is being administered by the courts.

Guerrero

Mines Department Refuses Denouncements Made by J. C. Flournoy

The Puerta del Sol, an old gold property in the Minas district belonging to a Spanish syndicate, has resumed work and is erecting a flotation plant.

The Campo Morado property, one of the most famous in Mexico, which has been in the hands of the bandits for the last six years, has been turned over to the owners by the new government and steps have been taken to reopen the property. Owing to the activities of "highgraders" the mine is said to be in a rather bad condition.

The Department of Mines, City of Mexico, has just rendered a decision refusing denouncements made during the Carranza regime by James Campbell Flournoy, of Washington, D. C., on the Santa Ana, San José de Cuitzuitla, San Basalio, Socavon de Guadalupe, Ampliacion de Mina Grande, Haines, La Cruz del Sur and San Antonio properties of the Balsas Valley Co., of St. Louis, Mo. The decision is important and far reaching as these properties were only a few of a large number of mines in various parts of the country which had been denounced on the pretext of failure to pay taxes, special decrees, etc. The action of the department indicates the intention of the government to respect all interests legitimately acquired and that no advantage will be taken because of failure to live up to the letter of the law during these turbulent times.

Guanajuato

Guanajuato—A. A. Taylor, of Taylor Bros., Chihuahua, Casas Grandes and El Paso, has purchased an interest in the Ruby Silver Tunnel property situated four and a half miles west of the City of Guanajuato on the automobile highway to La Luz. Development has begun and drifting is in progress on a vein many feet in width, 5 ft. on its foot wall averaging around half a kilo in silver with 30 to 80 grams gold, or above $40 U. S. currency, per ton. This property has been a steady producer for years. In fact, during the entire revolutionary period it has been worked on the "buscon" system, shipping its ores to the smelters and local mills. The Ruby Silver Tunnel is rather a historic property, Baron von Humboldt in his writings on Guanajuato stating that it was the most highly mineralized piece of ground in the entire La Luz district.

The Pasadena mine, situated four and a half miles east of Guanajuato and directly adjoining the famous El Monte San Nicolas property, is being reopened after six years of idleness. Surface equipment, machinery and houses destroyed or stolen during the revolutionary period are being reconstructed and replaced under the management of C. Bartholomai, many years with the Moctezuma Copper Co. of Nacozari, Son. Work is being rushed at the Pasadena. The present shaft, which is almost 1,000 ft. deep, is to be enlarged to one of three compartments. It is also to be deepened.

At the Esperanza mine, work of building the new tramway to the San Matias mill on the outskirts of the city has been under way for some time. A mill for treating Esperanza ores is being remodeled into a continuous-process counter-current cyanide plant with a capacity of about 9,000 tons monthly. The Esperanza was taken over from the "Casa Castenada" after long idleness.

Guanajuato camp was one of the few not affected by the almost general strike that recently occurred throughout Mexico. The utmost harmony is said to exist between the workmen and mine owners.

Nayarit

Esperanza Exploration Co. Acquiring Holdings Near Cuale

The Esperanza Exploration Co., of El Oro, has acquired large holdings in and near Cuale, in the State of Nayarit (formally Tepic). The mines are situated about 25 miles from the port of Las Peñas, to which point a truck road is being built. Large quantities of machinery have been ordered and will be transported over this road. The company has acquired all the properties in this district, some of them having been large producers of gold and silver in the days of Spanish mining; others were acquired through denouncement. Altogether this is looked upon as quite significant of the fact that confidence is returning in Mexican mining.

The Cucharas mine was recently examined by engineers with a view to purchasing. This is a silver-copper property located near Acaponeta in the State of Nayarit, and belongs to the Lacy interests of Los Angeles, Cal. There is a matting furnace on the property which has been operated to some extent in years past.

Messrs. Newman and York are traveling through the West Coast looking for mining properties for a New York syndicate.

The property of J. B. Shepard, of Denver, Col., situated in the Santiago de los Caballeros district, is under option to Pasadena, Cal., capitalists, who are to start cleaning out the caved workings for examination, with a view to purchase. A truck road is projected to connect this district with the Southern Pacific de Mexico, at the station of Guamuchil. This proposed road will open up a large silver and lead producing district, and will undoubtedly be the direct cause of the development of many promising prospects, as well as the reopening of many large mines which were worked successfully before the revolution.

Chihuahua

Santa Eulalia—Read Miller and associates have ceased operating a sub-lease of the Santander.

Durango

It is reported that the Hayden Stone interests have also taken an option on the famous mines at Cianori, Durango. These mines belong to the house of Wohler Bartning, of Mazatlan, and have records of very large silver production. The export ore from these properties carries about 1,000 oz. silver to the ton with a trace of gold. The low-grade ore was formally treated with cyanide with good results. There is a twenty-stamp mill with cyanide equipment on the property.

Copalquin District—The Rocha Mining Co., owners of the San Igancio, Soledad and Chiuhuahvilla mines, are doing extensive development work. There is a 10-stamp mill with cyanide equipment on each of these properties, and their normal production is about 60,000 oz. silver per month and 3,000 oz. gold. Sr. Don Everisto Paredes is general manager and Charles Hitchler is metallurgist in charge. These mines have been large producers for many years. The San Ignacio has produced to date about $6,000,000 gross, the Soledad about $500,000, and the Chiuhuahvilla about $200,000. In times gone by, the miner's wage consisted of one tablespoonful of ore each day, it is said, for which they were perfectly contented to work twelve hours per day.

Mocorito—The Palmarito and Potrero companies, in the Mocorito district, are both working full capacity in spite of the recent decrease in foreign silver. The mining agency in Mocorito reports an increase in the number of denouncements being made by foreigners.

Capt. R. D. Adams and Col. J. E. Leckie, of San Francisco, expect to be in Mexico this fall with an exploration and development company. They have options on a number of promising prospects, as well as partially developed mines, and will occupy themselves principally with the development of mining properties in Sinaloa and Western Durango.

CANADA

British Columbia

New Ore Reported in Premier—Ward Difficulties Finally Settled

Stewart—R. K. Neil, part owner of the Premier mine, recently stated that a 100-ton cyanide plant is being installed and will be ready for use early next year. It is reported that a new orebody has been cut in Tunnel 2. About 150 men are employed.

There are about 100 claims staked in the Marmot River section of Portland Canal and on many development work is in progress. George Clothier, government mining engineer, recently made a tour of inspection through the district with a view to ascertaining the extent of the necessary road and trail improvements. The B. C. Exploration Company is heavily interested in this section. P. D. I. Honeyman has a small crew of men at work for this company on the Salmon River Lode Mining Co.'s property, near the Big Missouri group.

One of the two diamond drills on the Big Missouri has been closed down, that at work on the E Pluribus claim being continued. This is the claim on which high-grade ore is being opened.

The Northern Light and Spider groups on Salmon River and the Fitzgerald Group on the Bear River are being thoroughly explored by the Algunican Development Co., whose operations are more extensive than those of any other concern interested in the district, with the exception of the Premier Mining Co.

Alice Arm—The Dolly Varden is shipping 150 tons of ore a day and preparations are being made for the extension of the railway to the Wolf Group. The Toric, Tiger, Musk, Silver Horde, Climax and other prospects are being opened up. Surface stripping is being done on La Rose Group.

Quesnel—Once again R. T. Ward, of the Bullion Placer Leases, Cariboo, has been heard of in connection with litigation. Having won his long drawn-out suit with John Hopp it was thought that the operation of the long-disused property would follow without delay. Some of Mr. Ward's associates, however, challenged his right to retain control of the management of the project. A settlement has been reached

Nelson—The Provincial Prospectors' Protective Association continues to gather strength. Local organizations representing the Grand Forks and Smithers districts have applied to the central body for copies of the constitution and there is every reason to believe that they will become affiliated. It has been decided that the Provincial Attorney General shall be asked what action will be taken to protect prospectors' cabins and caches from the depredations of thieves. It appears that members of the association have been put to expense and annoyance in many instances by finding their headquarters in the hills rifled on returning from their periodical trips.

Ontario

Hollinger's Costs Increased—New Company To Take Over Bewing-Moreing Interests

Porcupine—It is stated that a new company is being organized to take over the interests of the Bewing-Moreing company, an English concern, which in the early days of the Porcupine camp purchased a number of claims in the area. They were unable to develop their holdings owing to the war. The financing of the new company is said to have been arranged looking to active operations in the immediate future.

Mining costs at the Hollinger Consolidated have increased to a greater extent than was anticipated owing to the increase in wages. It was expected that the higher pay would add about 25c per ton to the cost of treatment, as the management calculated that larger forces would be attracted and that increased efficiency would result, neither of which anticipations has been realized, the increase in operating costs being about 50c per ton. While in some respects the result of the raise in wages has been disappointing, it is realized that it was a wise measure, as otherwise the company might have been unable to retain sufficient labor to continue in operation.

The McIntyre has purchased the Blue Diamond Coal Mines, of Brule, Alta, with an area of about 3,300 acres, and has secured an option on the Canadian Coalfields, Ltd., in the same vicinity, with a larger area. The Blue Diamond is producing over 500 tons of steam and coking coal daily. It is capitalized at $1,500,000 and the Canadian Coalfields at $10,000,000. A 50 per cent interest in the transaction has been offered to the Temiskaming Mining Co.

Cobalt—At the Bailey a shoot of high-grade ore 4 to 5 in. wide has been cut at the 5th level.

The case against the Mining Corporation of Canada, charged with conducting blasting operations without taking proper precautions, was sent by the Police Magistrate to a higher court for trial.

Kirkland Lake—At the annual meeting of the Kirkland Lake on August 10. President F. L. Culver stated that a spectacular new find had been made in No. 8 drift on the 400-ft. level in virgin territory. Questioned as to reports of a possible merger of the company with the Orr and Teck-Hughes mines, Mr. Culver stated that the suggestion of an amalgamation had been made but that the matter had gone no further.

The new mine plant of the Hunton-Kirkland has been installed and is ready for operation. It is planned to put the shaft down to the 300-ft. level where lateral work will be undertaken.

South Lorrain—The Keeley is installing the old Trethewey mill equipment, which is expected to handle about 80 tons of low-grade ore daily. Underground work is being carried on at the 300-ft. level.

Quebec

Harricanaw River.—A report of an important discovery of silver in this district some 30 miles south from Amos on the Transcontinental Ry., caused a rush of prospectors. The report turned out to be erroneous, the alleged discovery proving to be a crack in the mica schist which had been salted by the insertion of a small amount of leaf silver.

CALIFORNIA

Shawmut Mine Suspends Because of High Costs—Morning Star Mill Erected

Portola—The mill at the Gruss mine is now installed and crushing is expected to begin about August 20. Recent developments have exposed much high-grade ore, running $104 to $120 per ton.

Shawmut—Operations have been suspended at the Shawmut mine, the largest producer of Tuolumne County. The mine is owned by the Tonopah Belmont Development Co., of Tonopah, Nev. Although the ore is of good grade with a large tonnage blocked out, the steadily mounting labor and material costs have made it advisable to shut down.

Jackson—A large mill has been erected at the Morning Star group, seven miles southeast of Jackson in Amador County. The property contains large bodies of medium-grade ore near the surface and is to be worked on a large scale. The group was formerly named the Boston.

Washington—A new compressor and auxiliary equipment have been added to the plant at the Red Ledge mine near Washington, Nevada County. Several new buildings are also being erected. Efforts are being made to place the Red Ledge on a sound productive basis.

Columbia Hill District—Three miles of new ditch between Bloody Run and Grizzley Canyon, in the Columbia Hill section, are being built by the Delhi Mines Co. A 900-ft. tunnel has been completed and will be used to carry water through the mountain; it will be ready for use in thirty days. The new water line will eliminate the use of the old two-mile ditch and 2,000-ft. flume line around Whistle Point, which has been practically useless all winter.

Sutter Creek—Drifting on the 3,500-ft. level of the Old Eureka is progressing well, and it is expected that the laterals will enter territory where extensions of rich veins are thought to be.

Darwin—The Darwin Silver Co., owning the Lucky Jim, Defiance and Lane properties, is working about fifty men on the Lucky Jim putting old workings into condition for active development. Heretofore the mine has been worked only for shipping ore but now there is a substantial quantity of low-grade ore. It is intended to install a mill which will treat all ores under $50. The process will probably be water concentration followed by cyaniding. A. G. Kirby is manager.

Swicegood, Putnam & Shea are installing jigs on the Wonder property for treating low-grade ores in mine and on dump. Water is to be pumped from Darwin Wash.

Recent attempts by Porter & Seaman to sulphide and float the chloride and carbonate ores from the Lane and Jackass mines at the Lane mill have proven unsuccessful. The mill is being dismantled and efforts are now being concentrated on the Jackass mine, where shipping ore of good grade has been opened up.

At 100 ft. depth on the property of the Argus Sterling Co., 12 miles south of Darwin, a drift has been advanced 75 ft. on a shoot of lead carbonate ore which has an average width of 3 ft. The smelter valuation of the first carload shipped was $110.50 per ton, the lead content being 47 per cent. A second carload is now in transit. A. C. Taylor, of Los Angeles, is manager.

Trona—Certain improvements in the process have been made at the plant of the American Trona Corp. in the Searles Lake district. Working forces are being increased as rapidly as possible.

At the Copper Queen, operated by the Slate Range Minerals Co., a winze which is being sunk from the lowest level in the mine is now down 90 ft. and galena carrying high silver values is coming in. The combination table and flotation mill is being operated to full capacity on lead-carbonate ores, which receive a sulphidizing bath before flotation. Shipments of both crude ore and concentrates are going forward to the smelter regularly. L. D. Hirschfeldt, of Bakersfield, Cal., is manager.

NEVADA

United Comstock Installing Equipment for Driving New Tunnel—Rochester Mines To Continue Shut Down

Tule Canyon — The Silver Hills Nevada Mines Co. is now operating the three-stamp mill recently brought from California by W. J. Loring, manager, and it is thought that it will handle about 18 tons daily. The stamps weigh 1,050 lb. each. It is expected to run the mill in conjunction with the five light stamps that were on the property when it was taken over by the present company. The three-stamp mill is the one used by Mr. Loring to test the ore in the Calaveras and Morgan mines and he considered it a mascot.

Virginia City—Work of installing the compressor and other surface equipment for driving the big electric haulage tunnel of the United Comstock Mines Co. was started July 31. The tunnel will be 8 x 8 ft. in the clear, the portal being located at American Flat at the site of the 1,000-ton mill that is to be built later. The V. & T. Railroad Co. is to build a spur track from its station at Scales to the millsite.

Simon—In answer to a direct question, P. A. Simon has denied to a representative of the *Engineering and Mining Journal* the reports that the control of the Simon Silver-Lead mine has passed to the International Nickel Co. and that Charles D. Kaeding is to have charge of the property. Mr. Simon states that the resignation of Albert Burch was a matter of economy and that while Mr. Kaeding is being consulted by him at times he is not on the payroll of the company. Tom McNamara, who has worked under Kaeding for years, is foreman at the Simon mine, succeeding Ed Orr, who held the position under Mr. Burch.

Searchlight—The last of several carload shipments by Burdick & Perkins, lessees at the Duplex mine at Searchlight, is said to have yielded the shippers $9,000.

Snake Range—A 1,200-ft. tunnel has been driven on the lead-silver property of Dearden & Johnson near the head of Snake Creek, about 40 miles southeast of Ely. The vein is 18 in. wide and is said to carry high values.

Rochester—It is expected that the mines at Rochester and Packard which were forced to close down as a result of lack of power, due to a shortage of water for generating electricity, will have to remain idle for some weeks. After the irrigating season is over there will be water enough for power.

MONTANA

Jefferson Mines Plan Leaching Plant—Tuolumne To Use Own Trucks

Butte—Crosscutting by North Butte for the Edith May vein on the 3,600-ft. level continues, with the belief that the ledge will be reached within a week or two.

The Tuolumne Copper Co. is planning to install its own system of trucks for transporting ore from its Main Range properties to the loading platforms alongside of the Northern Pacific tracks, about a mile distant.

Four-hundred steel lockers have been purchased by Davis Daly for the new dry house to be installed at the Colorado mine. A new blacksmith shop and a framing plant of modern construction have been completed and a tool sharpening works will also be installed. Storage rooms for mine supplies have been built and a garage for trucks. The ore showing on the 2,700 level is reported to be good.

Potomac District—From 4 to 5 ft. of ore carrying up to 4 per cent copper has been opened by Potomac Copper in the No. 4 tunnel being driven for the Copper Cliff property. The objective will not be reached before 60 days, according to the company's Butte office.

Whitehall District—A two-compartment shaft has been sunk by the Jefferson Mines Co. to a depth of 218 ft. with the 300 level as the objective, at which point the ore deposit will be crosscut. The installation of a leaching plant to treat the upper oxidized portions of the deposit, which carry varying amounts of copper, ranging from 2 to 6 per cent, is planned.

IDAHO

Coeur d'Alene District

Nabob Shipping Lead and Zinc Concentrates — Interstate-Callahan Takes Up Option on Kill Buck

Pine Creek—The Nabob Consolidated Mining Co. is now hauling both lead and zinc concentrates to the railroad. The 150-ton mill is running only one shift, but will add two more as soon as a raise is completed to the Denver tunnel level, which will make much ore available.

Wallace—The Consolidated Interstate-Callahan has exercised the option held on the control of the Kill Buck Mining Co., which was owned by Senator W. A. Clark and associates of Butte. The Kill Buck property joins the Chicago-Boston, control of which was recently purchased by the Interstate-Callahan, and the two properties will be jointly developed and eventually consolidated. The Chicago-Boston company is sinking from the 200 to 400 level, at which point the vein will be explored, while sinking will continue. A large body of lead-silver ore has been opened on the 200 level.

The Friend Mining Co., operating on Beaver Creek, is arranging to construct a mill that will handle about 10 tons of ore per day, the company now using a hand jig. It is intended to handle both mine and mill with the same working force. As soon as there is a sufficient accumulation of ore the men will come out of the mine and run the mill, and when the ore is cleaned up they will return to the mine and repeat the operation. In this way the management expects to pay for development. A shoot of lead and zinc ore has been followed about 400 ft. in the main tunnel. It carries from 6 to 18 inches of good ore.

The Jack Waite Mining Co. has two motor trucks hauling ore to the railroad at Prichard, 13 miles from the mine, each truck hauling 3 tons and making two round trips per day. Much of the ore is hand-sorted and the lower grade is hand-jigged. Two jigs are working and two more will soon be added. The mine is reported to be in good condition for production and would easily supply a 100-ton mill for several years. The ore being shipped is running above 50 per cent lead but low in silver.

COLORADO

To Increase Capacity of Boulder County Mill—First Unit Completed at Telegraph Mine at Ward

Victor—The Bonanza property is being developed and operated by the Granite Gold Mining Co. under lease from the United Gold Mines Co. A winze is being sunk in ore. Recent development work has produced a carload assaying $60 a ton.

Breckenridge—The Tymos Mines Co. is equipping and developing its property at Shock Hill. A transmission line has been completed to connect with the Colorado Power Co.'s system. Electrically driven pumps and other equipment will be installed. It is planned to drive a crosscut 1,000 ft. from the 300-ft. level toward the Brooks-Snyder and Ground Hog properties. George B. Tyler is president of the Tymos company.

Two shifts are employed in sinking the shaft on the Missouri property, which is being developed under lease. The shaft has reached a depth of 115 ft. and will be sunk an additional 50 ft.

Ward—The American Gold & Platinum Co. has completed the first 25-ton unit of its plant for treating gold-platinum ores from the Telegraph mine. Preliminary tests are reported to have been successful, and indicate that the ore averages $14 gold and $200 platinum per ton. John Ogden is manager.

Cardinal—The new flotation equipment recently installed in the Boulder County mill is in successful operation. The capacity of the plant will be increased from 40 to 100 tons per day. It is estimated that the ore supply will keep the mill running for about two years. The Boulder County Tunnel has been advanced 2,700 ft. on the vein, of which about 1,200 ft. is in ore.

Silverton—The Bandora mine is reported to have been sold by William Sullivan to Denver capitalists for $100,000. It will be operated under the management of Henry Wycoff. Arrangements are being made to purchase the Eucon mill and move it to the Bandora mine. The mill is owned by J. F. Sweet, of Boston.

ARIZONA

Hardshell to Reopen—Diamond Drilling at Three R Encouraging

Patagonia — The Hardshell mine, which has been shut down since May, is ready to be reopened. Owing to the shortage of fuel oil caused by the railroad strike the company was forced to suspend. Advantage was taken of the shutdown to enlarge the surface plant. New hoisting equipment has been added and everything is ready now except for completing additional fuel oil storage tanks. There is ample boiler and pump capacity and no difficulty is expected in unwatering the mine.

At the Flux property the mill is being overhauled and will shortly be put into operation.

Diamond drilling with one machine continues at the Three R mine. Results are not being announced. It is said they are encouraging. Ten holes have been drilled to cut a parallel vein to the main workings. The Colossus tunnel is being advanced.

At the Blue Nose, jigs are being built to treat some fairly high-grade ore from the dumps.

Duquesne—The Bonanza mine is being unwatered from the 160 level to the 300. Lessees are working on different parts of the property. The railroad point nearest to this property is Zorilla, a station on the Southern Pacific de Mexico, in Sonora. The ore is hauled to this point, crossed in bond and brought out at Naco, Ariz., where the S. P. de M. connects with the El Paso & Southwestern R.R.

Dragoon—Mills & Co., lessees on the Texas-Arizona, who struck high-grade lead-silver ore several months ago, are installing a compressor, direct-connected to a fuel-oil engine. A drift has been started on the 350 level, which should cut the orebody within 150 ft. Stoping will be started on this level when the vein is reached.

Johnson—Installation of a hoist and compressor at the Mammoth has been completed and two shifts are working breaking ground and hoisting.

Dos Cabezas—Sill & Sill, of Los Angeles, have been retained as consulting engineers for the Dives mines. The ore being mined and treated at the company's mill is running about $20 per ton, a large part of which is being recovered on the plates.

Good progress is being made in the tunnel of the Gold Prince Mining Co., where it is expected the main vein will be reached within 30 ft. Installation of tables and electric wiring will complete the new mill. A test run is to be made about Aug. 20.

Bert Macey, of Tombstone, has arrived with miners to start work on the Le Roy Con. Mining Co.'s property.

Globe—The Northwest Inspiration is crosscutting at 300-ft. depth in a 700-ft. tunnel with the expectation of picking up the Warrior vein within a couple of hundred feet. The main shaft is to be sunk from 340 to 540 ft. Jack Huston is in charge.

The cutting of Old Dominion's Maggie vein on the 19th level is considered important as affecting the future of the Old Dominion. The vein is practically new and undeveloped. The ore cut thus far runs over 5 per cent. Operations are to be continued down to the 20th level to secure drainage.

Willcox—The Grand Reef property, in the Aravaipa district, 60 miles north of Willcox, is reported to have been sold by Richard V. Dey, of New York, to the Aravaipa Leasing Co., a corporation controlled within the American Lead & Zinc Co. An immense dyke, cut by a canyon to a depth of several hundred feet, shows a number of paystreaks of silver ore, the broadest being 20 ft. in width. A mill has been operated at the mine by lessees, though the long wagon haul to the nearest railroad point is understood to have consumed all profits. It is though that a railroad route can be found to Willcox. The lease was recently abandoned and it was announced that the mill would be junked.

Jerome—The Shea tunnel is within 100 ft. of the main shaft. The heading is now in 1,140 ft., with a vertical depth of 460 ft., and is in ore. Shipments are being made to the U. V. Extension smelter, the ore coming from the 350 level.

Creditors of the Verde Apex have brought a $24,000 suit against the company for unpaid bills.

NEW MEXICO

Burro Mountain Mill in Operation

Tyrone—The first unit of the new mill of the Burro Mountain Branch of the Phelps-Dodge Corporation was put into operation Aug. 2. This marks the resumption of regular operations at this property. A year ago the mill was shut down and since that time has been remodeled, various improvements being installed.

Silver City—A meeting of the stockholders of the Silver Spot Mines Co. was held Aug. 3. R. I. Kirchman is in charge of developments.

SOUTH DAKOTA

Trojan Shaft Below 100 ft.—Operations Curtailed by Labor Shortage and High Costs

Deadwood—The Iron Hill tunnel has been advanced 1,285 ft. and it is expected that the old Iron Hill workings will be tapped very soon. The tunnel will cut the mine at a depth of 300 ft. and will drain the property and allow further development of this one-time famous silver mine.

The Cutting property is being developed by means of a drift on the 200-ft. level. The shaft has been sunk to 500 ft. depth and a short lateral driven at that depth. A drift has also been driven on the 350-ft. level but the work is being confined to the 200 level until suitable pumps can be installed to handle the large amount of water.

Trojan—Sinking of the Trojan shaft is now below the 100-ft. point and continuing. From the surface the shaft has been concreted to a depth of 70 ft. The shaft will be continued to a depth of from 600 to 700 ft. The plant and mines of the company are in continuous operation although at reduced capacity owing to labor shortage and high costs.

MICHIGAN

Gogebic Range

Installing New Hoisting Equipment at Winona Shaft of Ironton Mine

Ironwood—The new electric hoists and flywheel set for the Winona shaft of the Ironton mine at Bessemer, Mich., are now erected, and the switching apparatus is being installed. Power will be purchased from the street railway company and used to drive the motor-generator-flywheel set, which will supply the direct current for the hoists. The cage hoist has two drums clutched to the main shaft, which is driven through gears. The ore hoist also has two clutched drums, but its motor is connected directly to the main shaft. It is rated at 1,650 hp., using 2,550 amp. at 525 v. All four drums are fitted with post brakes. The two skips and two cages will be run in balance as much as possible. Practically all of the hoisting for this mine will be done at this shaft. Electric-driven air compressors are to be installed in the new engine house also.

Two of the three 400-gal. pumps ordered for the Davis mine have been received. They are four-pole, pot-form, center-packed plunger pumps. The plungers are 4¾-in. in diameter with a 24-in. stroke, and the pumps will be driven at 52 r.p.m. through herringbone gears by 300-hp. induction motors. They will work against a head of about 2,600 ft., to withstand which pressure the water ends are made of forged steel.

Continued delay in delivery of material is holding up the erection of the transmission line from the Davis and Puritan mines to the power station at the Pabst mine.

The district offices of the McKinney Steel Co. have been moved from the Colby mine into a new building at the Ironton mine.

The Republic Iron & Steel Co. is installing a 600-gal. pump on the 12th level of the Plumer mine at Pence, Wis.

ALABAMA

Preparing for Deeper Mining in Birmingham District—Electrification of Mines Being Pushed

Birmingham—The Woodward Iron Co. will not make use of its new shaft for some time, but is simply preparing for the time when its present workings are exhausted. The shaft was sunk during the last year and a half. It has been concreted and the hoisting machinery installed so that it is ready whenever needed. According to a company official the ore in the shaft at depth is better than that nearer the surface. The ores near the lower end of Red Mountain, where the Woodward properties are located, are self-fluxing. The shaft is of sufficient capacity to supply the company's five furnaces.

Together with the Shannon mines of the Gulf States Steel Co., the Woodward mine is part of the plans for deep mining in this district. Borings are now being made on virgin ground. The two projects mentioned promise large outputs, which will cover demands for years to come.

Electrification of the iron mines of the Birmingham district continues, with the Sloss-Sheffield Steel & Iron Co. building transmission lines from its power plant at North Birmingham, near the byproduct coke ovens, while the Tennessee Coal, Iron & R.R. Co. and others are using power from the Alabama Power Co., which has a hydro-electric plant on the Coosa River. The latter company is adding a fifth unit to the plant, which will increase the total capacity to 105,000 hp. The flow of water in the Coosa is not sufficient the year around to operate all five units but it is believed that water can be stored while the river is up. The Alabama Power Co. is furnishing power not only to ore mines but to coal mines, cotton mills and various other manufacturing plants.

The Tennessee C., I. & R.R. Co. is giving much attention to all developments on Red Mountain, the little communities established being looked after, and welfare work is said to be securing excellent results.

JOPLIN-MIAMI DISTRICT

Oklahoma-Missouri-Kansas

Niangua Mining Co. Operated by Receiver—Hawkins Company Opening Rich Lead Property Four Miles from Baxter

Commerce, Okla.—The Tydings & Seals Mining Co. has recently taken a lease on the tract of the Commerce Mining & Royalty Co. adjoining Commerce, and has started two concentrators on it and will start a third within a few weeks. The mills placed in operation are the Turkey Fat and the Cactus, the latter having been renamed the "Dinty Moore." The dirt for the latter mill is being taken from the old Midas shaft. The Never Sweat mill has been renamed the "Maggie" by the company and will be placed in operation as soon as necessary overhauling and new installations are completed. Included in the company are John Newton, general superintendent for the Commerce Mining & Royalty Co., with many years' experience in this district, and Homer Seals and T. Rader, formerly operators at Joplin, and Walter Tydings, of Commerce.

Baxter Springs, Kan.—A new lead mine of exceptional richness has been opened up by the Hawkins Mining Co. on the Dawes land, four miles southeast of Baxter. The lead is found at 100 ft. and the run extends down to 150 ft., many large chunks weighing up to a ton or more having been recovered. Hand jigs have been installed and the company plans to erect a mill. Harry Hawkins, of Miami, is general manager for the company.

Picher, Okla.—The Niangua Mining Co. recently went into bankruptcy and is being operated under the management of W. S. O'Bannon, as receiver. The No. 1 mill of the company burned down some months ago, and the No. 2 plant has not been sufficient to pay on the lease at the rate contracted. The receivership, therefore, is more a mutual agreement proposition on the part of the creditors, calculated to give the company a better chance. Since it was created, the company has driven a 600-ft. drift connecting the No. 2 mill with the No. 1 mine. In addition, better dirt has been found in the No. 2 mine, so a good production is being recorded at present.

The Keltner Mining Co. is installing a 150-hp. gas engine and a 580-ft. compressor for operating the Gold shaft recently completed 200 yd. north of mill.

The new 300-ton mill of the Aztec Mining Co. has been placed in operation. It includes a sludge room with a 50-ft. Dorr thickener. Electric power is used throughout except for one compressor. H. G. Tarsh, Joplin, Mo., is president.

The Red Bird Mining Co. has completed a small concentrator on the 40-acre lease adjoining Aztec, the lease on the southeast. Frank Childress, of Galena, and R. L. Kidner, of Joplin, are the principal owners.

THE MARKET REPORT

Daily Prices of Metals in New York

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
12	18.35@18.50	44.50	47.75@48.00	9.00	8.75@9.15	7.80@7.85
13	18.35@18.50	44.50	48.00@48.25	8.90@9.00	8.75@9.15	7.85@7.90
14	18.35@18.50	44.50	48.00@48.25	9.00	8.75@9.15	7.90@7.95
16	18.35@18.45	44.50	47.75@48.00	9.00	8.75@9.15	7.95@8.00
17	18.35	44.50	48.00@48.25	9.00	8.75@9.15	7.90@8.00
18	18.35	44.50	47.75@48.25	9.00	8.75@9.15	7.90@7.95

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered" which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
12	93 1/4	95 1/4	112	276 1/2	283 1/2	36	36 1/4	41 3/4	43 1/4
13	94 1/2	96 1/4	112	276 3/4	283 1/2	35 1/4	35 3/4	41 1/2	43
14	....	....	...	..	....			...	..
16	94	95 3/4	111	274 1/2	282	35 3/8	36	41	42 1/2
17	93 1/4	95	111	274 3/4	281 3/4	35 1/4	36 3/8	41 3/8	43 1/2
18	93 7/8	95 1/2	111	274 1/2	281 1/2	35 1/2	36	41 1/4	42 3/4

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver			Aug.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
12	365	99 1/2	95 3/8	58 3/4	16	363	99 1/2	95 7/8	59 3/8
13	362	99 1/2	95 3/8	59 1/4	17	363	99 1/2	97 1/4	59 3/4
14	363	99 1/2	95 3/8	59 1/8	18	362 1/2	99 1/2	98	60 1/2

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Aug. 18, 1920

Possibly in no week this year have the metal markets exhibited less activity than in that just past. Consumers are, in general, showing no interest, nor are conditions expected to improve much until after Labor Day.

Copper

The fair buying which we reported last week proved to be only a flash in the pan. Consumers are not in the market, and there also seems to be little inclination to sell at current prices. Inquiries for reasonaby large lots would soon push the market up at least ½c. above current quotations. Some small lots of metal are reported as being offered by second-hands from the Middle West. Near-by metal in small lots can be obtained at our prices. Larger lots of copper for forward delivery we quote at 18.50@18.85c.

Lead

The only event of importance during the last week was the action of the A. S. & R. in advancing its contract price to 9c., New York, on Thursday. At this price, lead from Europe can be brought into this country and sold at a very attractive profit, and international traders have not been slow to take advantage of the situation. Several thousand tons have arrived or been contracted for, largely American, Australian and Mexican brands, although Spanish and German lead is also included. The demand, however, is not as large as might be supposed, consumers rightly assuming that the price is not likely to go higher, so that, outside of contract business, only present demands are being provided for. Large producers are turning down orders and making no promises regarding shipment. We quote lead for near-by delivery, both New York and St. Louis, at 9.00@9.25c.

Zinc

The feeling in the zinc market is decidedly more cheerful. Demand is much more active at the higher prices now prevailing, though business is not yet what might be termed strong. Those who are selling now are, in general, resellers, who bought at 8¼c. and less and are willing to take a reasonable profit. Producers are not anxious to get rid of their metal, for they believe that prices will go still higher. Production continues to be curtailed, and one Western smelter bought outside zinc to fill his contracts. It would not be at all surprising to see zinc gradually approach 8¾c., at which point importations from Europe would begin to pay at current London prices.

Forward deliveries command 5 to 10 points premium over the prices which we quote, which represent the near-by market. There is little or no demand.

Tin

No signs of life are yet apparent in the tin market. Demand is equally lacking for all grades and deliveries, and prices are largely nominal.

Straits tin for future delivery: Aug. 12th, 48.00@48.25c.; 13th, 48.25@48.50c.; 14th, 48.25@48.50; 16th, 48.00@48.25c.; 17th, 48.00@48.50c.; 18th, 48.00@48.50c.

Arrivals of tin in long tons: Aug. 10th, Australia, 100; 12th, China, 50; Straits, 25; 17th, Liverpool, 60; London, 85.

Silver

The silver market has been steady the last week in London, on buying for China and Indian bazaars, and closes with advancing tendency on higher rates from China. The New York market has been above London parity on a good demand from China banks which has developed this week, and closes strong. Offerings of foreign silver continue limited. If Chinese and Indian

demand continue urgent, it is possible the silver export price will pass the limit of $1 per fine oz., fixed for domestic production under the Pittman Act, in which event the export and industrial demand must take care of all domestic production to maintain price level over the Government figure.

Last week, some copies of the *Engineering and Mining Journal* appeared with the prices of New York domestic and foreign silver interchanged. The 99¼c. price of course applied to silver of domestic origin.

Mexican Dollars—Aug. 12th, 72⅝; 13th, 72⅝; 14th, 72⅝; 16th, 73; 17th, 74¼; 18th, 75.

Gold

Gold in London on Aug. 12th, 111s. 11d.; 13th, 112s. 11d.; 16th, 113s. 3d.; 17th, 114s.; 18th, 114s.

Foreign Exchange

Price changes during the week were narrow. Sterling is not likely to advance materially for some weeks, owing to the large volume of grain and cotton bills which will be thrown on the market. Yesterday, francs were 7.28c.; lire, 4.86c. and marks 2.10c. New York funds in Montreal, 13⅞ per cent premium.

Other Metals

Aluminum—The Aluminum Co. of America has announced a price increase of about 2c. per lb. effective Aug. 10: Ingot, 99 per cent and purer, 35.1c.; 98@99 per cent, 34.9c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Market continues weak. Spot, 7c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7c. W. C. C. brand, 9@9¼c. Chinese needle antimony, lump, firm at 9@10c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market dull.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$95@$110 per oz.

Platinum — Firm at $110@$115 per oz. $105 per oz. in 100 oz. lots.

Quicksilver — Market steady; $85@$88 per 75-lb. flask. San Francisco wires $83. Steady.

Ruthenium—$200@$220 per troy oz.

[1]Selenium, black, powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c. per unit, f.o.b. mines.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. Operators claim it will be necessary to advance ore prices, owing to increased cost of production.

Manganese Ore — 70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum ore—85 per cent MoS_2, 75@85c. per lb. of contained sulphide, New York.

[1]Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 65@70c. per lb. in ton lots.

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

Zircon—Washed, iron free, 6c. per lb. Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

[1] Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 11—Zinc blende, per ton, high $51.75; basis 60 per cent zinc, premium, $48.50; Prime Western $47.50@$45; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $45.73; calamine, $38.86; all zinc ores, $44.54.

Lead, high, $104.30; basis 80 per cent lead, $100; average settling price, all grades of lead, $99.20 per ton.

Shipments for the week: Blende, 7,916; calamine, 211; lead, 1,344 tons. Value all ores the week, $503,610.

Eighty tons were reported purchased on $45 basis, 2,600 tons on $46 basis, largely purchased by a smelting company from a subsidiary mining company, and the balance of 12,000 tons purchased, except the premium and fines and slimes grades, was on $47.50 basis.

Platteville, Wis., Aug. 11—Blende, basis 60 per cent zinc, $50 per ton for high-grade. Lead ore, base 80 per cent lead, $100 per ton. Shipments for the week: Blende, 1,551; calamine, 30; lead, 26; sulphur ore, 32 tons. Shipments for the year: Blende, 44,624; calamine, 2,330; lead, 387; sulphur ore, 1,209 tons. Shipped during the week to separating plants, 2,124 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground.

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $25@$30 car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3¾c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. Wholesale, plaster of paris, carload lots, $3.75 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 16½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

[1]Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, prompt delivery, $200@$225 freight allowed; last half, $200@$220; English, $195@$200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75@$80, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150 @$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22¼@23c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ½ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$90@$100 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $50@$55 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $45@$50. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$100@$110 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110 @$120.

Silica Brick—9-in. per 1,000, $51@$55, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 17, 1920

Production of steel ingots in July was at the rate of about 39,900,000 gross tons a year, representing a decline of 6 per cent from the June rate. Pig-iron production by steel interests decreased in lower ratio and some seems to have accumulated. There was also accumulation of semi-finished steel, on account of car shortage, and shipments of finished steel were nearly equal to the amount produced.

Pig Iron—Claims are made of a recent transaction in basic setting the market at $48.50 Valley, but there are some uncertainties connected with the report, and the reported $2 advance is not confirmed. Bessemer is said to have sold in several small lots at $47, in one case at $50, and one sale of 500 tons of foundry for the balance of the year at $50.50, Valley basis, is reported. Transactions are only a small fraction in volume of those that have hitherto occurred when the whole market was advancing, hence we quote last week's prices, subject to premiums for delivery: Bessemer, $47; basic, $46.50; foundry, $46, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40, but to advance 40 per cent next week.

Steel—A week ago sheet bars were reportable at $70, a decline of $5, and now it appears that $70 could be shaded slightly. Billets are quiet at $60@$65.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

An Analysis of the Copper Situation

Record for Half Year Satisfactory, but Present Condition Exhibits Tendency To Lose Gains—Domestic Consumption About Twice Pre-War Rate—Foreign Demand Was Encouraging—Need of Co-operative Policy in the Industry

THE copper market is still in the doldrums. With the exception of the first three or four months of the year, when buying of copper occurred on an unprecedented scale, the copper trade has sunk into a lethargic state from which relief is not yet in sight. The table presented herewith records the statistical position of the metal so far as can be ascertained from available figures, a close inspection of which indicates that the results of the trade during the first half of the year were satisfactory, but that there is a tendency at the present time to lose a measure of the improvement gained.

Export trade, which has been largely counted upon to assist the copper market in its troubles, has exhibited encouraging aspects, the total exports for the half year being about 373,000,000 lb., or at the rate of 746,000,000 lb. annually, which compares favorably with exports averaging about 800,000,000 lb. for the five years preceding the war. Imports were a little above the pre-war rate of 360,000,000 lb. annually. The figures indicate that despite financial difficulties European nations and Japan were factors in the copper market whose importance should not be underestimated. The net balance of exports over imports of copper was maintained in the varying monthly amounts indicated with the exception of June, when a small adverse balance was recorded. Results over one month, however, are never of any particular significance, but should this condition be maintained for several months it will impair part of the export record made earlier in the year.

Domestic smelter production of blister copper has not varied much—always within a few per cent of the preceding month—and is at the rate of 1,415,000,000 lb. yearly, about 17 per cent more than the pre-war rate of 1,210,000,000 lb. Refinery production is also above the pre-war rate. Owing to the large stocks of crude copper on hand at the refineries, transporation troubles did not affect refining as much as expected.

The estimates of sales into foreign and domestic consumption total about 860,000,000 lb. for the first half of 1920. Domestic deliveries of copper for the same period are estimated at 680,000,000 lb. Exports were 373,000,000 lb., a large portion of domestic deliveries and exports the conclusion of heavy sales in the latter part of 1919. The estimate of domestic deliveries or consumption would indicate a consumption of copper of 1,360,000,000 lb. annually, or on a scale much larger than the pre-war rate of 741,000,000 lb.—almost twice as much, in fact. This is one of the most optimistic indications in the copper industry, and were it not for one other factor which seemingly the copper industry is unable to eliminate, the market would be in a highly satisfactory condition. This factor, of course, is the large stock of both crude and refined copper still on hand. Domestic consumption is doing its share, but enlarged buying from foreign quarters, from France, England, Italy and particularly Germany, is necessary before any great inroads into surplus stocks can be made.

On Jan. 1, 1919, according to the U. S. Geological Survey, there were on hand refined stocks amounting to 180,000,000 lb., and of blister copper, 562,000,000 lb. On Jan. 1, 1920, there was 631,000,000 lb. of refined copper on hand and 310,000,000 lb. of blister copper, or a total of 940,000,000 lb. of copper. Let us say an average cost of 14c. per lb. had been expended upon this product, or a total outlay of $131,600,000, which is quite a bit of capital to have tied up in unmarketed copper in these days of stringent credit facilities. The good record made in the first half of the year indicates that the stocks of refined copper were reduced, and are now between 475,000,000 and 500,000,000 lb., though there is probability that stocks of blister copper, if they show any change, exhibit an upward trend. It is probable that for the first few months of the year decided inroads were being made into the refined copper stocks, but that this improvement diminished monthly, so that now practically no reduction is recorded.

The price of copper has in general moved in sympathy with the situation in the metal. The lowest average price for electrolytic this year was recorded in June (18.07c.), but in comparison with the conditions existing a year ago with copper between 14c. and 17c. the present averages are a pleasing comparison. The current stagnation in the copper market comes at a time when demand should be particularly brisk, when requirements for the latter part of the year are ordinarily covered. August last year, it will be remembered, was the month in which the peak prices of copper for the year were attained (over 22c.). That copper will go much above its present level before the end of the year seems unlikely unless there is a material change in the fundamental difficulties hampering the industry. Twenty-cent copper is a low price, but if attained would be a creditable showing, considering the adverse conditions.

The seriousness of the present condition demands emphasis. The United States, which is the world's leading copper-producing country, is marketing a wasting asset at a cost but little above the cost of production. Every pound of copper sold diminishes by so much the nation's copper resources, which, although tremendous, are not of such a character as to warrant producing them and supplying the world at prices which represent an exceedingly small return. The obvious remedy that first comes to mind is to curtail production, thereby creating a smaller supply and easing the acute labor situation in other fields. In some cases, such as a step, by increasing the overhead expenses, might increase the cost of production. All producers have decreased their production drastically from war rates, and generally to the economic limit, refraining from a further decrease not only for business reasons but for the certain measure of responsibility that they have toward the mining communities which depend for their existence upon the continued operation of the mines. Nevertheless, the situation is critical, and copper producers would be justified in forming plans whereby this valuable resource may be conserved to the best advantage and no one producer will take unfair advantage over his neighbor.

ANALYSIS OF THE COPPER SITUATION FOR FIRST HALF OF 1920

In Pounds

Month	Crude Copper Production	Imports	Exports	Net Exports	Estimated Sales Foreign and Domestic	Estimated Stocks of Refined Copper on First of Month	Estimated Domestic Delivered	Average Price
Jan.....	121,900,000	34,220,000	49,680,000	15,460,000	239,000,000	(a)631,000,000		18 92
Feb.....	117,450,000	39,170,000	57,600,000	18,430,000	89,000,000	612,000,000	500,000,000	18 57
Mar.....	120,310,000	28,870,000	88,030,000	59,160,000	320,000,000	585,000,000		18 33
Apr.....	116,080,000	21,950,000	64,390,000	42,440,000	100,000,000	520,000,000		18 66
May.....	114,960,000	44,860,000	83,280,000	38,420,000	62,000,000	469,000,000	[illegible] 000 000	18 48
June.....	116,670,000	31,510,000	30,100,000	(b)1,410,000	52,000,000	456,000,000	[illegible] 000	18 [illegible]
Totals...	707,370,000	200,580,000	373,080,000	172,500,000	862,000,080	485,000,000 July 1st.	[illegible] 000,000	18 51 Six
Yearly rate	1,414,740,000	401,160,000	746,160,000	345,000,000	1,724,000,000	. . .	1,3[illegible] 000,000	Months

(a) 310,000,000 lb. crude copper in addition.
(b) Net imports.

MINING STOCKS

Week Ended August 14, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*20	*40	*40		
Ahmeek	Boston	60	58	58	June '20, Q	.50
Alaska-B.C.	N. Y. Curb	1/8	1/8	1/8		
Allouez	Boston	22	20	21	Mar. '19,	1 00
Amazonda	N. Y.	52½	49½	52	Feb. '20, Q	1 00
Ariz. Com'l	Boston	9	8½	9⅛	Oct. '18,	.50
Big Ledge	N. Y. Curb	1/16	1/8	1/16		
Bingham Mines	Boston	8¼	8	8	Sept. '19, Q	.25
Calumet & Ariz.	Boston	54	52	54	June '20, Q	1 00
Calumet & Leeda	Boston	300	290	300	June '20, Q	5 00
Canada Copper	N. Y. Curb	1/16	1/8	1/8		
Centennial	Boston	11	11	11	Dec. '18, SA	1 00
Cerro de Pasco	N. Y.	39	33⅞	37½	June '20, Q	1 00
Chief Consol.	Boston Curb	3⅛	1½	3	Feb. '20, Q	.10
Chile Cop.	N. Y.	14½	12⅝	14½		
Chino	N. Y.	26⅜	25⅛	25½	June '20, Q	37½
Columbus Rexall	Salt Lake	*43	*38	*40		
Con. Ariz.	N. Y. Curb	2	½	2	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb			27/32		
Copper Range	Boston	36	34½	34½	June '20, Q	.50
Crystal Copper	Boston Curb	*30	*27	*26		
Davis-Daly	Boston	7⅛	7⅛	7	Mar. '20, Q	.25
East Butte	Boston	10⅛	9⅛	10⅛	Dec. '19, A	.50
First Nat'l	Boston Curb	*90	*90	*90	Feb. '19, SA	15
Franklin	Boston	*70	*40	*50		
Gadsden Copper	N. Y. Curb			*71		
Granby Consol.	N. Y.			33	May '19, Q	1 25
Greene-Can.	N. Y.	25	23½	25	Feb. '19, Q	1 50
Hancock	Boston	4	4	4		
Houghton	Boston Curb	*40	*40	*40		
Howe Sound	N. Y. Curb	3⅛	3	3¼	July '20, Q	.05
Inspiration Con.	N. Y.	46⅞	43⅛	46⅛	July '20, Q	1 00
Iron Cap	Boston Curb	8¾	8⅛	8⅛	Feb '19, M	.25
Isle Royale	Boston	29	25	26	Sept. '19, SA	.50
Kennecott	N. Y.	24	22½	24	June '20, Q	.50
Keweenaw	Boston			1⅞		
Lake Copper	Boston	3	2⅞	2⅞		
La Salle	Boston	2⅛	2⅛	2⅛		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb	26	24½	25	Jan. '19, Q	.50
Majestic	Boston Curb	*13	*10	*12		
Mason Valley	N. Y. Curb			2⅛		
Mass. Con.	Boston	2⅞	2⅝	2⅝	Nov. '17, Q	1 00
Mayflower-O.C.	Boston	5⅛	4⅛	4⅝		
Miami	N. Y.	19	18⅛	18⅝	May '20, Q	.50
Michigan	Boston	4	4	4		
Mohawk	Boston	60	58⅛	58⅞	Feb. '20, Q	1 50
Mother Lode (new)	N. Y. Curb	5⅞	5⅛	5⅛		
Nevada Con.	N. Y.	11	10⅛	10⅜	June '20, Q	.25
New Arcadian	Boston			3		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17	16⅛	16⅜	May '20,	.25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	14⅜	14⅛	14⅜	Oct. '18, Q	.25
North Lake	Boston	⅜	⅜	⅜		
Ohio Copper	N. Y. Curb			1/16		
Onbway	Boston	1⅛	1⅛	1⅛		
Old Dominion	Boston	23⅛	21	21	Dec. '18, Q	1 00
Osceola	Boston	1⅛	1⅛	1⅛	June '20, Q	.50
Phelps Dodge	Open Mar.	†195	†180		July '20, Q	2 50
Quincy	Boston	46	44	44	Mar '20, Q	1 00
Ray Con.	N. Y.	14⅜	13⅛	14⅛	June '20, Q	.25
Ray Hercules	Boston Curb			*60		
St. Mary's M. L.	Boston	38⅛	38	38⅛	June '20, K	2 00
Seneca	Boston	14⅜	13⅜	13⅜		
Shannon	Boston	1⅛	1	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	8⅛	8⅛	8⅛	Jan. '20,	.25
South Lake	Boston			2		
South Utah	Boston	*15	*15	*15		
Superior	Boston	4⅛	3	4⅛	Apr. '17,	1 00
Superior & Boston	Boston	3⅜	3	3 1/16		
Tenn. C. & C.	N. Y.	9⅛	9	9⅛	May '18, I	1.00
Tuolumne	Boston	*60	*60	*60	May '13,	.10
United Verde Ex.	Boston Curb	30⅛	29⅛	30⅛	June '20, Q	1 50
Utah Con.	Boston	6⅛	6	6	Sept. '18,	.25
Utah Copper	N. Y.	61	56⅛	60⅛	June '20, Q	1 50
Utah M. & T.	Boston	1⅛	*95	1	Dec. '17,	.30
Victoria	Boston			1⅞		
Winona	Boston	*50	*50	*50		
Wolverine	Boston	13½	12	13	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	4⅛	3⅞	4	June '20, QX	.20
St. Joseph Lead	N. Y.	14⅞	14⅜	14⅞	June '20, QX	.50
Stewart	Boston Curb			*16	Dec. '15,	.05
Utah Apex	Boston	1⅛	1⅛	1⅛	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	12⅜	11	12	May '17,	1 00
Am. Z. L. & S. pf.	N. Y.			44⅜	May '20, Q	1 50
Butte C. & Z.	N. Y.	7⅛	6⅞	7⅛	July, '18, I	.50
Butte & Superior	N. Y.	19	16	18⅛	Sept. '17,	1 25
Con. Interst. Cal.	N. Y.	10⅜	9⅛	10⅛	June '20, Q	.50
New Jersey Z.	N. Y. Curb	186	184	184⅞	May '20, SA	4 00
Success	N. Y. Curb	*5	*4	*4	July '16,	.03
Yellow Pine	Los Angeles			1 01	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1	1⅛		
Alaska Juneau	N. Y.	1⅛	1⅛	1⅛		
Carson Hill	N. Y. Curb			24⅛		
Cresson Consol. G.	N. Y. Curb			1⅛	June '20, Q	.10
Dome Ex.	Toronto	*34	*30	*34		
Dome Mines	N. Y.	12	10	11⅛	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	May '20, Q	.02
Goldfield Con.	N. Y. Curb	*9	*8	*8	Dec. '19,	.05
Hedley	Boston			4⅛	June '19,	.10
Hollinger Con.	Toronto	5.65	5.65	5.65	June '20, BM	.05
Homestake	N. Y.	50	50	50	Sept. '19,	.50
Kirkland Lake	Toronto	*52⅛	*51	*57⅛		
Lake Shore	Toronto	1.15	1.15	1.15	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	2.04	1.85	2.04	May '20, K	.05
Porcupine Crown	Toronto	*31	*25	*30	July '17,	.03
Portland	Colo. Sprgs.	‡		*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb	5	3	3	May '19,	.05
Silver Pick	N. Y. Curb	*6	*5	*5		
Teck Hughes	Toronto	*8⅛	*8⅛	*8⅛		
Tom Reed	Los Angeles	1.10⅛	1.00	1.08	Dec. '19,	.02
United Eastern	N. Y. Curb	2⅛	2⅛	2 2/16	Apr. '20, Q	.21
Vindicator Consol	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome Consol	Toronto	*7	*7	*7		
White Caps Min.	N. Y. Curb	*9	*7	*8		
Yukon Gold	Boston Curb	1⅛	1⅛	1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*16	*10	*11	Apr. '20, M	.03
Beaver Con.	Toronto	*45⅞	*44	*45	May '20, K	.03
Conagas	Toronto		†2.50		May '20, Q	.25
Crown Reserve	Toronto			*25	Jan. '17,	.05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept. '19,	1.00
La Rose	Toronto	*33	*31	*31	Apr. '18,	.02
McKinley-Dar.	N. Y. Curb	*51	*51	*51	July '20, Q	.03
Mining Corp.	Toronto	1.80	1.75	1.75	June '20, Q	.12½
Nipissing	N. Y. Curb	8⅞	8⅛	8⅛	July '20, Q	.25
Ontario Silver	N. Y. Curb	5⅛	5⅛	5⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	1/16	1/16	1/16	Jan. '12,	.10
Peterson Lake	Toronto			*12⅞	Jan. '17,	.01½
Temiskaming	Toronto	*37	*34	*35	Jan. '20, K	.04
Trethewey	Toronto	*27⅞	*26	*27⅞	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1⅞	*2		
Barnes-King	Butte	‡		1.11	May, '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb	*7	*6⅛	*7		
El Salvador	N. Y. Curb	1⅜	1⅜	1⅜		
Jim Butler	N. Y. Curb	*12	*11	*11	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*5	*4	*4⅜	June '16,	.05
Louisiana Con	N. Y. Curb	⅜	⅜	⅜		
MacNamara M.	N. Y. Curb	1⅜	1⅜	1⅜	May '10,	.02½
N.Y. Bond. Resar	Open Mar.	†13	†10½		July '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅜	1⅛	1 1/16	Jun. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1 1/16	1⅛	1 1/16		
Tonopah Ex.	N. Y. Curb	1⅜	1⅜	1⅛	July '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅜	1⅛	1 1/16	Oct. '19, SA	.15
West End Con.	N. Y. Curb	1⅜	1	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*19	*17	*18	July, '20, M	.01
Consol. M. & S.	Montreal	25	24	25	July '20, Q	.62½
Daly Mining	Salt Lake			2.60	July '20, Q	.10
Daly-West	Boston	4⅛	4	4⅛	July '20, Q	.25
Eagle & Blue Bell.	Boston Curb			2⅛	Apr '20, Q	.10
Electric Point	Spokane	‡		30	May '20, SA	.03
Fed. M. & S.	N. Y.	10	10	10	Jan. '09,	1 50
Fed. M. & S. pf.	N. Y.	35⅛	32⅞	35⅛	June, '20, Q	1.75
Florence Silver	Spokane	‡		*45	Apr '19,	.01½
Grand Central	Salt Lake	*37⅛	*37⅛	*37⅛	Jun '20, K	.03
Iron Blossom	N. Y. Curb	1/16	*28	1/16	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	4.00	3.90	4.00	July '20, Q	.12½
Marsh Mines	N. Y. Curb	*13	*10	*12		
Prince Consol.	N. Y. Curb	1/16	⅛	1/16	Nov. '12,	.02½
Rambler-Caribno	Spokane	‡		*10	Feb '19,	.01
Rex Con.	N. Y. Curb	*6	*5	*6		
South Hecla	Salt Lake	*95	*90	*95	Sept '19, K	0 15
Stand. S. L.	N. Y. Curb	⅛	1/16	1/16	Oct. '12,	.05
Tamarack-Custer	Spokane	‡		2 42	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.50	3.35	3 47½	June '20, Q	0 10
Wilbert	N. Y. Curb	*4	*3	*3½	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	25⅛	16⅜	17⅛	Mar. '19,	.50
Internat'l Nick pf	N. Y.	80⅛	80⅛	80⅛	May '20, Q	1.50
QUICKSILVER						
New Idria	Boston			5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb			*8		
VANADIUM						
Vanadium Corp.	N. Y.	68⅛	66	67⅛	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	79⅛	75	79⅛	July '20, Q	1 50
Asbestos Corp. pf.	Montreal			94	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	55	52⅛	55	June '20, Q	1 00
Am. S. & R. pf.	N. Y.	89	88	88⅛	June '20, Q	1.75
Am. Sm. pf. A	N. Y.	72	72	72	July '20, Q	1 50
U. S. Sm. R. & M.	N. Y.	51⅛	50	51	July '20, Q	1 50
U.S.S.R.& M. pf.	Boston	44	43	43	July '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly.
SA, Semi annually. BM, bimonthly K, Irregular. I, Initial. X, includes extra

Current Prices of Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3 55-7 00	7 09	7 02	8 25	$7 12-8 00	4 57
No. 12	3 60-7 05	7 09	7 07	8 30	7 17-8 05	4 57
No. 14	3 65-7 10	7 09	7 12	8 35	7 22-8 10	4 67
No. 16	3 75-6 20	7 09	7.17	8.45	7 32-8 20	4 77
Black:						
*Nos. 18 and 20	4 20-6 20	8 10	7 80	9 35	8 30-9 80	5 30
*Nos. 22 and 24	4 25-6 25	8 10	7 85	9 40	8 35-9 85	5 35
*No. 26	4 30-6 30	8 10	7 90	9 45	8 40-9 90	5 40
*No. 28	4 35-6 35	8.10	8 00	9 55	8 50-10 00	5 50
Galvanized:						
No. 10	4 70-8 00	9 60	8 50	...	8 80-11 00	6 20
No. 12	4.80-8 10	9 60	8 60	10 10	8 90-11 00	6 25
No. 14	4.80-8 10	9 60	8 60	10 10	8 90-11 10	6 30
Nos. 18 and 20	5 10-8.40	9 60	8 90	10 40	9 15-11 40	6 60
Nos. 22 and 24	5 25-8.55	9 60	9 05	10 55	9 30-11 55	6 75
*No. 26	5 40-8 70	9.60	9 20	10 70	9 45-11 70	6 90
*No. 28	5.70-9 00	9 60	9 50	11.00	9.75-12 00	7 20

*For painted corrugated sheets add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, 9/16 in. and larger	$4 00	$3.25	$3.62-$4 25	$5.34	$7.75
Track bolts	6.00-6.50	4.90	4 75-6.50	7.00	8 75
Standard section angle bars	3.00-4 00	3.00	2 75-3 75	2.00	5 30

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the $2 55 places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2 45@$3 10	$4 47	$3 47	$4 04	$3 97
Channels, 3 to 15 in.	2 45@ 3.10	4 47	3.47	4 04	3 97
Angles, 3 to 6 in., ¼ in. thick	2 45@ 3 10	4 47	3 47	4 04	3 97
Tees, 3 in. and larger	2 45@ 3 75	4 52	3 52	4 09	4 02
Plates	2 65@ 4 00	4 67	3 67	4 24	4 17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55@$3 65	$2 55@$3 65	$2 25

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse New York Current	Warehouse New York One Year Ago	Chicago	St. Louis	San Francisco
¾ in. and larger	$4.50	$6.00	$4.72	$5.62	$5.69	$6.65
CONE HEAD BOILER						
¾ in. and larger	4.60	7.10	4.82	5.72	5.79	6.75
⅝ and 11/16	4.75	7.25	4 97	5.87	5.94	7.00
½ and 9/16	5.00	7.00	5.32	6.22	6.19	7.25

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, iron rigging and guy ropes, +17½%; bright plow, 25% off.

Chicago, + 12½ on galvanized, 30 off on bright.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight	$5 75	$8.15	$7 00	$7.00	$7.00
Assorted	5 85	8 40	7.15	7 15	7.25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars............$2.35@$4 00 Steel bars............$4.27@$4.50

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago	Denver
$0.10	$0.16½	$0.18	$0 11½	$0.15	$0.18

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@14c.	13c.	15c.	...
Hollow	16c.	.....	.....	21c.

STEEL AND IRON—The following discounts are to jobbers for carload [illegible] on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

Inches	Black	Galv.	Inches	Black	Galv.
BUTT WELD					
¾ to 3	57½@54	44@41½	¾ to 1½	34½@24½	18½@8
			2 and 2½	33½	17
LAP WELD					
2	50½@47	38@34½	2	28½@20½	14½@6½
2½ to 6	53½@50	41@37½	2½ to 6	30½@22½	17½@9½
7 to 12	50½@47	37@33½	7 to 12	27½@19½	14½@6½
13 and 14	41@37½	.			
15	38@35	.			
BUTT-WELD, EXTRA STRONG, PLAIN ENDS					
¾ to 1½	55½@52	39½	¾ to 1½	34½@24½	19½@9½
2 to 3	56½@53	44@40½	2 and 2½	34½@24½	19½@9½
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	48½@45	37@33½	2	29½@21½	16½@8½
2½ to 4	51½@48	40@36½	2½ to 4	31½@23½	19½@11½
4½ to 6	50½@47	39@35½	4½ to 6	30½@22½	18½@10½
7 to 8	46½@43	33@29½	7 to 8	22½@14½	10½@2½
9 to 12	41½@38	28@24½	9 to 12	17½@9½	5½@5½

From warehouses at the places named the following discounts hold for steel pipe:

	New York	Cleveland	Chicago
Black			
¾ to 3 in. butt welded	40%	40%	40@54%
3½ to 6 in. lap welded	35%	42%	40@50%
Galvanized			
¾ to 3 in. butt welded	24%	31%	30@40½%
3½ to 6 in. lap welded	20%	27%	27½@37½%

Malleable fittings, Class B and C, from New York stock sell at list plus 23%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$6.00	$3 25	$0 75	$1.90	$0 50	$1.05
Hot pressed hexagon	+ 6 00	2 70	.75	1.90	.50	.85
Cold punched square	+ 6 00	3 25	.75	1.90	.50	1 00
Cold punched hexagon	+ 6 00	2 70	.75	1.90	.50	1 00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ by 4 in. and smaller	+20%	20%	20%
Larger and longer up to 1 in. by 30 in.	+20%	20%	20%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York...... List Cleveland ... $2 50 Chicago $3 00

For cast-iron washers the base price per 100 lb. is as follows:
New York...... $7.00 Cleveland...... $4.50 Chicago....... $4 75

CONSTRUCTION MATERIALS

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	New York 1-Ply c.l.	New York 2-Ply l.c.l.	New York 3-Ply c.l.	Philadelphia 1-Ply c.l.	Philadelphia 2-Ply l.c.l.	Philadelphia 3-Ply c.l.
No. 1 grade	$2 50	$3 00	$3 55	$2 40	$2 90	$3 45
No. 2 grade	2.25	2 70	3 20	2 15	2 00	3 10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $4 25 per roll in carload lots and $4 50 for smaller quantities.

Shingles, red and green slate finish, cost $7.75 per square in carloads, $8 00 smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq ft.) per roll	$[illegible]
Tar pitch (in 400-lb. bbl.) per 100 lb.	[illegible]
Asphalt pitch (in barrels) per ton	[illegible]
Asphalt felt (light) per ton	[illegible] 10
Asphalt felt (heavy) per ton	127 00

HOLLOW TILE

	4 x 12 x 12	[illegible] x 12 x 12	12 x 12 x 12
Minneapolis	$0 1152	$[illegible] 2 16	$[illegible]
Seattle	09	75	[illegible]
Los Angeles	10	75	[illegible]
New Orleans	23	[illegible]	[illegible]
Cincinnati	.125	218	3286

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under			12 x 12-In. 20 Ft. and Under	
	P. Fir	Hemlock	Spruce	P. Fir	
Boston	$68 00	$65 00	$62 50	$80 00	$70 00
Kansas City	51 00	51 25	$51 25	51 25	60.00 51 25
Seattle		34 00			35 00
New Orleans	46.00			54 00	
Atlanta	62 50	64 50	66 00	76 00	79 50 82 00
Baltimore	75 00				87 50
Cincinnati	45 00	50 00	50 00		55 00 55 00
Montreal	80 00	80 00	65 00	75 00	73 00* 100 00
Los Angeles†		57 00			59 00
Detroit	67 00				79 00 79 00
Denver		43 75			44 75

	1-In. Rough, 10-In. x 16 Ft. and Under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P. Fir	Hemlock		P. Fir	
Boston	$110 00	$102 00	$52 00	$100 00	
Kansas City	102 00	106 50	106 50	113 00	$112 75
Seattle		37 50			38 50
New Orleans		42 00		46.00	
Atlanta	85 00	90 00		77 50	87 50
Baltimore (box)	57 50@ 65			57 50@ 62 50	
Cincinnati	50 00		55 00	50 00 45 00	50 00
Montreal	75 00		75 00	66 00 78 00	78 00
Los Angeles			58 00		
Detroit	50 00		49 00	44 00	
Denver		42 75			40 25

*Montreal—Up to 22 ft.; over which, $3.00 per M. increase up to 30 ft.
†Base price, 2 x 3's and 2 x 4's, 8 to 14 ft., is $54.00

Detroit—Dimension stuff ranges from $60 to $68. See "ups and downs in the market."

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Denver	Chicago	San Francisco
Wire	$3.25@4 50	$6.00	$5.40	$4.15	$6.00
Cut			5.90	5.85	8.50

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago Without Bags
New York (delivered)	$4.10	$3.80	$2.30
Jersey City (delivered)	3.22	2.97	2.27
Boston	3.42	2.60	2.42
Chicago	2.15	2.15	2.00
Pittsburgh	2.20	2.20	2.05
Cleveland	2.42	2.42	2.32

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$19.50	$18.50	$3.50*at plant	$3.30*
Kansas City	27.20	26.20	2.50	2.40
Chicago			2.40	1.75
St. Louis	25.00	21.00		2.25
Boston	27.50	25.25	3.70†	3.40†
San Francisco	23.50	19.50		2.25
Minneapolis	24.00	19.00	2.90†	2.30
New Orleans		2.25†		2.45

NOTE—Refund of $0.10 per barrel.
* 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	$1.48	$2.15	$1.95	$2.53
5-gal. cans	1.51*	2.28	2.15	2.73

* To this *oil* price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White	
	Current		One Year Ago		Current Dry and In Oil	1 Yr. Ago Dry and In Oil
	Dry	In Oil	Dry	In Oil		
100-lb. keg	15.50	17.00	13.00	14.50	15.50	13.00
25- and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	50-Ft. Lengths
Underwriters' 2½ in		$0.85 per ft.
Common, 2½-in		30%

	AIR		
	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.60	$0.40	$0.30

STEAM—DISCOUNTS FROM LIST

First grade..... 20% Second grade.... 30% Third grade..... 35%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	30%	20%

RAWHIDE LACING—For cut, best grade, 25%. 2nd grade, 30%. For laces in sides, 79c. per sq. ft.; 2nd, 75c. For semi-tanned: cut, 20%; sides, 83c. per sq .ft.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to $0.02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ¾-in., 8 ft., ½-in., 6; ⅜-in., 4½; ¼-in., 1¾-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ¾ in. and larger, in 1200-ft. coils:

Boston	$0.30½	Kansas City	0.305
New York	.29	New Orleans	.29
Cincinnati	.27	Seattle	.28
Chicago	.29½	St. Louis	.265
Minneapolis	.29½	Atlanta	.295
San Francisco	.27	Denver	.30

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1.00
Asbestos for high-pressure steam	1.70
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.30
Asbestos wick, ½- and 1-lb. balls	.85

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$1.75	$1.60
Chicago—Creosoted	1 95	1.80
San Francisco—Douglas fir, green	1 74	1.24
San Francisco—Douglas fir, creosoted	3.36	2.38

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98	No. 5	.87
7x9x8 white oak	1.05		
7x9x8 red oak, No. 4	.80		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago In Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0.93–0.94	$2.30	$2.00	$1.95
Pure destructively distilled pine oil	1.80	1.90	1.85
Pine tar oil, sp.gr. 1.025–1.035	.48	.45	.43
Crude turpentine, sp.gr. 0.900–0.970	2.00	2.25	2.18
Hardwood creosote, sp.gr. 0.96–0.99*	.35	.....	.....

*F. o. b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00–15.50	13.00	16.00	11.00–14.00
Colored mixed	7.00–10.50	9.00–12.00	12.00	9.50–12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13½
Cleveland	$55.00	$65.00
Chicago	41.00	43.50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.3125	$0.3425	.....	$2.30
Boston		.28	.31	.34	2.40
Kansas City	$0.2475	.27	.30	.34	2.40
New Orleans	.1975*	.2225	.2425	.....	.....
Seattle	.18	.2175	.2475	.29	2.60
Chicago	.2175	.2525	.2975	.34	2.45
Minneapolis	.2067	.2476	.2782	.....	2.80
St. Louis	.2175	.26	.285	.295	1.90
Denver	.2175	.2575	.2825	.33	2.70
Los Angeles	.22	.27	.31	.....	2.95
Atlanta	.22	.245	.265	.....	2.55
Cincinnati	.2275	.2525	.2725	.....	2.30
Montreal	.30	.32	.37	.38	4.10

* For 50%.

CHEMICALS

SODIUM CYANIDE — New York price is 25@30c. per lb.; Chicago, 30c.; St. Louis, 31c.; Birmingham, 45c.; Denver, 40c.

SODIUM SULPHIDE—New York price per pound is 9c.@10c. for concentrated, Chicago, 5c. for concentrated, 3½c. for crystals. Denver price is 6c. for crystals. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11@12c. per lb.; Chicago, 12½c; St. Louis, 12c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1.52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union Single 25-Lb. Drums	Union 25-Lb. Ton Lots
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52	$1.49
Southeastern portion U. S. A.	115.50	110.50	1.63	1.60
Texas (except E. Paso)	124.00	119.00	1.74	1.71
El Paso, Texas	126.00	121.00	1.77	1.73
Denver, Colo	124.00	119.00	1.74	1.71
West Coast	129.00	124.00	1.81	1.77

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 110 New York, August 28, 1920 *Number* 9

The Grand Canyon Mystery

IN OUR ISSUE of Aug. 21, in the Court Decisions in Mining Cases Section, it is recorded that the Supreme Court of the United States has affirmed judgment in the case of the United States against Ralph H. Cameron and others, "enjoining the defendants from occupying, using for business purposes, asserting any right to, or interfering with the public use of, a tract of land in Arizona approximately 1,500 ft. long and 600 ft. wide which Cameron was claiming as a lode mining claim. The tract is on the southern rim of the Grand Canyon of Colorado, and embraces the head of the Bright Angel Trail." It was staked by Cameron in 1902. The report of our legal editor proceeds: "Cameron also had sought patents for other claims embracing other portions of the trail into the Canyon. On these claims Cameron applied for a patent, which would have given him undisputed rights to the surface of this permanently valuable tract. The Commissioner of the General Land Office held that the claims were not valuable for mining purposes, and therefore invalid." The matter was appealed to the Secretary of the Interior, who "reported that with the possible exception of the Magician lode claim the evidence wholly fails to show valuable desposits of gold, silver or copper, or other minerals."

The report of the Secretary fails to mention platinum, which is the principal mineral claimed to exist in these properties by those who staked and held them. These alleged enormous platinum deposits of the Grand Canyon have for years attracted attention and comment. We should like further elucidation of this mystery before the matter is dropped. Has the whole been a bold scheme to defraud the Government and the public by grabbing the Bright Angel Trail under pretense of mining locations? The opinions of the Land Office, the Interior Department and the Supreme Court would seem to so imply. If this is the case the Government should not rest with a simple denial of the property to the claimants, but should take steps to prosecute the fraud.

If fraud has been attempted it has been complex, and has not rested on a passive holding of the claims. Great pretensions to valuable platinum content have been repeatedly and forcibly made for years; and many capitalists have been solicited to interest themselves. At least one prominent mining geologist was retained by the owners, whose final opinion, we believe, was that the sandstone actually contains platinum. On the other hand, engineers and investors who have investigated or attempted to investigate these deposits have given various confidential accounts of their experiences, which clearly imply, in their opinion, the possibility of their samples having been salted with platinum in some mysterious manner, which one engineer opined might be with the ash of platinum prints used in local photography. One large user of platinum has stated that he found platinum in a sample of the ore submitted for assay; but on asking for a hundred pounds or so of the ore was unable to obtain it, and therefore dropped the matter. The assay certificate was, however, used to attempt to interest others.

The halo of romance has never left this fabulous platinum wealth on the brink of a marvelous canyon. Even with the platinum actually infesting the sandstone, it eluded profane and irreverent seekers. Therefore, a Philadelphia man invented a machine which would and did recover it (he said); whereas the crude and discredited fire assay did not recover it. Where have we heard something like that before?

Selective vs. Tonnage Mining

ONE of the most important developments of modern mining is tonnage mining or low-grade ore mining on a large scale. The Alaska Treadwell mine was an excellent example of this kind of mining. The "porphyry coppers" represent without much doubt the best development in this respect. The principle thus established has to a considerable extent influenced mining operations of lesser magnitude. As a consequence there was less and less discrimination in the selection of ore in stoping operations. A low unit cost for mining and milling extended stoping limits. Milling capacity was increased to enable large tonnages to be handled.

The changed economic and labor conditions during and since the war have pinched in on the mining industry to such an extent that profit margins have been greatly curtailed. This is true of both small and large operations, and particularly so with reference to gold mines. A modification of the tonnage system has been recognized, and wherever it is possible to change mining consistently to conform to the new order it is being done. Higher-grade ore is being mined. Stope limits are curtailed and ores are more carefully selected.

It costs just as much to mine and mill a ton of waste as a ton of ore. Reduction in the amount of waste mined is the order of the day. Hand picking of waste out of the ore stream was at one time practiced, but tonnage mining cut this out to a considerable degree: it is not practical to reintroduce it under existing labor costs and efficiencies except in a few cases, and in its absence the stope becomes the important factor.

Consistent and thorough underground sampling is essential, that discrimination between ore and waste be properly made. The net result will be to increase the unit cost of mining and to reduce the tonnage mined. Milling capacity must necessarily be curtailed either by operating on one shift or two shifts, instead of three, or by shutting down some of the units in

the mill. Overhead costs can under the circumstances be lessened, although not in proportion as capacity is reduced.

No one can foresee how long existing conditions are to last, but while they last the technical men in charge of mining operations are put to a greater test than ever before. That they have responded to the test is shown by the continuation of mining. It is true that there is, on the whole, some curtailment, but the intensive study and work required to maintain the industry will react beneficially in the long run. It has established the importance of good leadership and the wisdom of close technical control of mining operations.

The Reports of the "Porphyry Coppers"

THE reports of the "porphyry coppers" for the second quarter of 1920 were issued a few days ago, and are published elsewhere in this issue, all of which reflect the lamentable situation in the copper market. Not one of the four companies, Utah, Nevada Consolidated, Chino, or Ray Consolidated, was able to show a profit from copper production equivalent to the disbursement to stockholders. Including even the support of miscellaneous income, only one company, Chino, was able to show a profit greater than dividend disbursements. The following comparative table brings out this point:

PORPHYRY COPPERS SECOND QUARTER OF 1920

	Production in Pounds	Net Profit From Copper Production	Total Net Profit	Disbursements to Stockholders
Utah	29,004,381	$1,254,033	$2,240,470	$2,436,735
Nevada Cons	13,063,677	47,276	384,000	499,864
Chino	11,989,451	260,032	330,152	326,242
Ray Cons	12,965,596	343,651	387,255	394,294
	FIRST QUARTER OF 1920			
Utah	27,257,546	$2,291,012	$2,870,590	$2,436,735
Nevada Cons	11,138,225	132,529	215,583	499,864
Chino	10,621,276	737,605	809,727	326,242
Ray Cons	11,650,443	587,166	637,300	394,294

During the first quarter of 1920 a better average record was made, although the record for this period failed to indicate the improvement desired. Production increased during the second quarter, but financial results —due entirely to the low selling price of copper—were comparatively poorer. Were it not for the substantial financial assistance rendered by miscellaneous income, through returns from byproduct precious-metal recovery, and railway dividends, the statements would have been worse, and surplus accounts would have been used to a greater extent. In the case of Nevada Consolidated, the miscellaneous income, chiefly a heavy credit from the Nevada Northern Ry., was about seven times as large as the operating profit.

In the matter of costs, all the porphyry companies with the exception of the one making the best general showing, Chino, were able to show a reduction in comparison with costs for the first quarter:

	—Net Cost per Pound— Second Quarter	First Quarter	Average Sales Price of Copper Second Quarter	First Quarter
Utah	11 77	11 94	18 21	21 99
Nevada Cons	15 56	20 72	18 50	22 66
Chino	15 29	13 91	18 17	21 88
Ray Cons	15 34	16 30	18 42	21 96

The reduction in costs may be attributed principally to the greater production for the second quarter. Chino's exceptional increase is accounted for by the lowering in the tenor and quality of the ore.

Considered collectively, the four porphyry copper companies are bearing up particularly well under the depressing influence in the industry, and are giving an exhibition of operating results which, although not satisfactory as expressed in dollars and cents, record splendid "staying" powers. These companies are essentially large-scale producers, a fact which has been held against them for times such as these, but considering the many adverse industrial and economic contingencies which they have had to surmount, their statements are of prime importance in illustrating what they can do with copper at a bottom price.

A possible further curtailment in dividend rate is likely with a continuation of the present conditions, but a relatively small and warranted increase in copper prices will greatly assist in lifting the "porphyries" out of their troubles.

Higher Freights May Be Temporarily Troublesome

LAST week we spoke of the freight rate increases, which we believe are fully justified in promoting railroad and, indirectly, industrial efficiency. The mining industry will be affected adversely, however, until the general improvement of conditions overtakes the temporary hardship which has been imposed. Precious-metal mines which are in a position to ship a finished product in the form of bullion will be affected only in so far as the cost of supplies, fuel, timber, steel, lubricants, and machinery are concerned. In the case of lead-silver mines shipping either first-class ore or concentrates there will be a considerable increase in cost for the movement between mine and smelter. Necessarily these mines will also have to meet increased freightage on their supplies.

With the copper mines there will be an increase in the cost of coal, fuel oil, and supplies, as well as increased cost for the shipment of copper bullion to tidewater. Already, with the decreased production, many copper mines will find the narrow margin upon which they are operating still further reduced. That there will be internal readjustments to meet such increases is obvious, and we may expect some copper mines to shut down.

Excepting lead and silver, metal prices have sagged or else have remained at low levels. There does not appear to be the possibility of passing on the increase, and for the time being the small producer as well as the large company will be compelled to strive for greater economy and higher labor efficiency.

The Search for a Meteorite

LEGEND has it that a vast store of Inca treasure lies at the bottom of some Peruvian lake, and on this basis many a tale of adventure has been written. The quest for hidden treasure, whether for rainbow gold or Ponzi's millions, is always alluring, and man is never wearied even though the work be fruitless. Today, the search is being renewed in Arizona for the great meteorite that is held responsible for the huge crater near Winslow. In its fascination this enterprise far surpasses any mere hunt for buried gold. One is reminded of the craters made by the projectiles in which the Martians in H. G. Wells' "War of the Worlds" invade the earth to conquer it, save that the Winslow crater is vastly larger. In diameter it is well over 4,000

ft., and the meteorite that caused it must have been of huge proportions, though it undoubtedly was much smaller than the crater itself.

Attempts to locate the meteorite have been made before. One company found its sinking operations, which were well within the crater, frustrated by quicksand which it could not handle. Today, a new organization known as the Crater Mining Co. is working on a different theory and is drilling with two Standard rigs on the chasm's inner edge. It is thought that the projectile from the heavens may have struck at an angle to the vertical, so that the mass does not lie directly below the crater's center but off to one side. Fragments of meteoric nickel have been found from time to time, supporting the theory of the meteorite's existence. The mass of metal that it is hoped to find is a prize worth searching for. But there is interest in the enterprise aside from that of possible financial return upon the investment.

This search for a meteorite is merely one of the many fascinations of the mining game, fascinations that generally hold the player even though the game yield an inadequate return. According to Emerson, everything has its just compensation, and the engineer may, and often must, accept the romance of the industry in part payment of what is due him.

Safeguarding Government Co-operation With Industry

THE Bureau of Standards has been during recent weeks establishing a number of so-called "industrial fellowships." The fellows so appointed are detailed to work at the Bureau by individual companies or associations on problems which are of common interest to the industry and the Bureau. By this means more intimate acquaintance with Bureau work will be gained by the industry, it is expected, and a considerable measure of support not previously available is given to the Government investigations.

The direct and rather obvious advantages of this co-operation should not, however, obscure certain possible disadvantages which may follow if each such project is not well considered and properly safeguarded. One of our Government bureaus, not, however, the Bureau of Standards, was recently referred to by a prominent engineer as being operated mainly "by and for appropriations." This tendency, indeed, is apparent from time to time in almost all of our bureaucratic activities, where there is a disposition to place expediency first in planning investigations, and effectiveness or appropriateness of work second.

Individual companies co-operating with any Government body are likely to stir up the suspicion, if not an actual public charge, of favoritism in the use of public funds. This is a charge easily made and difficult to refute at times, even when not justified. Another evil equally difficult to guard against is that of subordinating fundamental general investigations, which should be foremost in the program of the Government, to industrial studies of more specialized interest, which are for the moment more attractive, promising the individual investigator more immediate recognition.

It is to be hoped that none of these difficulties will be encountered by the Bureau of Standards in its new activities. We see no reason why these pitfalls may not be wholly avoided. Our industries, however, must co-operate to this end and avoid all appearances of leading any bureau into a false position by approaching it with offers of co-operative investigation where special interest or commercial, rather than fundamental, problems are involved.

Deflation No Menace to the Mining Industry

THE long-expected and much-postponed decline in commodity prices seems at last to have set in in earnest. The textile industry appears to have borne the brunt of the first onslaught, the woolen, cotton and silk mills now being operated at considerably reduced capacities or having shut down entirely. Merchants are confronted with daily losses on their inventoried stocks, which induce them to turn to bargain sales in order to unload. Sugar, which advanced possibly more than any other commodity equally widely used, has dropped from 25 to 19c. retail. It is surprising how easy it is to secure it now compared with the difficulty several months ago when the market was advancing.

Although business interests cannot expect to prosper in the next two or three years as they have in the term just passed, we can see no reason for alarm in the mining industry. Rather the contrary. Mining supplies and labor are almost certain to fall more than metal prices. The latter, with the exception of lead and iron, are too near the cost of production to be seriously affected. Iron is too badly needed for reconstruction purposes to experience any great dullness. Then, too, much construction work in which iron is used has been delayed during the last few years.

Lead may slump some, but, even with present high prices, production is too curtailed to allow much of a drop. Silver, of course, is pretty well pegged. Copper and zinc should be in greater demand month by month as normal conditions are restored. We think it unlikely that any great increase in price will take place in either of these metals, for general conditions do not favor such a change. Rather will these industries prosper through reduced costs of production.

So, although the big manufacturing industries may look on the period of deflation with some qualms, and the profiteers and speculators with actual dismay, the rest of us may profit. Things, as someone has said, affect different people differently. Adam, William Tell, and Isaac Newton each had his little affair with an apple, but with quite different results.

In Re "Coyote Howlings"

IN THE *Engineering and Mining Journal* of July 31, 1920, p. 228, in the news item on "Minerals Separation Hearings End at Salt Lake," our correspondent used the following sentence: "The term 'coyote howlings' is used to designate licensees making complaints." On investigation we find that the term was a facetious one used in certain correspondence between officials of Minerals Separation. It was not applied to licensees, but to attacks on Minerals Separation by certain sections of the technical press. It is an injustice to both the licensees and to Minerals Separation to permit the erroneous implication of the expression to remain unacknowledged, and we make correction.

WHAT OTHERS THINK

Pebble-Mill Grinding, and Amalgamation

I have read with a great deal of interest the article by Jesse Scobey on the operation of the La Luz & Los Angeles Mine, in Nicaragua, in your July 3 issue. There are some points which I hope Mr. Scobey will be able to explain to me, and in addition, from my long experience in amalgamation with stamps and Hardinge mills, I wish to comment upon the findings as expressed in Mr. Scobey's article, and may, in some small way, aid not only him but operators who have an amalgamation problem involving stamps and pebble mills.

From the summary of eleven years' amalgamation mill reports, it would appear that the Huntington mills were the best amalgamators; following them the stamps were the best, and last of all the stamps and regrinding pebble mills. I presume that the efficiency in amalgamation of the Huntington mills was due to the original character of the ore rather than to the efficiency of these machines as amalgamators. As described by Mr. Scobey, the ore which the Huntington mills treated carried the gold in a form very easy for amalgamation. What I am interested in is whether the results shown for 1919, using stamps only, with an extraction of 69 per cent, can be directly compared to the results for 1918, when the ten stamps, one ball mill and two pebble mills were used. If the ore treated in both years was the same, then stamps are the better amalgamators. This is contrary to my experience, particularly in work on ore from the Plymouth Consolidated Gold Mines, Ltd., Plymouth, Cal.

The original test work on the Plymouth Consolidated was carried out in a small two-stamp battery and showed a 69 per cent extraction by amalgamation. The equipment, as finally installed, consisted of thirty stamps grinding to 2 or 4 mesh, followed by Hardinge pebble mills regrinding in open circuit, as was used at the La Luz & Los Angeles. After their preliminary difficulties had been overcome the first eighteen months showed an average extraction by amalgamation of 71 per cent, the highest being 75 per cent and the low 55 per cent. These variations were due to the variations in the character of the ore. I have always explained the higher amalgamation recovery in the final plant as being due to the polishing action of the pebble mill regrinding, which put the gold in better condition for amalgamation than when broken loose from the gangue by the cracking action of the stamps.

The low recovery with the stamps, ball mill, and two pebble mills at La Luz & Los Angeles may be due to failure to use sufficient amalgamating devices. I have found that one cannot use too many such, particularly where tube or ball mills are used to regrind after stamps. At the Plymouth Consolidated Gold Mines, Ltd., the Hardinge patent amalgamators are used on the discharge of the pebble mills, followed by riffles similar to those employed in placer mining, then lip plates, then amalgam traps, then finally the stationary plates as used in most amalgamation practice. A similar method of amalgamation is practiced by the Gold Hill & Iowa Mines Co., Quartzburg, Idaho, and the Carson Hill Gold Mining Co., Melones, Cal. The chief reason for the Hardinge amalgamator on the discharge end of the mill, as well as the riffles, lip plates and traps, is that it has been found that when the gold is released by the rubbing action of the regrinding mill it is in ideal condition for amalgamation. It is also in ideal condition for coating, particularly if there is a considerable quantity of iron sulphide in the ore. If the gold is taken from the discharge of the pebble mill to the stationary plates through launders from 12 to 16 ft. long it has been found that amalgamation recovery on the plates is not as good.

At one property on the Mother Lode in which I was interested free gold was found in the concentrates on the tables where the discharge from the mill was sent to the stationary plates through distributing launders about 16 ft. long. Upon the addition of lip plates and amalgam traps immediately following the discharge of the mill this fine free gold in the concentrates disappeared and the extraction by amalgamation was materially increased. It may be wise to describe briefly here the lip plate used. For a 100-ton plant the lip plate is usually about 4-ft. wide by 6-ft. long, silver plated with 4 oz. of silver to the square foot and set at a slope of 2½ in. to the foot. This plate is only dressed every two days to a week, depending upon the richness of the ore, and the attempt is made to keep the amalgam thick and pasty. The amalgam traps are usually simple devices where the pulp flows in and is agitated by water under pressure, either ascending or descending, and flows out the other side of the trap after coming into intimate contact with a bath of quicksilver in the bottom of the trap.

Another point I have found which amalgamators overlook is that the treatment of the stationary plates after regrinding in a mill is considerably different from the treatment usually practiced after reducing in stamps. In mills using regrinding the best practice appears to be to dress the plates every morning, putting on only enough quicksilver so that when rubbed up it will be soft enough to roll up under the finger. Quicksilver is usually rubbed in with a burlap cloth or any rough piece of cloth, then brushed with a soft whiskbroom. This seems to be the best practice for the stationary plates, and keeps them in the best condition for amalgamating after regrinding mills. The Hardinge amalgamator is a rather simple device bolting onto the discharge end of the mill in place of the discharge bell, and was devised particularly for the Plymouth ores, in which there were considerable arsenical pyrites, so as to amalgamate as close to the grinding medium as possible but without actually feeding quicksilver into the grinding medium. However, on an ore containing no arsenical pyrites and showing no tendency for the quicksilver to flour and be lost, such as at the plant of the Gold Hill & Iowa Mines Co., quicksilver is fed directly into the feed of the pebble mill and the amalgamator is used purely as an accessory amalgamation device.

Mr. Scobey states that the test between the ball mill and the stamps could not be continued because of the lack of comparative data, and that both were retained. It is regrettable that actual data were not taken on the comparative work of the stamps and the ball mills as metallurgical devices, as well as mechanical devices, for the reduction of ore. The theory has been advanced, and seems to be well authenticated, that with small smooth balls in the mill the gold in the ore is beaten into cup shapes, which flow over the plates, through the amalgamating devices, and finally are only caught on the concentrating tables. This theory has been advanced to me by those in charge at the Gold Hill & Iowa Mines Co. In their particular case, as in that at the La Luz & Los Angeles, the ball mill which was installed had to be relegated to the place of a mechanical reducer, and the discharge from the mill was sent to the pebble mill and to the amalgamating devices. E. E. Carter, general manager of this company, told me that when an attempt was made to amalgamate after the ball mill the millmen could not make the proper amalgamation recovery and that they had to put the ball mill back to a primary reducer, sending the pulp produced by it through the pebble mill, before extraction by amalgamation became normal. I should like to hear from Mr. Scobey on this point as well as from any other readers of the *Engineering and Mining Journal* who have had a similar or a different experience in this kind of work.

Mr. Scobey also says that one of the pebble mills was operated in open circuit, "although not orthodox." I wish to state that in all of the plants mentioned above, where I have closely studied amalgamation after ball mills, and particularly the operation of pebble mills regrinding after stamps, none of these mills have been actually close-circuited with a classifier. In fact, it was found that at the plant of the Original Amador Consolidated Mining Co., Amador City, Cal., when the regrinding mills were close-circuited with a classifier, the gold was trapped in the circuit and ground so fine that amalgamation results were very poor, and this fine free gold was caught only in the cyanide plant. A change to mills in open circuit gave much better results. As the La Luz & Los Angeles had a mill in open circuit, followed by amalgamation, and also a mill in closed circuit, it might be interesting, if possible, to determine which gave the better amalgamation results. The usual practice has been to send the mill product, diluted as Mr. Scobey states in his article, over the plates, the tailings from the plates being elevated to the classifier, making as a rule three products. The first spigot discharge is an oversize, which is sent back to the mill for regrinding. The second and third spigot discharges are sent to sand tables, and the overflow from the classifier is thickened for concentration on vanners or other types of slime concentrators.

Hard ore from the mine is being used for regrinding mediums, according to Mr. Scobey. I should like to know if he has any data indicating whether the change from Danish flint pebbles to mine rock had any effect upon the capacity of the mill. I have found, as a rule, that it does have an effect upon the capacity, because energy is wasted in rounding off the chunks of ore before they become efficient as grinding mediums. I found, however, that one way to overcome this loss of efficiency in grinding is to speed the mill up several revolutions, thereby increasing the action in the mill and rounding off the chunks of ore just that much sooner. In the case of the Utah Leasing Co., Newhouse, Utah, where the change was made from Danish flint pebbles to a local quartzite, material economies were at once apparent in the cost of grinding, but the mills had to be run considerably faster than ordinarily. These mills were 8-ft. x 48-in. Hardinge pebble mills, and, with an El Oro type of lining, were operating at 28½ revolutions. Ordinarily the practice would have been to operate them at about 26 revolutions. However, the change to mine rock had no material effect upon the capacity of these mills, owing, in my opinion, mainly to the high speed at which the mills were operating.

I have one last point to comment upon in Mr. Scobey's article. He states that with the pebble mill running in open circuit, delivering a finished product, the practice developed of making a very wet discharge direct to the plates: "An excess of water permitted a classification in the mill that held back the oversize." This is a point very little recognized in the operation of a Hardinge mill, and something about which every operator of this machine should know. However, instead of making the feed to the mill dilute, the better practice is to insert a water pipe at the discharge end of the mill. This pipe is usually ¾-in. pipe with a ½-in. nozzle, and it is led into the discharge trunnion of the mill on the lifting side. The spray from the nozzle is then directed at an angle so as to hit as near as possible the point in the mill where the pulp and pebbles are cascading. The flow of water is regulated so that the pulp will not get beyond 18 in. to 2 ft. from the discharge end of the mill and therefore does not dilute the portion of the mill where the most grinding is being done. With this device the pulp in the feed to the mill is kept thick and the discharge is diluted so as to release the oversize particles, allowing only the finer material to discharge. The installation of such a device at the Bluestone Mining & Smelting Co., Mason, Nev., increased the capacity of the mill almost 10 per cent and had no effect whatever upon the consumption of grinding mediums, because the pulp in the effective grinding portion of the mill was still kept at from 75 to 80 per cent solids by weight. V. A. STOUT.

New York, N. Y.

Suggests a Gold Producers' Bank

The position of the gold producers today suggests to my mind that there is something fundamentally wrong that they should consider. Briefly, under the gold standard gold establishes the basis for money credit, but the producers of gold do not get the credit. The producer turns in his gold for about $20 per oz. That same ounce of gold has a money credit, which the banking interests get.

The gold producers in my opinion can correct this situation, and come into their own, only by forming a "Gold Producers' Bank," where all production would be deposited. The banking or industrial interests would then obtain the gold by payment of the credit value for gold, or it may be possible for the Government to issue currency to such a "Gold Producers' Bank" upon the credit system in operation.

In any event the gold producer would get what belongs to them rightfully, and the credit they established would be in their control.

I am advised that there is no law compelling gold producers to sell their production to the Government.

Reno, Nev. F. A. WRIGHT.

Ore Deposits of Arctic Canada

Occurrences of Iron and Copper Most Promising Discoveries Reported to Date—Latter Metal Widely Distributed—Gold Apparently Scarce, Though Pyrites Is Not Uncommon—Silver, Lead, and Zinc Ores and Other Minerals Found in Minor Quantity

By E. S. Moore
Written exclusively for *Engineering and Mining Journal*

WITH the extension of the railroads northward into the previously little known regions of northern Canada, interest in the possibility of finding ore deposits in Arctic Canada is daily increasing. The airplane has developed such efficiency as a new means of exploration that many mining men look forward to the time when rapid excursions may be made into the areas hitherto beyond the reach of all except a few adventurous souls who were willing to make long and perilous expeditions.

Through the explorations of Low, Bell, Tyrrell, Stefansson, O'Neill and many others the world has learned a little of the possibilities of that tremendous area which should surely harbor somewhere another Keweenaw Point, another Sudbury, Cobalt, or Mesabi. It has been known for some time that the rocks in the north-central part of the continent are chiefly pre-Cambrian and that they possess many characteristics similar to those of the great ore-bearing regions farther south. The Upper Huronian iron formations have been found underlying considerable areas in a number of localities, and the Keweenawan rocks, the parents of the Michigan copper, the Sudbury nickel, and the Cobalt silver deposits, are spread over a great expanse from the southern end of Hudson Bay northeastward to the Atlantic and northward and northwestward to the Arctic. During the Keweenawan period a great curved, volcanic zone extended from the Lake Superior basin through the Sudbury and Cobalt fields, along the Hudson Bay basin to the Arctic, and in this disturbed zone extensive igneous activity manifested itself. The time during which this occurred was one of the most notable metallogenetic epochs in the earth's history.

MAP OF NORTHERN CANADA, SHOWING DISTRIBUTION OF ORE DEPOSITS IN ARCTIC REGION. "C" INDICATES COPPER. HEAVY LINE INDICATES AREA WITHDRAWN FROM STAKING.

In a description of the ore deposits of Arctic Canada it seems wise to include a discussion of some areas not strictly in the Arctic regions. These areas are so far north that the problems connected with their exploitation are much the same as those of the Arctic regions.

These areas are interesting chiefly because of their iron deposits, and this metal has not been reported in large amounts from within the Arctic Circle.

The metals which so far have attracted much attention in the Far North are iron and copper, but gold, silver, lead, and zinc have all been found, and among the non-metallic minerals mica and graphite are reported in commercial quantities. It has long been known that coal exists in considerable quantities north of the Circle. The accompanying map indicates the distribution of the main areas of copper lands discovered up to the present time.

Most Interesting Iron Areas in Labrador and on Islands in Hudson Bay

A number of areas of the Huronian iron formation have been mentioned in geological reports under the head of Cambrian or other systems. Those which have been of most interest are the Nastapoka and Belcher Islands, in Hudson Bay, and the Koksoak River area, in the Labrador Peninsula near Hudson Strait.

LEFT, TYPICAL SCENE IN LABRADOR WHERE COUNTRY IS ALMOST TREELESS. RIGHT, AUTHOR'S CAMP NEAR MOUTH OF GREAT WHALE RIVER, HUDSON BAY

According to Low[1], the Nastapoka Islands form a group about 120 miles long made up of sixty-five islands situated along the east coast of Hudson Bay. They rise to a maximum altitude of 500 ft. and are separated from the mainland by Nastapoka Sound, one to three miles wide and deep enough for the navigation of the largest ships. They consist chiefly of sedimentary rocks, which include iron formation, shale, sandstone, and dolomite and which appear to be Upper Huronian in age.

The iron formation is similar to that found in the Lake Superior region, and consists of banded jasper, hematite, magnetite, and cherty iron carbonate. The formation is exposed on practically all the islands, but the bands of ore in the jasper are thin. No analyses are given by Low, but his descriptions indicate that as a whole the ore is very siliceous and of low grade. The thickest band of good ore mentioned is 4 ft. thick, and this band outcrops on Clarke and Gillies islands. All the sections indicate that, although there are numerous bands of ore, they are distributed through too much jasper to make them of much economic importance. The occurrence of these extensive areas of iron formation with bands of ore does, however, justify thorough prospecting for larger concentrations.

The Belcher Islands have been known locally for a long time, but it was not until 1914 that they were brought to the attention of people outside of Hudson Bay by R. J. Flaherty. In search of mineral deposits for the Northlands Exploration Co., Mr. Flaherty heard of the iron on these islands and visited them in the fall of that year. During the following year he studied this group and prepared a reconnaissance map of the islands. In the summer of 1916, I prepared a report on the iron deposits for Sir William Mackenzie, president of the Northlands company, and found considerable areas of iron formation. The results of this investigation have been previously published in the *Journal of Geology*[2] and the *Transactions* of the Canadian Mining Institute[3]. In making this trip some of the difficulties to be met in navigating Hudson and James bays were experienced. While in the midst of James Bay on July 1, 1916, our small steamer was surrounded by drifting ice, which continued to fill the bay for about five days. The ice snapped the propeller from the ship, and it was only after considerable difficulty that repairs were made. A new propeller was fitted on by dragging the stern of the ship up on the shore of a small island near by at high tide and adjusting it at low tide. The weather was stormy during much of the time, and it was only after many difficulties and numerous vexatious delays that the islands were reached and that the return journey was accomplished.

The Belcher group has usually been indicated on maps as small dots in the southeastern portion of Hudson Bay, but the main islands are of large size, the length being estimated at about ninety miles. One island has a lake within its borders about forty miles in length, according to Mr. Flaherty.

The rocks on these islands are Huronian and Keweenawan. The Huronian series contains sandstone, quartzite, limestone, dolomite, graywacke, shale and iron formation. One of the peculiar features of the limestone is the presence of thick beds of concretions formed by the low and primitive plants known as algæ. The largest of these concretions, which are made up of concentric spheres, are about 15 in. in diameter and the smallest are the little oölites which in some places are replaced by iron oxide, iron carbonate, or iron silicate. It appears that these primitive plants and the closely related iron bacteria have had an important influence in the precipitation of the iron compounds from solution

[1] A. P. Low, "Report on the Geology and Physical Character of the Nastapoka Islands, Hudson Bay"; Geological Survey of Canada, Vol. XIII, Pt. D.D., 1903.

[2] E. S. Moore, "The Iron Formation on the Belcher Islands, Hudson Bay with Special Reference to Its Origin and Its Associated Algal Limestones"; *Jour. of Geol.*, Vol. 26, p. 412, 1918.

[3] "Iron Deposits on the Belcher Islands, Hudson Bay"; *Trans. Canadian Min. Inst.*, Vol. 22, p. 100, 1919.

and the formation of the little granules of iron silicate and iron oxide which are similar to those found in the Mesabi Range of Minnesota.

The sediments on these islands are a continuation of those on the Nastapoka Islands, having been brought above the sea level in this region by folding. They are interbedded with sills of diabase and overlain by flows of basalt of Keweenawan age, the conditions resembling those found around the northern shore of Lake Superior. The islands are treeless, and in many places the rocks are perfectly bare of soil and vegetation, so the strata are as open to observation as the pages of a book. The great bands of jasper and red shale scoured off by the glacier make a very striking appearance, and naturally quicken the pulse of any prospector. The maximum thickness of the iron formation is about 275 ft., but the great bulk of the formation is hard, highly siliceous jasper with bands of slate or graywacke, the whole averaging less than 30 per cent iron. One band 35 ft. thick, measured in the best portion of the formation and carefully sampled, averaged 30.1 per cent iron, with 37.97 per cent silica, 0.039 per cent phosphorus, and a trace of sulphur. There are considerable bodies of this low-grade material close to tidewater. The highest-grade sample taken and analyzed ran 50.7 per cent iron.

The structure of the rock formations is comparatively simple, the dips running from almost nothing to 75 deg., and there is little faulting. There are frequent alternations of igneous instrusions or flows and sedimentary rocks. The iron formation lies immediately underneath a great flow of ellipsoidal basalt, which has spread practically all over the islands.

There has been much discussion as to whether the iron deposits on the Belchers are of economic value. It is my opinion that they are so lean, and the climatic

ALGAL CONCRETIONS IN LIMESTONE ON BELCHER ISLANDS

conditions are so unfavorable, that they cannot be worked at present. Electric smelting with power developed at the falls on the numerous rivers entering the east coast of Hudson Bay might be employed, but even then the conditions do not seem promising. The experiences which I had with the ice in James Bay early in July, in a year when everyone in that part of the country said the ice had broken early, convinced me that only specially constructed ships are safe in those waters. It is probable that as a rule the islands cannot be approached much before July 10, and in some seasons ice is said to remain around the islands until some time in August. Specially constructed ships might safely count on an open season from early July until the latter part of November in normal seasons, but they always run the risk of encountering heavy ice in Hudson Straits during that period. Eskimo labor may be employed for some purposes, but it cannot be relied upon for extensive mining operations.

Koksoak River Area Merits Further Prospecting

On the lower stretches of the Koksoak River, which empties into the head of Ungava Bay, Low[1] has found an extensive area of iron formation, and, although he states that much of the ore is low grade, he speaks of hundreds of millions of tons of ore and an almost inexhaustible supply of high-grade ore. He quotes a number of analyses which show that the metallic iron runs from 19.14 per cent in the lean jasper and garnet-

DOLOMITE MASS, IMPREGNATED WITH CHALCOPYRITE, ENCLOSED IN DIABASE SILL, BELCHER ISLANDS

iferous shale to 54.35 per cent in the better ore. The thickness of iron formation exposed is in some places over 400 ft. The rocks are described as Cambrian in age, but from all descriptions they appear to be the same as those around Hudson Bay, which are almost certainly Huronian.

From Mr. Low's description of this region and other areas one cannot but feel that he was a little sanguine regarding the quantities of high-grade ore seen. Nevertheless, there is no doubt that these areas merit much more extensive and detailed prospecting than Mr. Low was able to give them in his hurried reconnaissance expeditions through that hitherto unexplored country. The main outcrops of the iron formation mentioned occur in the vicinity of Shale Chute, Cambrian Lake, and the mouth of Swampybay River, on the Koksoak River. The locations are such that it should be possible to construct a railroad to the coast without great difficulty.

Scattered areas of iron formation carrying hematite and magnetite ore, but for the most part consisting of lean jasper, have also been reported by Low on the upper portions of the Hamilton River in Labrador. For example, at the narrows into Lake Petitsikapan, a band 20 ft. wide analysed 30.43 per cent iron. On Astray Lake and in a number of other places there are areas which may offer opportunities to prospectors in the future.

Copper Widely Distributed in Arctic Canada

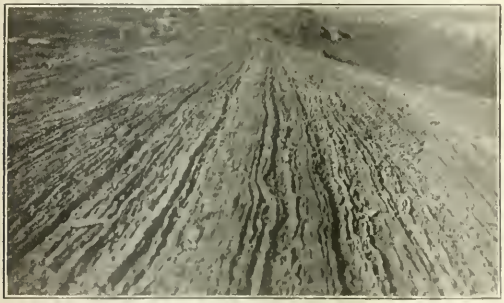
Since the early days of exploration in and around Hudson Bay and on the Arctic islands great interest has attached to the occurrence of native copper in Arctic Canada. The Eskimos, like the primitive inhabitants of Michigan, have long made use of this metal for tools and for other purposes. They have been known to make pilgrimages to the sources of the metal, and many

[1] A. P. Low: "Report on Explorations in the Labrador Peninsula"; Geol. Surv. of Canada, Annual Report, Vol. 8, Rept. L.

attempts have been made by white men, since that of Samuel Hearne in 1771 until the present day, to locate the mother lode. For a summary of the accounts of these expeditions the reader is referred to the articles by Tyrrell,[5] Douglas[6] and O'Neill[7].

There are certain conclusions on which most of the explorers agree. These are: (1) Native copper occurs widely distributed over the mainland and on some of the Arctic islands, and a few pieces of considerable size have been found; (2) the rocks are Keweenawan in age, and in nearly all respects closely resemble those of the copper-bearing area of the Lake Superior basin; (3) few of the areas so far examined contain extensive bodies of pay ore; (4) the probabilities of finding pay ore on a large scale seem promising; (5) great difficulty is experienced in carrying on explorations because of the remoteness of the area and the severe climatic conditions.

The areas in which native copper has so far been found by white men are on the Coppermine River, on Bathurst Inlet and on Boothia Peninsula. According to Stefansson and the members of the Canadian Arctic Expedition, the Eskimos also report deposits at the head of Prince Albert Sound, on Victoria Island. Two other places which have been mentioned are on the shores of Prince of Wales Island and on the Princess Royal Islands. The accompanying map shows the general distribution of these deposits and also the area which was withdrawn from staking for minerals by the Canadian government in 1918. This area lies north of 65 deg. N. latitude and between 105 deg. and 106 deg. W. longitude.



LEFT, A GLACIATED SURFACE ON VERY LEAN IRON FORMATION, SHOWING EFFECT OF DIFFERENTIAL WEATHERING. RIGHT, IRON FORMATION OVERLAIN BY BASALT FLOW, BELCHER ISLANDS

Bathurst Inlet and Coppermine River Deposits Not Directly Connected

According to O'Neill[7], the deposits on Bathurst Inlet are not directly connected with those on the Coppermine River, as formerly supposed. He describes the series as consisting of flows of basic rock with thin beds of sediments and with specks of copper distributed through the ground-mass of the basalt as well as in the amygdules. Copper also occurs as fissure filling. The disseminated copper runs about 0.25 per cent and the amygdaloidal copper will reach several per cent in some localities. The thickness of the amygdaloidal zone will vary from a few inches to several feet. The amygdules also carry chlorite, epidote, prehnite, opal, and agate. In some places the veins are important and carry several per cent of copper. Copper is found on practically all the islands and on the mainland in the vicinity of Bathurst Inlet.

In the Coppermine River area, the Copper Mountains are cut by the river about forty miles from its mouth and form a ridge about sixteen miles wide by forty miles or more long. They consist of interbedded basalt flows and sediments such as conglomerates and sandstones. According to Douglas[6], these rocks assayed in copper as follows: Conglomerates, 0.016-0.09 per cent; sandstone, 0.002; amygdaloid, 0.008-7.77; float, 0.09-43.39. There are traces of chalcocite with the native copper in some places. The most favorable locality mentioned is one on Burnt Creek.

From all descriptions of the copper-bearing rocks of Arctic Canada, a remarkable similarity is seen between the rocks and their copper deposits and the rocks of the Lake Superior basin, and one cannot but marvel at the tremendous amount of metal associated with the basic rocks of the Keweenawan system. Probably in no period of igneous activity in the earth's history has there been a more definite connection between a series of rocks and a particular type of metalliferous deposit. In some cases the zeolites of the Lake Superior region are lacking in the deposits of the Arctic, but they are reported from other areas.

As to climatic conditions, O'Neill claims that the temperature seldom gets lower than 40 deg. F. below zero and that the snowfall is not heavy. There is lignite and bituminous coal on Great Bear Lake and on some of the Arctic Islands. At present, the field is reached by sailing around the north coast of Alaska or by way of Great Bear Lake, and the navigating conditions are extremely difficult. The obstacles in the way of constructing a railroad through the country are not insurmountable, and an abundance of water power is available. From his experiences, Mr. O'Neill seems to be of the opinion that mining operations on a large scale are quite within the bounds of possibility in this region.

Copper sulphide deposits have been found in a number of places. Probably the most important is that mentioned by O'Neill[7] in the southern and western portions of Bathurst Inlet. Here bornite (Cu_5FeS_4) replaces dolomite which immediately underlies the

[5] J. B. Tyrrell: "The Coppermine Country"; *Trans.* Canadian Min. Inst. Vol. 15, p. 508, 1912.
[6] James Douglas: "The Copper-Bearing Traps of the Coppermine River"; *ibid*, Vol. 16, p. 83, 1913.
[7] J. J. O'Neill: "Deposits of Native Copper in Arctic Canada"; *ibid*, Vol. 22, p. 406, 1919.
[5] J. J. O'Neill. *Op. Cit.*, p. 410.
[6] James Douglas. *Op. Cit.*, p. 101.
[7] J. J. O'Neill. *Op. Cit.*, p. 411-12.

copper-bearing basalts. One layer is mentioned which is 6 in. thick and assayed 49.87 per cent copper. Another analysis of diabase from a sill showed 1.18 per cent copper in disseminated chalcopyrite ($CuFeS_2$).

On the Belcher Islands, in Hudson Bay, I have seen small masses of chalcopyrite in the dolomite at the contact with diabase sills. A. P. Low[11] mentions the occurrence of several large bands of pyrite, pyrrhotite, and chalcopyrite on the shores of the bay into which the Kogaluk River flows. This bay lies about forty-two miles north of Portland Promontory, Hudson Bay. These are probably the only copper sulphide deposits reported so far that might be of interest to prospectors.

In writing of his explorations in the Labrador Peninsula, Low mentions deposits of pyrites in a number of places. They usually occur in the Huronian schists near the contact with granite. In addition to the deposit mentioned, there are quartz veins charged with pyrites and galena near the mouth of the Stillwater River on the Koksoak River. Half a mile above the mouth of Wabaminsk River, in the eastern portion of the peninsula, a deposit of pure pyrites 100 ft. long by 10 ft. thick is mentioned as occurring in green chloritic schists.

STEAMER SURROUNDED BY ICE, JAMES BAY, JULY 1, 1916

The Paint Hills on the east coast of James Bay are described as consisting of squeezed trap carrying large segregation masses of pyrites, which contain a small amount of silver but no gold. On one of his expeditions Tyrrell[12] found a mass of dark green Huronian schist cut by a highly altered diabase dike 75 ft. wide and containing a large amount of arsenical pyrites. This occurs north of Rabbit Island, on the shore of Hudson Bay.

Very little gold has been found in these northern regions, but it seems probable that with more detailed work the extensive deposits of pyrites will be found to yield this metal. Silver has been found in small amounts in several places. It occurs in the pyrites of the Paint Hills, as before mentioned, and in the galena which is associated with zinc near Little Whale River, on the shore of Hudson Bay. Assays of from 5.1 to 12.03 oz. silver have been reported by Low from this galena.

The lead and zinc ore occurs in a band about twenty-two miles long between Little Whale River and Richmond Gulf, and has been prospected to some extent but without marked success. The ore occurs in limestone or dolomite in this locality, as it does in a number of other areas where these Upper Huronian rocks outcrop.

In a small calcite vein on the Belcher Islands I have seen smaltite and cobalt bloom near a diabase sill. This is interesting chiefly because of its similarity to the occurrence of these minerals at Cobalt, Ont. According to reports, mica has been mined for a number of years by the Scotch whalers on the coast of Hudson Straits, and deposits of graphite have also been mentioned.

From the widespread occurrence of ores and the still more extensive distribution of rock series long notable for their metals, the chances of discoveries of extensive ore deposits in Arctic Canada and adjacent lands seem bright. The very severe glacial scouring which most of that country has undergone has no doubt injured some of the less resistant and more exposed iron deposits. The present climatic conditions are very severe, and they make traveling and mining operations difficult, but detailed prospecting should bring to light some very valuable deposit in that tremendous area, which will make it worth while to overcome climatic obstacles by modern engineering methods.

[11]A. P. Low: "Report on an Exploration of the East Coast of Hudson Bay"; Ann. Rept. Canadian Geological Survey, Vol. XIII, Pt. D, p. 28.

[12]J. B. Tyrrell: "Report on Doobaunt, Kazar and Ferguson rivers and the Northwest Coast of Hudson Bay"; Annual Report, Canadian Geological Survey, Vol. IX., Pt. F, 1896, p. 32.

Mining in Bolivia Hampered by Poor Transportation

The Department of Chuquisaca does not rank with Oruro and Potosi departments as among the important mining regions of Bolivia, according to the U. S. Department of Commerce. The working of such mineral deposits as do exist has been prevented by almost insuperable difficulties of transportation. During 1918 concessions for mining lands covering every class of mineral, from salt to radium, were presented to the departmental government, yet in reality little mining of any kind is carried on, although there is good evidence of existence of copper, silver, lead, and iron ores in the country to the east of Sucre. The presence of copper deposits in the Tarabuco district, about twelve leagues from Sucre, offers probably the best possibility for mineral development. The natives in the country about Lagunillas carry on some alluvial gold mining, and the fact that quantities of precious stones exist in the Tarabuco district is strongly insisted upon in Sucre.

Lake Tahoe Has Shrunken

Lake Tahoe, in California, is often said to occupy an old volcanic crater. This is not a fact. It is true that the region about the lake shows evidence of volcanic activity of various kinds and that the water has at times probably been dammed by outpourings of lava, but the lake itself lies in a structural depression—a dropped block of the earth's crust.

The prehistoric Lake Tahoe was larger and deeper than the present lake, according to the U. S. Geological Survey. During the Neocene epoch and the earlier part of the Pleistocene epoch its water stood much higher than now, but in its overflow it has since cut through the lava dams that maintained it at that height. Distinct beaches that mark the former higher levels of the lake stand about 100 ft. above its present surface, but the water doubtless once stood at even greater heights. At Tahoe City the most distinct of these old beaches is a terrace that stands 35 to 40 ft. above the level of the lake.

Physiological Effect of High Temperatures and High Humidities in Metal Mines*

A Preliminary Study of the Results of Atmospheric Conditions Underground—The Observations Show the Importance of Low Humidity and Rapid Circulation of Air in Hot Working Places

BY R. R. SAYERS[1] AND D. HARRINGTON[2]

ONE of the important problems encountered in present-day metal mining practice is that of providing efficient ventilation, especially in those mines which have high air temperatures and high relative humidities in extensive workings at considerable depths, or in workings where mine fires are found or where there is much oxidation of timber or of ore.

It has long been recognized that mine workers subjected to hot, humid, stagnant air, and to certain harmful dusts in many of our metal mines, contract miners' consumption and possibly other diseases; and though considerable study has been made as to dusts, as well as of temperatures and humidities, in mines in England,[3] South Africa, and of some European countries,[4] little has been done in the United States, especiallly in respect to the effect of high temperatures and high relative humidity.

The following study was made in two comparatively deep copper mines, both with fairly high temperatures and humidities, one in which there was practically no attempt at ventilation and one with a ventilation system of a much more efficient kind than is generally found in metal mines. In both mines, the data were taken at points over 2,000 ft. below the surface and with surrounding rock temperatures generally in excess of 90 deg. F.

In general, the following data were obtained: Surface air temperatures and relative humidities and body temperatures, blood pressure readings, pulse, and time of day. Underground data at each place visited included temperature and humidity readings of air in working places, occasionally rock and water temperatures, temperature of compressed-air blowers, air movement or velocity, kind of work performed, number of workers, exact time each day, as well as body temperature, blood pressure, pulse rate, and other data as to those upon whom or by whom the experimental work was being done.

INVESTIGATIONS IN MINE "ONE"

On three consecutive days, the investigators entered a mine (designated "One") for the purpose of taking data as to the effect of high temperatures and high relative humidity in stagnant air, there being no attempt at ventilation other than from compressed-air blowers, which, however, furnished sufficient air to prevent excessive vitiation. On the first day, data were taken on five subjects, A, B, C, D, and E; and on the two succeeding days on A, B, and C. No work was done other than to walk slowly a few thousand feet underground and to take the necessary readings as to temperature, humidity, velocity, and blood pressure, and in only one instance did the investigators leave the level to climb a few feet into a stope.

The compiled data taken on the three days in mine "One," show that the investigators were in the hot region 120 minutes on the first day, 90 minutes on the second, and 115 minutes on the third. It had been the intention to remain underground at least four or five hours each day, but the effect of the hot, humid, stagnant air was so great that the investigators were physically unable to remain underground much longer than the length of time indicated.

EFFECT OF HOT STAGNANT AIR

It is significant that although A, B, and C had been accustomed to go underground on investigative work regularly prior to making this investigation, at the end of the three days in this hot stagnant air, during which time a total of but 5 hours and 25 minutes were spent underground doing only such light work as walking on level ground and taking temperature, blood pressure, and other readings, A lost six pounds and B lost over five pounds in weight, and though C did not weigh, he lost perceptibly in weight, and all were seriously fatigued each day after leaving the mine.

During the three days in mine "One" there was no period during which the investigators were in temperature (either wet- or dry-bulb) lower than 90 deg. F., and in many cases the dry-bulb reading was 95 deg. F.

At all times there was absolutely no perceptible movement of air except what could be obtained immediately in the current from compressed-air blowers. Even the air from the compressed-air blowers had dry-bulb temperatures above 85 deg. F., and in many tests the air was over 90 deg. F., temperatures being taken at the end of the nozzle of the compressed-air hose. Though compressed-air temperatures were nearly as high as those of the surrounding air, the high velocity and comparatively low humidity when in the direct current gave at least a temporary measure of relief, and this constituted the only relief from the extremely depressing conditions.

The blood pressure fell decidedly when the subjects were exposed to stagnant, humid air with temperatures over 90 deg. F. and below 100 deg. F., and a marked fall in blood pressure was found immediately upon reaching the cooler, purer air of the surface after having been exposed for about two hours to the unfavorable conditions noted. For a considerable time after reaching the surface the rise in blood pressure was slow, even when the subjects took a hot shower bath with a finishing dash of cold water. It was not until after eating, an hour to two hours later, that the blood pressure rose, and then it mounted somewhat higher than before the subjects went underground.

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*Condensed from the original and published by permission of the Director of the Bureau of Mines. This preliminary study is based upon data which have in part been secured by C. A. Allen and K. T. Sparks, to whom due acknowledgment is made.

[1]U. S. Public Health Service; Chief Surgeon, Bureau of Mines.

[2]Mining engineer.

[3]Haldane, *Journal of Hygiene*, Vol. 5, pp. 494, 1905.

[4]Oliver: "Diseases of Occupation."

Body temperature rose at the rate of approximately 1 deg. F. per hour when exposed to hot, stagnant air with wet- and dry-bulb temperatures between 90 and 97 deg. F., even when no work was being done other than leisurely walking along level haulage roads. This increase of body temperature continued until 102.8 deg. F. was reached in one case and approximately 102 deg. F. in the other cases, or fever temperatures throughout. After having been underground for about two hours under the conditions described, temperature decrease took place in still surface air at about 70 deg. F. and 50 to 60 per cent relative humidity, at the rate of about 1 deg. F. per hour, there appearing to be comparatively little influence in taking the hot shower bath with the final dash of cold water.

The pulse increased rapidly upon entering and remaining in the hot, humid air, and after having been in this atmosphere for about two hours, doing little or no work, as above described, the pulse had reached as high as 130 and occasionally 140 or over. Upon returning to the surface a comparatively rapid decrease of pulse rate was noticed. It, however, did not reach for several hours the same rate as before going underground. In general, pulse rate was high in the hot, humid, stagnant air, and it seemed to be abnormally sensitive to even the slightest exercise. It was found to rise rapidly even in subjects who had been accustomed to hard work under such conditions, as well as in the subjects of this experiment.

Physical Effects Noted

During the first day, all five subjects said that they felt dizzy within twenty minutes after entering the hot, humid, stagnant air, and within an hour all felt weak. B was very nervous after an hour's exposure, and later had alternate hot and cold sensations. C had a dull headache. All subjects perspired very freely, and all appeared unable to think quickly or accurately after less than one hour's exposure. On reaching the surface, all felt well except B, who was very weak for about fifteen minutes. All five complained of feeling somewhat weak for the remainder of the day, and A, B, and C did not sleep well that night, though D and E, who were more accustomed to hard physical work, slept well.

On the second and third days, only A, B, and C went underground, and the symptoms experienced on these days were similar to those felt on the first day, but in a somewhat milder degree. However, after the three days' experimentation, in which a total of less than five and a half hours was spent underground, the exhausting effect of stagnant, humid air with temperatures between 90 and 97 deg. F. was shown in the fact that A and B (C not weighing) had each lost over five pounds in weight, though no work was done, the subjects of the test walking leisurely in unobstructed level drifts.

Observations were made on five miners who volunteered, all being healthy, robust men except V, who was pale and thin (he had worked fourteen years in this mine). While underground the men dressed in shoes and trousers or overalls, usually cut off just above the knees. Underwear or shirts were not worn. Except in case of Z, blood pressure fell perceptibly after seven and a half hours underground in humid, stagnant air with temperature between 90 and 95 deg. F. Blood pressure reacted practically to normal with W and Z after the shower bath, these two men having worked in this mine eleven days and four months respectively; and in the case of X, who had worked twelve days, blood pressure increased perceptibly after the bath. On the other hand, in the case of Y, who had worked his first day in six months, blood pressure fell perceptibly after the bath, this apparently indicating that workers who were accustomed to the conditions had acquired a degree of tolerance, or at least were not as sensitive as were the newcomers. But in the case of V, who did not bathe after returning to the surface, there was a slight drop of blood pressure. He had worked in this mine fourteen years, and was pale and thin, but was active and apparently not physically exhausted by seven and a half hours underground to the same extent as the other more robust men. His work is much less arduous than the other men's, as he is a shift boss.

The pulse rate had risen perceptibly after the men had spent seven and a half hours underground, and, except in case of W, fell quickly after they reached the surface. W showed a pulse rate increase as well as increase of blood pressure after reaching the surface. However, after having been on the surface practically one-half hour after the end of the underground shift, the pulse rate remained perceptibly above normal in every case.

How the Men Were Kept "Fit"

Notwithstanding the obviously unhealthful conditions in this mine, the miners present a generally robust and healthy appearance, this probably being due to three reasons: First, knowing the conditions, the foreman employs only strong, healthy appearing men; second, the men are never hurried or rushed by the shift boss, and in fact are told to "go easy" and "take five" frequently; third, men employed continuously in the hot, humid, stagnant air generally remain for only a few months.

The foreman said that at least 50 per cent of the men employed worked one shift or less, but that if they can last a week they usually remain several months. Though the monthly labor turnover was over 100 per cent, plenty of men were available, as the mine is close to the heart of a large mining community. The men are expected to work a seven instead of the customary eight-hour shift, for which they receive 25c. per day more than employees of neighboring mines with eight-hour shifts; and, as before stated, the workers are rarely if ever hurried by the bosses.

The efficiency of the workers is somewhat difficult to gage, but it is certainly much less than 50 per cent of that of similar workers in other mines. At working faces, while one machine man or mucker works, his companion rests in the full stream of a compressed-air blower, the men exchanging places at intervals of twenty to thirty minutes, and frequently both rest. Moreover, the man working the short interval at the face must work at reduced speed. For example, two men at the face of a drift in this mine, in still air with 96 deg. wet-bulb and 94 per cent relative humidity, muck about twelve tons per shift, though in a drift in an adjoining mine, less than 1,000 ft. away, in moving air, with 82 deg. wet-bulb and 82 per cent relative humidity, two men muck thirty tons or over per shift.

The average of about thirty readings taken at all working faces of this mine gave wet-bulb 93.3 deg. F., dry-bulb 94.4 deg. F., and relative humidity 96 per cent, and at no place was there any perceptible movement of air except at points close to compressed-air blowers. However, though the resultant conditions were undeniably

depressing, little or none of this effect was attributable to air impurity, practically no smoke was encountered, and analyses of air samples taken at working faces showed slight vitiation or none, the large amount of compressed air from blowers apparently keeping the quality of the air good, but not in sufficient quantity to give the necessary velocity to cause cooling by evaporation.

Investigations in Mine "Two"

A second series of readings was taken on two days in mine "Two," a deep mine with extensive workings. This mine, though more efficiently ventilated than most metal mines, has high rock temperatures, and practically any desired condition as to temperature, humidity, and air movement is obtainable. In the mine, the workers are supplied fresh city water at a temperature of about 65 deg. F., and the men say they can drink large quantities of the water without ill effect. They generally work in a suit of underwear, trousers, and shoes, and upon leaving the mine put on a woolen shirt and a heavy coat.

A, B, C, and D entered mine "Two" about two weeks after the completion of the readings in mine "One," spending over an hour the first day at the face of an abandoned crosscut with practically stagnant air, wet-bulb 94½ deg. F., dry-bulb 97½ deg. F., and relative humidity 89 per cent. All were dressed essentially as in the mine "One" investigation, and on the first day A, B, and C remained practically at rest for about seventy minutes. There was comparatively little change in blood pressure during the first forty-five minutes in this atmosphere *at rest*, except that the blood pressure of D fell. At the seventy-minute reading the blood pressure of A and B had fallen perceptibly, though there was little or no change as to the blood pressure of C; and D, who was the youngest and perhaps the most vigorous of the four, had slightly increased blood pressure as compared with the forty-five-minute reading, due probably to slight exercise taken just previous to the last reading.

The body temperature of the four investigators at rest at the face of the crosscut had risen slightly during the first ten minutes after entering the place, and perceptibly at the readings forty-five and seventy minutes after entering, reaching a maximum of 102.6 deg. F. with D at the seventy-minute reading, he having carried a light ladder about 50 ft. during the interval between the forty-five- and seventy-minute readings.

The maximum body temperature of A, B, and C (101.8, 101.4, and 101.5 respectively) was reached at the seventy-minute reading, and none of these men had exerted himself in the slightest other than to take readings of temperatures and blood pressure, and to record similar data. Pulse rate had started to rise slightly at the reading ten minutes after entering the hot, humid, still atmosphere, and continued to rise at the twenty-five,- forty-five,- and seventy-minute readings, except that in case of B and D there was a slight fall in pulse beat between the forty-five- and seventy-minute readings.

After having remained practically at rest for seventy minutes at the face of the abandoned crosscut in stagnant air 97½ deg. F. and 89 per cent relative humidity, all experimenters perspiring freely and having increased body temperature and pulse rate and decreased blood pressure, the men walked about 200 ft. to a point where air was being discharged from the end of a canvas tube at the rate of 2,300 lineal feet per minute, this air having a temperature of 82 deg. wet-bulb, 82½ deg. dry-bulb, and relative humidity of 80 per cent. A, B, and C stopped at the end of this pipe, D going out to the shaft station. A sat with his head in the direct air current about three feet from the end of the canvas tube; B sat at one side somewhat out of the current, C sitting out of the current twelve minutes and partly in the air current three minutes. At the end of fifteen minutes A's temperature fell from 101.8 to 100.9 deg. F., pulse rate fell from 136 to 120, blood pressure rose from 98 systolic to 106 systolic, and from 68 diastolic to 82 diastolic. Meanwhile B, sitting a few feet distant in *still* air with essentially the same temperature and humidity as that of the *moving current* in which A sat, had only a slight bodily temperature decrease of from 101.4 to 101.2, showing the decided influence of *air movement*, even when the air had high temperatures. C, also sitting near A, but within the direct air current only three minutes, showed slight increase of bodily temperature, but had marked rise in blood pressure and definite fall in pulse rate. As in similar readings in mine "One," a definite fall in blood pressure was noted immediately upon reaching the surface, with subsequent slow increase in blood pressure, which returned to normal after the men had eaten a good meal.

Physical Effects Noted

In another series of readings in which the effect of work was studied it was noticeable that there was comparatively little drop in blood presure or increase in bodily temperatures or pulse rate so long as the four investigators remained quiet in the still air with temperature 85½ to 86 deg. wet-bulb and relative humidity 96 per cent. When light work was done, such as climbing up 24 ft. of vertical ladder and then down, with eight to eighteen minutes' rest before taking readings, little or no perceptible change of blood pressure or of bodily temperature was recorded, but the men exhibited a definite increase of pulse rate. When 120 ft. of vertical ladder was climbed up and down in five minutes, with three to fourteen minutes' rest before taking reading, though blood pressure was affected only slightly, there was a perceptible increase in bodily temperature. As climbing up and then down 120 ft. of vertical ladder in five minutes cannot be called strenuous work, it is apparent that attempts at actual sustained performance of hard work under the conditions noted would result in high body temperatures.

Upon coming to the surface the readings were almost normal in all subjects, this being true of blood pressure, pulse rate, and of bodily temperature in all but A, whose bodily temperature remained over 100 deg. F., due presumably to his having exercised somewhat more strenuously than his companions had done. None of the subjects experienced unusual symptoms except A, who thought he became tired more easily than usual.

Summary of Conclusions

In still air in metal mines, with a wet-bulb temperature over 90 deg F., and under 100 deg. F., and with a relative humidity of 89 per cent or above, the following signs and symptoms were found, even when little or no exercise was taken: 1. Blood pressure, systolic and diastolic, fell rapidly. 2. Body temperature rose, and in one case reached 102 deg. F., and this after less than two hours being spent in the hot, humid

air described. 3. Pulse rate increased and seemed more sensitive to exercise than that normally found. 4. Perspiration was very profuse. 5. Dizziness was a common symptom, and sometimes was marked. 6. Physical weakness, or exhaustion, was marked in some cases and was present in all. 7. Inability to think quickly or act accurately was a common symptom. 8. Nausea was occasionally noted. 9. Headache also was occasionally produced. 10. Loss of weight was especially marked in men who have been employed under the conditions of the tests over a period of years, but occurred even after exposure for only a few days.

In still air, with wet-bulb temperatures of from 85 deg. F. to 86 deg. F., and a relative humidity of 96 per cent, there were no marked changes in the blood pressure or body temperature, nor were the symptoms mentioned in the foregoing paragraph, dizziness, physical weakness, and inability to think or act quickly, found so long as the subjects remained at rest or took only light exercise. When moderate exercise was taken—climbing up and down an 8-ft. ladder fifteen times in five minutes—the blood pressure and body temperature rose.

Blood-pressure readings taken after reaching the cool air of the surface were found to vary considerably with men unaccustomed to high temperatures. Under conditions which resulted in rise of body temperature to 100 deg. F. or more, the systolic pressure fell, but where the conditions were such as not to cause the body temperature to rise above 100 deg. F., there was a rise in the systolic pressure when the subjects reached the surface. One man long accustomed to hot, humid air, recorded a fall of systolic pressure. In three others not accustomed to the conditions mentioned, a rise of systolic pressure was noted.

The tests denoted that the body temperatures reached normal in from one to two hours after the subjects reached the cool air of the surface after having been exposed to conditions that caused a rise above 100 deg. F.

It was noted that a shower bath, beginning with tepid water and ending with a dash of cold water, had little immediate effect upon the body temperature.

Dewatering Coarse Concentrates

Such Material May Be Put in Bins and Allowed To Drain, or More Elaborate Methods May Be Employed

REMOVAL of excess water from coarse table concentrates is usually considered a simple problem, as simple as the filtering of flotation concentrates is difficult. The latter, especially when the pulp contains clay or much slime, often causes considerable trouble, and unless the mass is made more porous by the admixture of coarser material, only a very thin filter cake can be made. For this reason, in combined table and flotation plants, all of the concentrates are often run together to the filters, and, where this is necessary, the practice affords a good solution of filtration difficulties which would otherwise be encountered. However, it is a good policy to try to handle at least a part of the coarse concentrates separately, as, in themselves, they do not require filter treatment, and the smelter superintendent is always glad to have a little of the coarser material by itself to sweeten his disposition after trying to get the sticky filter cake from the cars to his roasting furnaces.

The simplest way of removing water from table concentrates is to run them into a wooden bin with enough small openings in the bottom to allow the water to drain out. In this case, however, some provision must be made to take care of the water, and conditions under the bin are very sloppy. Sometimes the planks in the bottom of such a bin are spaced an inch or two apart and the whole is covered with screening or burlap. Some of the water should preferably be removed before the material goes to the bin. One convenient means for doing this is in use at the Arthur mill of the Utah Copper Co. The table and vanner concentrates are dewatered by four three-section Dorr classifiers equipped with filter bottoms made of wire screen, canvas, and burlap, under which a slight suction is maintained. The product is quite dry, but is mixed with the very fine flotation concentrates in order to make a pulp more easily filtered.

Another means for doing the same thing is in use at the mill of the Magma Copper Co., Superior, Ariz. The Wilfley roughing table concentrates are dewatered in an ordinary Akins classifier arranged over a bin into which it discharges. The product runs about five per cent moisture, and the upkeep on the machine is slight.

At the Old Dominion mill at Globe, Ariz., a more elaborate system is used. The concentrates are dewatered in concrete tanks with bottoms covered with coco matting, a slight vacuum being carried underneath. The pulp is distributed by revolving arms so that the tanks are evenly filled. When the concentrates have accumulated to near the top of the tank, the feed is stopped and the water drained off. A plug in the center of the bottom of the tank is then pulled out, and a Blaisdell excavating machine plows the material to the central hole, through which it drops into the cars, which have been spotted underneath. This scheme has the advantage of delivering the dewatered concentrates into cars for shipment.

Iron, Zinc, and Aluminum for Coins

Germany has ceased to use silver for coinage, but is employing iron, aluminum, and zinc for the purpose. In February, 1,168,251 marks were minted in iron 5-pfennig pieces, 2,166,457 marks in zinc 10-pfennig pieces, and 3,605,137 marks in aluminum 50-pfennig pieces. The shortage of nickel and copper has no doubt precluded the use of those metals. In British West Africa, one-shilling notes have been issued as a substitute for the silver coins which have found their way into the melting pot. Twenty-five cent notes are also used to a small extent in Canada, and are convenient for mailing small remittances.

Lead and Zinc in India

The chief deposits of India are those of the Bawdwin mines in the Northern Shan States (Burma). There was estimated Dec. 31, 1917, 4,033,000 tons lead-zinc ore, assaying 24.7 oz. silver, 27.4 per cent lead, and 19.1 per cent zinc. The essential constituents of the ores are galena and sphalerite, with a little pyrite and chalcopyrite. The lead and zinc concentrates are available for the customary methods of smelting. A zinc-distilling and sulphuric-acid plant is being constructed at Sakohi, with the aid of the Indian government, to treat the table-zinc concentrate. The company operates a lead smelter at Nam-Tú, eleven miles from the mines.*

*F. B. Hyder in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Roasting Zinc Concentrates in Suspension

New Type of Furnace, Developed at the Case School of Applied Science, Appears Worth a Trial On a Commercial Scale — Surrounding Each Sulphide Particle With Heated Air Effects Quick and Efficient Oxidation

BY CHARLES H. FULTON AND J. BURNS READ
Written for *Engineering and Mining Journal*

FINELY divided zinc sulphide ores now produced in large quantity by the flotation process may be roasted in gaseous suspension by the furnace to be described in this article. In furnaces of the ordinary type, in which the fine ore is forwarded through the furnace in the form of a shallow bed or beds, the very fineness of the ore leads to dense impervious bedding, preventing oxygen from reaching the interior of the bed, thus unduly lengthening the time of roasting and preventing the elimination of the last of the sulphur. Normally, the fineness of the concentrate should lead to a rapid and complete roast, for the speed of roasting is a function of the surface exposed to oxygen, which surface is greatest per unit of weight in very fine material.

The difficulty in bed roasting is to get the oxygen to the particle. If the fine ore during the roasting could be freely suspended in oxidizing gases, full advantage could be taken of the great surface conferred by its fineness. This principle is not new. The Stetefeldt furnace, familiar to the older metallurgists, is a classic in this respect. Nevertheless, although the broad conception of roasting in gaseous suspension is not novel, the manner in which this is accomplished may be so.

An analysis of the literature on roasting in gaseous suspension leads to the following classification of apparatus:

Class I. Furnaces in which finely pulverized ore is *dropped* into the furnace, usually of the shaft type, with or without baffles or shelves to break the path of the falling ore. There are three sub-classes:

(a) The ore is dropped from the top of the furnace against a rising current of gaseous products of carbonaceous combustion. (Examples: Stetefeldt, U. S. Patent 43,140; 72,931, reissue, 8,266; J. P. Arey, 103,066; J. H. Ray, 303,456; R. E. Wickham, 829,819.)

(b) The ore is dropped from the top of the furnace against a rising current of air. This may be accomplished by surrounding a vertical muffle with hot products of combustion and dropping the ore down the muffle; or by heating the ore first to a red heat and then dropping it down a vertical shaft. (Examples: J. S. Briggs, U. S. Patent 53,266; M. D. Brett, 188,098; J. E. Rice, 275,272; C. J. Fauvel, 503,839; C. L. Priestone, 534,517; J. E. Greenewalt, 551,725; J. E. Greenewalt, 717,093.)

(c) The ore is dropped down a shaft with the descending current of the products of combustion and air. (Examples: H. Hutchinson, U. S. Patent 414,051; A. S. Wilfley, 898,024; A. S. Wilfley, 930,254.)

Class II. Furnaces in which finely powdered ore is *blown* into a shaft or chamber which is heated by the burning of carbonaceous fuel, by coal burnt on a grate, by pulverized coal, or by oil or gas burners. In all cases the furnace space is filled with the products of carbonaceous combustion, and the ore is blown in either by hot or cold air or by steam. (Examples: J. L. Constable, U. S. Patent 39,257; Whelphley and Storer, 41,250; J. W. Bailey, 117,363; F. W. Wiesebrock, 241,108; C. E. Robinson, 246,690; H. E. Parsons, 292,944; O. H. Tobey, 315,089; W. Brueckner, 321,003; J. J. Storer, 613,828; Sutton and Steele, 729,008; L. S. Hughes, 920,333; L. S. Hughes, 920,334; J. W. Thomas, 1,084,175. Also patents 1,160,621 and 1,164,653, to Klepinger, Krecji and Kuzell for smelting furnaces in

FIG. 1. 30-FT BRICK COMBUSTION CHAMBER ERECTED IN THE CASE LABORATORY

which a mixture of ore and fuel and flux is injected by means of a burner for pulverized coal into a revolving cylinder or a reverberatory furnace by means of air, preheated in regenerative stoves.)

Class III. Roasting devices in which finely divided ore is blown into externally heated coils of pipe by means of air, hot or cold, or steam. (Examples: U. S. Patent 136,261 and 236,739.)

Former Objections to Furnaces of This Type No Longer Hold

The numerous efforts to roast in gaseous suspension point clearly to the fact that the idea is attractive; in fact, an analysis would indicate it to be the most reasonable way to effect the oxidation of ore, provided certain difficulties can be overcome. One of the objections against such a method which formerly had such weight as to counterbalance any possible advantages was that the cost of fine grinding the ore was too great, and, further, that the finely ground product, even after roasting, was unsuited for further metallurgical operations. The former objection, however, has been removed by the production of great quantities of flotation concentrate, which, in point of fineness, present a material that is ideal for roasting in gaseous suspension.

The inception of the experiments on which the information given in this paper is based is due to David B. Jones and March F. Chase[1]. The general type of furnace and the process were suggested to the authors, and the experimental work was carried out in the metallurgical laboratories of the Case School of Applied Science, at Cleveland. The fundamental purpose was to make a furnace for roasting zinc blende flotation concentrate that would use the heat value of the sulphide to accomplish the roast and to produce a gas suitable for making sulphuric acid, i.e. of sufficient concentration in SO_2 and practically free from the products of carbonaceous combustion. Auto-roasting of sphalerite is theoretically possible[2], and also practically, as was demonstrated in the experiments which were conducted.

The flotation concentrate used in the furnace was a complex sulphide containing 31.4 per cent sulphur, 44.3 per cent zinc, and 11.6 per cent iron. With good running conditions, the sulphur was reduced to 3.6 per cent, and a minimum of 2.2 per cent was obtained. Much of this, especially in the finest particles, was in the form of sulphate, due to resulphatization of the roasted ore.

A diagrammatic drawing of the roasting furnace and accessory apparatus as erected is shown in Fig. 2 and

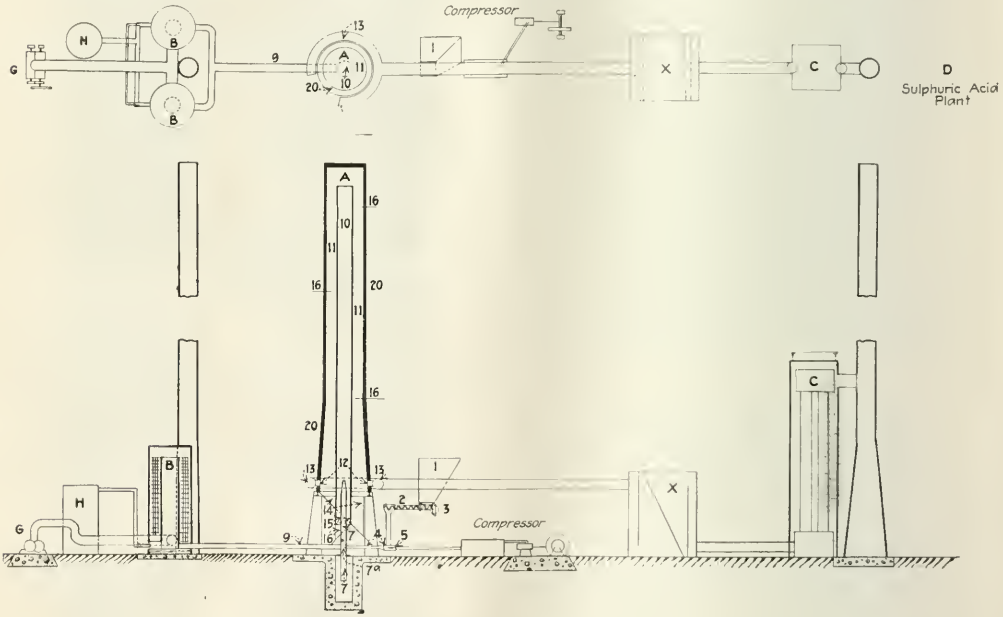


FIG. 2. GENERAL ARRANGEMENT OF EXPERIMENTAL APPARATUS

a photograph of the combustion tube in Fig. 1. In Fig. 2, *A* designates the furnace proper; *B*, the two stoves, heated by natural gas, which serve for pre-heating the air; and *C*, the Cottrell electrical precipitator for the precipitation of flue dust and fume carried from the furnace by the gases, which, in a commercial plant, would pass to a sulphuric-acid plant. *H* indicates the gas supply for the stoves, and *X*, the dust chamber. *G* is the cycloidal blower, furnishing air to carry the ore in suspension in the furnace. The dried, pre-heated ore (60 to 100 deg. C.) is charged into the hopper *I*. The screw conveyor *2*, operated by a variable speed electric motor *3*, permitting a range in the rate of feed, discharges the ore into the pipe *4*, directly above the nozzle *5*. Through this nozzle a stream of high pressure air (20 to 60 lb.), moderately pre-heated, is discharged

[1]The work was carried out for David B. Jones. The authors wish to make grateful acknowledgment to Mr. Jones and Mr. Chase for much aid and many valuable suggestions.

[2]J. W. Richards, "Metallurgical Calculations," One Vol. Ed. p. 620.

in only such quantity as readily to carry the fine ore in suspension through the pipe *4*, into pipe *7*, on the injector principle. Pipe *7*, of larger diameter than pipe *4*, is lined with refractory material and serves as the main injector pipe into the furnace. Air heated to approximately 800 deg. C., coming from one of the stoves *B*, enters the injector pipe *7* through the refractory lined supply pipe *9*, this being the main air supply for roasting the ore.

Regulation of Air Supply

The amount of this air supply is governed by two principles: 1. The quantity must be correct to roast the ore and to furnish a gas of the correct composition for the manufacture of sulphuric acid. Every pound of sphalerite required 35.7 cu. ft. of air (standard conditions) to convert the zinc to oxide, the sulphur to dioxide, and the dioxide to trioxide. Some excess must be carried, and, in the experiments, from 41 to 55 cu. ft., and sometimes 75 to 100 cu. ft., were used, as measured by meter. 2. Such a relation must exist between the quantity of air per minute and the area of the riser tube *10*, that the velocity of the ascending air current will be great enough to carry the largest ore particle to the top of this tube and over the edge. Fortunately, the requirements for both conditions can be fulfilled readily.

Pipe *4* enters the main injector pipe *7*, by means of a nozzle *7a*, turned upward. The mixture of ore and high-pressure air entering the main injector pipe with a rotary motion is caught by the ascending hot air from the pipe *9*, and injected into the riser tube *10*, from the mouth of the injector pipe *7*. The fundamental purpose is to have the temperature of the ore-air mixture at the ignition point of zinc sulphide, (between 650 and 810 deg. C, dependent on size of particle), as it leaves the injector tube to enter the riser tube, so that the full time of the ore particle in the furnace will be available for oxidation. After leaving the riser tube *10*, the ore particle falls in the annular space *11*, the area of this space being large so that the natural velocity of fall shall not be augmented by the velocity of the descending gases.

Time Required

The gas envelope surrounding the ore particle is probably constantly changing, fresh oxygen being supplied to the particle. The time element necessary for the roast is furnished by the time of its travel up the combustion tube and its fall in the surrounding annular space. This is controlled first by the height of the furnace, the length of travel being practically twice the height; and second by the velocity of the ascending air current in the combustion tube. Assuming a definite ratio of cubic feet of air per pound of ore, the velocity will then be determined by the area of the combustion tube. Definite figures on this point are given subsequently in this paper. In any given furnace, i.e. a fixed area of combustion tube, variation is allowable in the velocity of the ascending gas current, obtained by varying the amount of air, which will then vary the time of the ore in the combustion tube. Too high a velocity, obtained either by too much air only or too great an ore feed, with its correspondingly increased amount of air, will shorten the time element too much, so as to eliminate sulphur insufficiently.

The greater part of the ore collects in the hopper *14*, the gases and fine dust passing out through the openings *12* into the flue *13* and thence to the settling chamber *X*, where the coarser dust is settled out. The gas then goes to the Cottrell precipitator, *C*, for the precipitation of the finest dust and fume. This outlines the process and furnace.

The points of importance are as follows:

(a) The ore travels with the gases, and hence cannot be blown from the furnace before it travels the length of its path, which is essentially twice the height of the furnace.

(b) No carbonaceous gases are present, so that the SO_2 can be utilized for sulphuric acid.

(c) The ore is roasted by the heat developed by the combustion of the ore. Some fuel is necessary for preheating a certain amount of air. This pre-heated air is considered essential to obtain early ignition in the furnace, to get a complete roast. What amount of the total air must be pre-heated can be determined only by a commercial-sized furnace. The question of amount of pre-heated air is again discussed further in this paper.

(d) The furnace will make more flue dust than the usual type of mechanically operated furnace. However, this flue dust will be completely roasted, whereas in the usual type it is not.

(e) The furnace contains no mechanical movable parts in the heated zones. This means a low repair and depreciation cost as compared to the usual type of mechanically operated furnace.

(f) The labor cost will be low. One man can take care of a 50-ton furnace.

(g) The power required to operate the furnace will be about the same as that necessary for the usual type of mechanically operated furnace.

Heating the Air

Insufficient data are available with regard to how much of the air must be heated and to what temperature heating should be carried for the most efficient operation of the furnace. Obviously, one of these four methods must be used:

1. Heating all the air and passing all of it through the mixer tube and into the furnace with the ore. This will require large stove construction and will not admit of air changes in various parts of the furnace, as will be desirable for proper control.

2. Heating all the air and passing only a portion of it into the furnace through the mixer. The remainder would be put into the combustion tube at various points. This method is not desirable, as the heat is needed in the bottom of the furnace for heating the ore and bringing about early ignition.

3. Heating none of the air. Present indications are that this will not be possible, as already explained.

4. Heating a part of the air, (say one-fifth), which will be passed into the furnace with the ore through the mixer; the remainder of the air to be admitted cold at points throughout the height of the furnace.

This method will make all the stove heat available for ignition and for holding down the combustion zone, and permit the use of cold air for combustion and temperature control of the top of the furnace. Of course, the stoves should be of ample capacity and of such construction as to permit of changing the temperature and amount of air going into any part of the furnace as necessary.

Under the first condition, assuming 300 deg. C.

necessary for mixer temperature, the air in a 50-ton furnace must be heated to 350 deg. to heat the ore if it is being fed cold. If the ore is coming direct from the drier, this temperature may be reduced somewhat. Three stoves of the following dimensions should be sufficient for a 50-ton furnace: 1,060 sq.ft. heating surface, 246 flues, 4 x 4-in. cross section, 14 ft. long, and 3.25 in. walls. Total height, allowing for gas and air ports, foundation and dome, about 25 ft. Diameter, about 12 ft. Cross section of combustion chamber, 12 sq.ft.

Under condition No. 4, which seems the most promising, such stoves would be larger than required, but not necessarily inefficient, and would provide for emergencies where the heating of all the air was necessary. The ratio of fuel necessary for heating all the air to 350 deg. to that necessary for heating one-fifth to 600 deg. is about 1 to 2.5. This is a material saving in favor of the fractional heating.

Drying the Ore

Feed for this type of furnace must of course be dry, or it will not pass the feeder and injector. Most of the concentrate delivered at the roasting plant probably would have to be dried before feeding, and it was planned to do this drying with the waste heat in the gases leaving the furnace by circulating them beneath the hearth of an ordinary kiln drier. That there is sufficient waste heat available for this purpose can be readily calculated. In the experimental furnace, the gas left the furnace at 800 deg. C. under conditions of best roasting. The volume of this gas (measured under standard conditions) was approximately 50 cu.ft. per lb. of ore roasted, and was made up of about 8 per cent sulphur dioxide, 10 per cent oxygen, and 82 per cent nitrogen. The fact that sufficient waste heat was actually delivered by the small experimental furnace would seem to remove any doubts that enough heat would be available for completing the roast and maintaining furnace temperatures on a furnace of commercial size, well insulated.

The ore from the drier will contain some lumps formed in the drying and some coarse particles that will not work well in the feeder, and it was planned to interpose a vibrating screen between the drier and the feed hopper to remove these.

Capacity Varies With Size of Combustion Tube

Evidently, the capacity of these furnaces will vary as the square of the diameter of the combustion tube. This is substantiated in the results from the 9- and 12-in. combustion tubes that were used in the experimental furnace, which had capacities of 2 and 3.6 tons per twenty-four hours respectively. Assuming similar conditions as to ratio of air and ore, and the velocity in the combustion tube, the diameter necessary in the tube of a 50-ton furnace will be 45 in. For a furnace of this capacity it might be better to use two tubes of a combined area equal to 45 in. diameter, or 32 in. diameter. Such an arrangement would provide for repairs in feeders, nozzles, and injectors on a part of the furnace without complete shutting down, with attendant cooling.

Details of Probable Cost

To give figures of the cost of this type of roasting furnace and its operation that would be applicable to present conditions is impossible, and therefore only a brief analysis of cost based on pre-war conditions for a 50-ton furnace follows:

		Cost per Ton
Labor, 6 men, $19 80 for 24 hours		$0 3960
Power: compressor, blowers, drier and feeder, 26 kw.-hr. @ ¾c.		0 1998
Fuel for heating stoves (coal for producer gas)		0 0820
Interest and depreciation, figured on total costs as follows:		
Producer	$4,500	
Furnace	17,000	
Feeders	500	
Screen	500	
Drier	2,500	
Stoves	18,000	
Cottrell	12,000	
Piping and flues	800	
Compressor	1 200	
Blowers	1,000	
Housing and incidentals	7,000	
	$65,000	0.5290
General charges		0.0791
Repairs		0.1000
Total cost per ton		$1.3859

Many of the most important items in this table were taken from actual bids and were dependable for the time. Repairs, labor, and overhead cannot be definitely determined except in actual operation, but the charges given are the result of careful study and comparison. Repairs should be small compared with other types of roasting furnaces, because of the removal of all movable parts from the heated portions of the furnace. The main repairs will be in the feeder parts and injecting nozzles, which will wear because of the abrasiveness of the ore. Under continuous operation the interior of the furnace would deteriorate little. Therefore, the repair cost, like the other items, is conservative, and the total compares favorably with that of other types of furnaces now in common use.

Leasers and Lessees

An enthusiastic youngster was "Seeing America First" via the Cinderless Limited. At San Antonio the glad-hand expert of an organization of professional boosters edged up toward the good thing and permitted Bertram to break the ice. Soon the longhorn bid the attendant of the observation car to bring cracked ice and a mysterious brand of ginger ale, of which Bertram also partook. The ensuing conversation brought out the fact that a select group of Texans had acquired operating rights in a marvelously rich silver mine in Chihuahua. The narrator had just about decided to mortgage his Oklahoma birthplace, recently inherited, to equip the mine with some necessary machinery for sinking a shaft lower than the ancient workings. About a day later Bertram's father, in New York, received a message from El Paso to the effect, "Stopping over to see valuable silver mine in Old Mexico. Leasers shipping eight-hundred ounce ore from surface workings. Offer me opportunity to purchase half interest. Telegraph Frost National Bank twelve thousand dollars my credit." Father, being a methodical old lawyer, looked up the word "leaser" in the Century Dictionary, page 3,391; and then telegraphed, "Cease dealing with parties of the third part and proceed at once to Grand Cañon."

Increased Value of South African Gold

The Transvaal Chamber of Mines estimates the value of the April, 1920, output of gold at £5.125 per fine ounce, which represents an increase of £600,017 in the total value of the month's production. The amount of gold produced by the gold mines of South Africa in April was 683,962.456 fine ounces.

Prominent Metallurgical Engineers

John Brown Francis Herreshoff

IN OUR issue of May 22 we referred to "the late J. B. F. Herreshoff." "The late J. B." soon after called us up on the phone and convinced us of the truth of Sir Oliver Lodge's theories by inquiring from us if we knew the exact date of his demise. He subsequently materialized and called in person, and to the nude eye seemed not at all "late" but very much on the job. Dr. Herreshoff looks, as his photograph (taken especially for us the other day) shows, possibly a little rising fifty. He still has the biceps of our old hero John L. Sullivan, and the color of youth. When a boy he became interested in hygiene and physical culture, and he ascribes his extraordinary vigor to the pursuit of both. Dr. Herreshoff attended Brown University, and was afterward a member of the faculty, teaching chemistry. Although he did not graduate he was later awarded several degrees by that institution. Both the metallurgical and chemical professions have profited greatly from the inventions of this distinguished engineer. Younger metallurgists are probably not familiar with the Herreshoff blast furnace, inasmuch as it has been superseded by oblong furnaces with greater capacity. This was a circular, steel-jacketed, water-cooled furnace, and even more of an improvement over the old brick furnaces which it displaced than the modern furnaces are over the Herreshoff. It was designed for the Nichols Copper Co.'s Brooklyn plant but was also widely used by the Canadian Copper Co. at Copper Cliff, and in the Ducktown district in Tennessee. A feature of the furnace was a detached, portable forehearth.

J. B. F. HERRESHOFF

Better known today is the Herreshoff roasting furnace, by reason of its extensive use at the Calumet and Arizona smelter and elsewhere. Dr. Herreshoff did not like the way the rabble arms were rigidly attached to the shaft of the old McDougall roasters, and he substituted a light, hollow air-cooled shaft for the solid 8-in. shaft of the original. The principle of quickly-removable rabble arms, first devised by Dr. Herreshoff, has been widely applied.

The refining of copper was not neglected. When Herreshoff began experimenting on this phase of the copper industry, electrolytic refining was practiced only in a very small way in two different works in the United States. The present Nichols Copper refinery, the second largest in the world, is a monument to his genius. The suhphuric-acid industry has also benefited greatly from Dr. Herreshoff's inventive ability. First he greatly improved the atomizers used for the injection of weak acid into the chambers. Great improvements were also made in the Gay-Lussac towers. He then devised the Herreshoff tower, a modification of the Glover tower, of much longer life, and which permitted a much greater concentration of acid. This acid was further concentrated by a distillation apparatus of his own design. It was really in connection with pyrites burning that the Herreshoff roasting furnace, already mentioned, was developed, so that every stage of the chamber process of sulphuric-acid manufacture was much improved. Not content with this, however, he adapted the contact process to American conditions, and economized the operations to such an extent that that method of acid manufacture is thoroughly established.

Throughout his career Dr. Herreshoff has been associated with the same interests. From 1875 to 1890 he was with the firm of G. H. Nichols & Co., from 1890 to 1900 with the Nichols Chemical Co., and after 1900 with both the Nichols Copper Co. and the General Chemical Co. He is now vice-president and trustee of the Nichols Copper Co. and a director of the Granby Consolidated.

The work which Dr. Herreshoff has done has not gone unappreciated. Among other honors he was the first to receive the Perkin medal of the Society of Chemical Industry, given "to that chemist in the United States who had accomplished the most valuable work in applied chemistry during his career." This was awarded in 1908. At that time three predominant traits in Dr. Herreshoff's character were emphasized: his modesty, his simplicity as contrasted with "duplicity," and his freedom from all thought of self. "He has been a scientist in the highest sense of that term."

BY THE WAY

Experienced

The suggestion has been made to Senator Harding that, in the event of his election, it would please engineers generally if Herbert Hoover were made Secretary of the Interior. It certainly would, in our opinion. Then, too, as Food Administrator, Hoover has already had a lot to do with our interior.

What's in a Name?

The Turkey Fat concentrator near Commerce, Okla., has been renamed the "Dinty Moore," and the Never Sweat from now on will be called the "Maggie." A third mill of the same company, now known as the "Cactus," will probably be rechristened by the operators, who are evidently admirers of George McManus and his magnum opus, "Bringing Up Father." The syndicated humor of our daily papers makes us feel at home, whether we go east, west, north or south. It is a common bond which the Reds must destroy if they would disrupt the nation. What will happen when Mutt, Jeff, and the Hall Room Boys make their final bow? But why rename a concentrator unless it be that thus the jinx that has queered the recovery will be dispelled? Naming a mine is like naming a baby, only one need not be so careful. In a recent news item we note that "Porter & Seaman are concentrating their efforts on the Jackass mine." Such a name would never do for one's offspring, but a mine is another matter.

Diversified Industry Again

Inhabitants of desert camps need no longer fear their dependence upon the mining industry alone. A specialist in Buffalo has written an Arizona postmaster seeking five thousand pounds of snakes and offering 30 cents a pound. This, however, is an opportunity only for such camps as are favorably situated near serpentine occurrences. It will also be of benefit only so long as the market remains good. So important would be the establishing of such a supplementary industry that the *Journal's* market editor might be persuaded to quote snakes weekly, if he were approached diplomatically and a sufficient number of people appeared interested. Readers are warned, however, that no matter how firm the market stays, it is inadvisable to introduce snakes into a snakeless community and to attempt to raise them, as if they were squabs or Angora goats. Snakes excel slide rules in multiplying. But for a desert community where the snake supply is steady and not too abundant the idea is worth considering.

A Bar Story

On the loading platform of a forwarding house at old Maricopa, in Arizona, years ago, there was an imposing pile of bullion bars, each weighing about 200 lb. and each stamped as the product of a Mohave County silver mine. The pile was there for months, awaiting settlement of litigation. One morning it was noted that a bar was missing. Investigation soon showed it had been taken by two men, presumably tramps, overcome by a vision of sudden wealth. A short way westward the unweildy bar was found to have been chopped in two with a stolen axe. Each man had then staggered along under his 100-lb. load for several miles further on the way toward California. Then, the load of riches too heavy to be carried further, the half bars had been abandoned. The most interesting feature of the incident is that the glittering metal was about nine-tenths lead.

When Scot Writes Scot

A blue ribbon, if nothing more, should have been given the writer of the following letter, which was received by the manager of a certain copper company in Arizona during the war:

Pardon the liberty I take of addressing you, but I would be pleased to have you help me toward a solution of my desires. First of all, I may state that I am from the land of "peet reek" and the "Dochan Doris," and possibly this is the reason I find myself prompted to take the liberty of writing you, as I understand you are likewise from Caledonia, and therefore may be moved to a spirit of sympathy toward a fellow countryman.

On April 17 I applied to your company for a position as stenographer, and under date of April 20 received from your chief clerk the usual epitaph to applications for jobs: "Your application has been placed on file for future reference." Now, I am asking that you have your chief clerk refer to his files and show you said application, with attached references, and if you have anything to offer me, and consider same worthy of your consideration, I would be pleased to have a line from your facile pen.

I may state that I am willing to turn my hand to anything there is money in, provided the salary is, or exceeds $130 per month, and if you will bear with me a little while I will justify my statement of being able and willing to tackle "anything." In 1915 I was interested, financially, in the local agency of the ——— company at ———, being cashier, at that point, but owing to a misdemeanor of my unscrupulous partner, who absconded with our female stenographer and $1,500 of my money, I got stranded. Being at that time prompted with a desire to serve the old country, I hied myself to Galveston and joined a British ship, then requisitioned by the Admiralty, and signed on as fireman. You will agree with me when I draw the comparison between a cashier's desk and working before the blazing fires in the bowels of an ocean-going "tramp," that this demonstrates Scotch grit. After buffeting the waves for five solid weeks in one of the awfullest storms I ever saw or heard of and being chased by a "U" boat, we put into Le Havre, France, from which point we sailed up the coast to Boulogne, France. At this point I developed a fever, and was sent to a military hospital, where after spending six long weeks in bed I proceeded to my old home in Bonnie Scotland, and after recuperating there was given my passport by the Foreign Office to return to America.

I have been in office work too long and am getting somewhat tired of the confinement, and would like to get something on the outside where the remuneration is equally as good, and would therefore be pleased to have an expression from you as to whether or not you could place me somewhere over there under your jurisdiction, where there would be a chance of getting ahead, and making some money, as I need it, and need it worse, to send it to my old home, surrounded as it is by the horrors of war. As we read in Proverbs, 27-2 "Let another man praise thee and not thine own mouth," will say I can furnish additional references both as to my financial standing, and otherwise, should you so desire.

Thanking you for giving this matter your kind consideration, assuring you same will be appreciated, and with kind regards, I beg to remain,

Yours very truly,

I met a fellow here by the name of ——— (who I understand worked for you once) and his "nose is just a sicht we drink in drams" that I am afraid he will have to betake himself to that state where everybody is like unto a "camel," otherwise I am afraid he will "weaken" over here.

Hope you will not consider that I have been overbearing in these elucidations.

CONSULTATION

Concrete Furnace Hearths

"We would appreciate any information which you may be able to give us relative to the use of concrete in the construction of hearths in mechanical roasting furnaces. We are under the impression that concrete has been used for this purpose by some of the leading copper-smelting plants in the roasting of copper and iron pyrites. We would also thank you to advise us regarding the composition of the concrete used, the temperature which such hearths have stood, and the greatest period of time."

The hearths of mechanical roasting furnaces are commonly made either of fire brick or ordinary red brick. Fire brick will of course stand a higher temperature, but red brick seems perfectly satisfactory for temperatures ordinarily maintained, which will not, in general, exceed 750 deg. C. for roasting copper sulphide ore. Red brick, of course, is cheaper. Sectional cast-iron drier hearths are sometimes used, as at the Copper Queen smelter, and, if sufficient room is allowed for expansion, are satisfactory. The Copper Queen roasters, which are 8-ft. furnaces of the McDougall type, use red brick on all but the drier hearth. Concrete hearths were tried at that smelter several years ago, but would not stand the heat. Concrete hearths have also been tried and condemned by the United Verde at Clarkdale, in Wedge furnaces. The principal trouble there was that the arches swelled, allowing the rabbles to run on the hearth floor and thus wear out quickly, at the same time reducing furnace capacity. We are also under the impression that the Anaconda company once built one of its Anaconda type furnaces of concrete, with the result that it had to be shut down in a week. The company now uses silica brick of its own manufacture. The A. S. & R. Tacoma smelter tried concrete hearths a few years ago, and later threw them out.

We have heard the statement made that if concrete hearths were properly hardened and dried out before use, they would be satisfactory. Possibly some of our readers who have had success with concrete can give a more favorable account of the use of this type of hearth construction. We note that Professor Hoffman, in his "Metallurgy of Copper," states that Evans-Klepetko furnaces at Great Falls, Mont., have been successfully operated with concrete hearths, a mixture of 1 part portland cement, 2 parts tailing sand, and 4 parts crushed slag being used.

Uses of Gypsum

"Will you kindly tell me where I can find detailed information on uses, treatment, and other facts concerning gypsum?"

Gypsum has a wide variety of uses, which during the war found especial application as a structural material and as an ingredient of portland cement. Because of their light weight and fire-resisting qualities gypsum boards, blocks, and tiles are increasing in demand. Particularly in hurried emergency construction are gypsum materials favored. A building plastered with gypsum dries rapidly, enabling construction to proceed with minimum delay. Although as a plaster alone gypsum may be weak, when combined with other materials it is admirably suited for special purposes. Thus plaster board consists of sheets of gypsum plaster fabricated between sheets of some tough, fibrous binding material, such as felt.

As a fertilizer gypsum is advantageously used on some soils and crops, and may play an important part in agricultural pursuits where intensive cultivation is desired. There are other minor uses of gypsum, which, briefly and partly enumerated, are as common blackboard crayons, as a flux in certain methods of lead smelting, in filling cotton cloth and paper, as a base for paint, as an adulterant in food, in the manufacture of buttons, as a bedding for plate glass, in molds for pottery manufacture, in cheap statuary, for surgical casts, and in dental work.

The technology of the treatment of raw gypsum and much valuable information regarding the United States gypsum resources is contained in Technical Paper 155, "Gypsum Products," published by the U. S. Bureau of Mines.

Lime Production

"What percentage of lime production is used in metallurgical work?"

During the year 1918, which is the last year for which the complete statistics are available, 7.9 per cent of the domestic production of lime was used in metallurgy. The largest amount was used for construction purposes, 28.5 per cent; agriculture consumed 12.2 per cent; and paper mills 10.1 per cent. The total production, according to the United States Geological Survey, was 3,206,016 short tons.

Electrostatic Precipitation

"Does electrostatic precipitation successfully separate gases? What is the general principle upon which the electrostatic method works?"

The electrostatic processes of fume precipitation can be applied to practically every fume-carrying gas; that is, to gases in which minute particles are suspended. They will not work upon the gaseous constituents of the gas itself, except where the mixtures of vapors have different temperatures of condensation and allow the formation of mists or particles upon which the high potential current can act. Electrostatic precipitation is occasionally used in the recovery of non-ferrous smelter flue-dust, cement dust, potash fume, and iron blast-furnace dust. Through its agency, many valuable byproducts are recovered which would ordinarily be lost into the air. Essentially, the processes consist in subjecting the gas stream to a high potential electrostatic force sufficient to charge the minute particles in the stream and drive them to the suitable receiving surface of an electrode. For this purpose chains are commonly hung in pipes about 12 in. in diameter.

THE PETROLEUM INDUSTRY

Oil and Gas in Montana

A Compilation From U. S. Geological Survey Bulletins and Other Sources Describing Localities Which Contain Favorable Geological Structures and Horizons for Oil and Gas Occurrence

BY J. P. ROWE

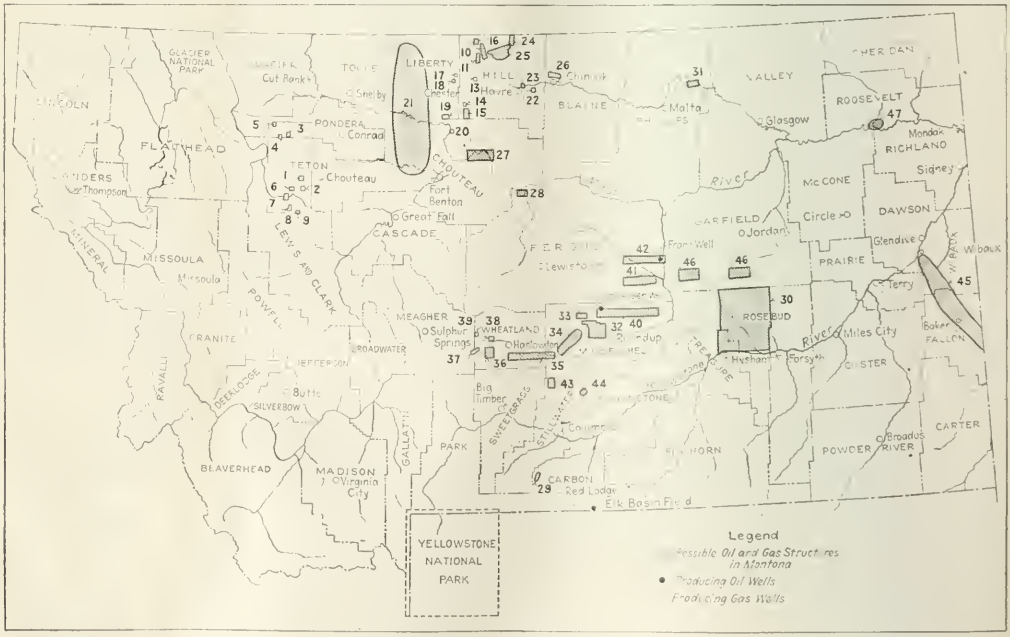
Written for *Engineering and Mining Journal*

THE MATERIAL for this article has been gathered from my field notes, from the bulletins of the U. S. Geological Survey, and from every other available source. The only detailed geological work that has been done in Montana is that of the U. S. Geological Survey. The search for oil and gas in the state has been in progress since 1900. Parties from Butte started to drill a well in that year in the northern part of Flathead County, known as the Kintla Lake district. Several thousand dollars were spent in drilling, but without success. A little later work was done in what is known as the Browning or Swift Current field, about eighty miles north of Browning.

In 1904, a well was drilled in the southern part of Carbon County on a sharply defined anticline. The crest of the anticline is in Jurassic rocks, and therefore no oil was struck, although a splendid flow of water was obtained. Somewhat later, drilling took place on what is known as the Glendive or Cedar Creek anticline, in Dawson County, in the extreme eastern part of the state. A sufficient flow of gas was encountered to be piped a few miles to Glendive, and at present many houses are heated and lighted by the gas.

About this time Havre, the county seat of Hill County, in the northern part of the state, drilled almost directly in the town and secured a fairly good flow of gas. Not long after gas was discovered at Havre several other wells were drilled in the state. Commercial gas was secured at Baker, the county seat of Fallon County. In 1914 a well was drilled at Great Falls. The well was drilled in a flat country and in the Kootenai formation and was a failure.

In 1914 a great oil excitement took place in the Sweet Grass Hills district. This locality is partly in Toole County and partly in Liberty County. The hills are three sets in number, East, Gold and West Buttes, and are laccolithic in structure. The East and Gold Buttes are several miles apart, whereas Gold Butte and West



PETROLEUM AND GAS AREAS OF MONTANA

Butte are close together. In this section conditions are favorable with respect to the geology. However, there are numerous dikes, and, while two or three wells have been drilled, no commercial oil or gas has been discovered, although a flow of gas in one or two of the wells was encountered.

In 1917, a test well was put down in the Glendive or Cedar Creek anticline at a spot selected by a widely known geologist. The company, according to reports, drilled to a depth of over 4,000 ft., going through all of the known oil or gas formations. A flow of gas was encountered at one point, but no oil of commercial value was secured.

In 1918, a well was drilled at Laurel, Yellowstone County, and it was claimed that a slight amount of oil was found. The structural conditions are such that a large amount of oil could not accumulate, as the formations are almost horizontal. There were several other rigs in the district in 1918. Wells were drilled near Conrad and west, in the Birch Creek-Sun River area, in northwestern Montana. A well was drilled to a considerable depth in Carbon County about the same time, without results. Many other wells have been drilled in the state, but, outside of Elk Basin, up to 1919 no oil was found in commercial quantities. Wells were also drilled at Twodot, Wheatland County, Wilsall; in the Shields River Valley, Park County; and also one in the southern part of Stillwater County.

Up to January, 1919, the only commercial natural oil or petroleum found in Montana occurred at Elk Basin. At this locality, in 1915, wells were drilled and a good grade of oil was secured. The Elk Basin field is partly in Carbon County, Montana, and partly in Wyoming. The field is a good producer and may be considered a part of the Wyoming field.

Since 1919 several wells have been drilled in Musselshell, Garfield, and Fergus counties. In fact, at present the area for many miles surrounding Roundup has all been leased except the land that has been withdrawn by the Government. Recently a well on Sec. 24, T. 11 N., R. 24 W. brought in oil. This well is on the Devil's Basin anticline in Musselshell County. The anticline was mentioned by C. F. Bowen, in Professional Paper 90-I of the U. S. Geological Survey. At present, it is claimed that, besides the one before mentioned, the Roundup Oil & Gas Co., well No. 1, Sec. 14, T. 11 N., R. 24 E., and the Roundup, Vandusen and Tri-City joint well, Sec. 30, T. 11 N., R. 25 E., are in operation.

The Roundup well is reported to have struck a good flow of oil, and a good flow of oil is said to have been struck on the Cat Creek anticline in the Cat Creek district near Mosby, in the eastern part of Fergus County. Great excitement prevails in the city of Roundup and in many of the smaller towns near by. An oil boom in Montana, centered around the city of Roundup, may be expected.

Geology of Oil Deposits

It is not thought that oil and gas in commercial quantities in Montana will be found lower than the Upper Carboniferous formation. At several localities where structural conditions are favorable the Upper Carboniferous is entirely missing. A general geologic section in North Central Montana above the Devonian is given in Table 1.

The eastern two-thirds of Montana is within the Great Plains region, and its areal geology, for the most part, belongs to the Tertiary or the Cretaceous formation. The great oil and gas formations in Wyoming are found in the Cretaceous, and principally in the Upper Cretaceous (Colorado and Montana) groups. Some oil has been found in the Embar (Permian) and the Chugwater, above. The oil from these latter formations is a black asphaltic oil, whereas the Upper Cretaceous rocks produce the higher grade light (paraffin) oils. The great producing horizon in Wyoming is the middle Colorado, known as the Frontier sands and shales. Elk Basin, Grass Creek, Salt Creek, Big Muddy, Greybull, and Byron domes all have their producing sands in the Frontier formation. Elk Basin, as stated, is partly in Montana.

TABLE 1. GEOLOGIC SECTION, NORTH CENTRAL MONTANA

System	Series	Group and Formation	Thickness, Feet
Quaternary	Recent	Alluvium	...
	Pleistocene	Glacial drift	0-150.
Tertiary	Pleistocene and late Tertiary	Terrace gravels	5-50
Tertiary (?)	Eocene (?)	St. Mary River formation	650
	Upper Cretaceous	Horsethief sandstone	250-400
		Bearpaw shale	0-500
		Two Medicine formation	1800-2200
		Virgelle sandstone	200-380
		Colorado shale with Blackleaf sand member at base	1800
Cretaceous	Lower Cretaceous	Kootenai formation	890-920
Jurassic	Upper Jurassic	Ellis formation	240-310
		Unconformity	
Carboniferous	Mississippian	Madison and later limestones	1200

Dowling, of the Canadian Geological Survey, in Memoir 52, No. 42 Geological Series, says that "Gas has also been obtained from rocks at about the horizon of the Niobrara at Medicine Hat and in southern Manitoba." He also says, "The great flows of gas at Bow Island and at Pelican Rapids, on the Athabaska, are believed to come from rocks at the horizon of the Dakota." Although Stebinger, in U. S. Geological Survey Bulletin 641, states that "It is probable, however, that this sand is actually in the lower part of the Colorado shale," the Dakota proper has not yet been recognized in Montana.

Stebinger, of the U. S. Geological Survey, in Bulletin 691-E, says, "Because of its association with the Colorado shale, the Virgelle sandstone may contain oil or gas in the rocks of northern Montana. At Medicine Hat, in the southern part of Alberta, a gas field yielding more than 40,000,000 cu.ft. daily from this sandstone has been producing for many years and has led to considerable industrial expansion in that city. More recently large amounts of gas have been obtained from the Virgelle, at Havre, Mont."

I visited the Alberta gas fields at Bow Island and Medicine Hat in 1914. During the same year I traveled across the entire State of Montana, from the Sweet Grass Hills to Marmouth, N. D. Later I spent considerable time in the oil fields of Wyoming, and from observation and all geological knowledge Wyoming Montana, and Alberta are similar geologically. Many oil wells are found in Wyoming in the same geologic formations that occur in Montana. Gas wells in Alberta are found in similar formation to those carrying gas and oil in Wyoming. If, then, as my observation leads me to believe, Montana geological formations were laid down in a similar manner and under similar conditions to the formations in Wyoming and Alberta, the conclusion might well be drawn that where structures are favorable in the geological formations above the Carboniferous, and not eroded and not too deep, dikes and faults being absent, there is reasonable expectation of finding either oil or gas.

The following are geologic formations that probably

contain oil or gas in Montana: The Kootenai—clay, shale, sandstone; the Colorado[1]—shale, sandstone; the Virgelle—sandstone (Lower Montana).

Beginning with the western part of the state, and going eastward, the significant areas will be discussed briefly. The numbers used correspond to those in the map on page 412.

Birch Creek-Sun River Area

The Birch Creek-Sun River area is described in U. S. Geological Survey Bulletin 691 E. It has a maximum length of 53 miles, running from T. 20 N. Lat. 47° 30′ to T. 29 N. Lat. 48° 15′. Its width is 21 miles, running from R. 6 W. Long. 112° 20′ to R. 10 W. Long. 122° 52′. The area is about 750 square miles.

The following anticlines in this area may contain oil or gas.

1. *Willow Creek Anticline* (T. 24 N., R. 6 and 7 W.), Teton County—According to Stebinger, an initial test well can probably be best placed in the "bad-land" area on the crest of the fold near the line between Secs. 19 and 30, T. 24 N., R. 6 W.

2. *Anticlines South of Deep Creek*, Teton County—These structures are south of the Willow Creek anticline. The westernmost anticline has its northern axis in Sec. 34, T. 23 N., R. 6 W. It continues slightly south and east for a little over three miles. The eastern anticline has its northern end in Sec. 35, T. 23 N., R. 6 W. It continues south and east for about three miles.

3. *Anticline on Dupuyer Creek*, Pondera County—Indications of a small anticline the axis of which trends about N. 17 deg. W. appear on Dupuyer Creek, near the center of Sec. 27, T. 28 N., R. 8 W. This fold is exposed only along the valley of Dupuyer Creek. At least two-thirds of the Two Medicine formation (Middle Montana) overlies the Virgelle (Lower Montana) in this locality.

4. *Scoffin Butte Anticline*, Pondera County—In the vicinity of Scoffin Butte there is a well-developed anticline the axis of which trends N. 7 deg. W. through Sec. 36, T. 28 N., R. 9 W. The depth to the Virgelle sandstone along the crest of this anticline is probably not less than 2,500 ft.

5. *Anticlines on Birch Creek*, Pondera County—Six miles northwest of the Scoffin Butte anticline there is a well-defined anticline crossing Birch Creek in Secs. 4 and 9, T. 28 N., R. 9 W., trending about N. 11 deg. W. The fold has a thick cover over the possibly productive beds, thus presenting the same difficulty as the Scoffin Butte anticline. East, one mile from the anticline just described on Birch Creek, is another small fold of doubtful value. Stebinger states that "only a very general production of petroleum in this area would seem to warrant drilling on either the Birch Creek folds, the Scoffin Butte anticline, or the fold on Dupuyer Creek."

6. *Anticlines on Deep Creek*, Teton County—On Deep Creek there are three parallel folds trending north, underlain by the Virgelle sandstone and lower formations which seem to offer the possibility of a small production of oil. The axis of the easternmost anticline crosses the creek about 1,000 ft. west of the east line of Sec. 30, T. 23 N., R. 7 W. The second anticline on Deep Creek is about 1,000 ft. west of the one just described. The third fold on Deep Creek crosses the valley of this creek near the old Goodwin ranch, extending through the southwest quarter Sec. 25, T. 23 N. R. 8 W.

7. *Anticlines on Sun River*, Teton County—There are several north-south parallel anticlines principally in T. 22 N., R. 8 W., in which the Two Medicine formation and Virgelle sandstone are the chief surface formations. The closely spaced parallel nature of these anticlines limits their collecting areas, and there does not seem to be a possibility of more than a small production of oil along their axes.

8. *Anticlines in the Vicinity of Barr Creek*, Lewis and Clark County—There are three well-defined anticlines in the vicinity of Barr Creek. Two wells were drilled on the flanks of the easternmost fold, but probably did not go deep enough to give the locality a thorough test. The easternmost anticline extends across Secs. 24 and 25, T. 21, N., R. 8 W. The second anticline in this region is found in Sec. 26, T. 21 N., R. 8 W., along Barr Creek. The third fold extends through Black Butte, in Sec. 35, T. 21 N., R. 8 W. Because of the small sizes and broken condition of this anticline it seems to offer small inducements for prospecting.

9. *Anticline in T. 20 N., R. 7 W.*—In Sec. 15, T. 20 N., R. 7 W., Lewis and Clark County, there is a well-defined anticline. This might be a fair anticline for further prospecting.

Anticlines of Doubtful Value for Oil or Gas

North of Deep Creek there are several rather large anticlines. They expose for the most part formations below the Kootenai, some being eroded to the lower Carboniferous or Madison limestone. They are, therefore, of doubtful value for oil or gas. The northernmost of the larger folds crosses the three forks of Dupuyer Creek near No Mountains and is designated the Dupuyer anticline.

The Teton anticline, lying parallel to the Dupuyer anticline, and about one and a half miles to the west, is by far the largest fold in the area.

All of the drilling has been done in the southern part of the area. None of the wells reached the Virgelle sandstone or to the probably oil-bearing beds associated with the lower part of the Colorado shale; nor were any of them located on the more favorable structural features of this area, and none of them brought in commercial gas or oil, and the district has not, therefore, been properly tested.

Anticlines in Blackfeet Indian Reservation

North and slightly west of the Birch Creek-Sun River area, running from Lat. 48° 15′ to the 49th parallel north and from the town of Cut Bank on the east, the county seat of the new County of Glacier, to the western boundary of the Blackfeet Indian Reservation, several anticlines have been described by Stebinger in U. S. Geological Survey Bulletin 641, entitled "Anticlines in Blackfeet Indian Reservation, Montana." A short description and location of each anticline is herein given, with their numbers and therefore their easy location on the map:

10. *Milk River Anticline*, Glacier County—This anticline has its northern outcrop in the valley of the North Fork of Milk River in the southwestern part of T. 37 N., R. 12 W. It extends in a southeastern direction and is twelve miles long. It is the largest single fold in the Blackfeet Reservation. The west limb of the fold near the axis of the anticline, and especially Sec. 31 and 32, T. 37 N., R. 12 W.; Sec. 27, 34 and 35, T. 36 N., R. 12 W.; and Sec. 2, 3, 11, 13 and 14, T. 35 N., R. 12 W., seem to be the most favorable localities for drilling.

11. *South Fork Anticline*, Glacier County—This anticline is second in size in the district. It lies east and parallel to the Milk River anticline. It can be traced for about six miles across the principal branches of south fork of Milk River in T. 36 N., R. 11 and 12 W., and in T. 35 N., R. 11 W. The South Fork anticline is probably as valuable as a possible reservoir of oil or gas as the Milk River fold. Stebinger states that "The desirability of prospecting in this anticline is somewhat uncertain, because of the great thickness of rocks that overlie the possible oil and gas sands." He states that "the depth to the Virgelle sandstone is over 3,000 ft. and the depth to the base of the Colorado shale nearly 5,000 ft. However, if other anticlines in this region should prove productive, drilling might be done on this fold."

[1]This formation is probably the most important source of oil and gas in northwestern Montana if not in the entire state.

12. *Blackfeet Anticlines*, Glacier County—These folds seem to offer little chance of finding oil or gas, for the reason that faults on both sides limit the collecting area for oil or gas.

13. *Anticlines on Cut Bank Creek*, Glacier County—On Cut Bank Creek, in Sec. 10, 11, 14 and 15, T. 33 N., R. 11 W., there are two parallel anticlines the axes of which trend about N. 18 deg. W.

14. *Anticline on Two Medicine Creek*, Glacier County—This fold is in the Valley of Two Medicine Creek, in Sec. 22 and 27, T. 31 N., R. 10 W.

15. *Badger Creek Anticline*, Glacier County—This fold lies in the east half of T. 30 N., R. 10 W. The crest of the anticline is so high above the oil-producing sands, and the fold so small, that this structure seems to offer little inducement for prospecting.

16. *Anticline on North Fork of Milk River*, Glacier County—This anticline lies in T. 37 N., R. 11 W., and is a very gentle fold. A well drilled to the nearest productive sands would probably have to attain a depth of 4,500 ft.

17. *Anticline on Cut Bank Creek*, Glacier County—In Sec. 34, T. 34 N., R. 9 W. is found a gentle anticline the axis of which extends north-northwestward. The axis lies approximately along the center of the valley of Willow Creek, which at this point enters Cut Bank Creek from the south. According to Stebinger, the depth to the top of the Virgelle sandstone is about 2,400 ft.

18. *Anticline on Willow Creek*, Glacier County—On Willow Creek, in Sec. 8, 16 and 17, T. 33 N., R. 9 W., there are excellent exposures of the crest of a broad, gentle anticline. To search the Virgelle sandstone a well would have to be sunk about 2,700 ft.

19. *Anticline on Blacktail Creek*, Glacier County—In the Blacktail Creek Valley, in the southeast quarter of T. 30 N., R. 8 W., a fold is clearly outlined in the upper part of the Two Medicine formation. This is a gentle fold, and to reach the base of the Colorado shale from the crest of this anticline a well would have to be sunk about 3,800 ft.

20. *Anticlines on Birch Creek*, Glacier County—This narrow-crested anticline lies in Sec. 4 and 9, T. 28 N., R. 9 W.

No drilling, so far as my information goes, has as yet been done in the Blackfeet Indian Reservation proper, though several wells have been drilled on the east, north and west border of the reservation, all with negative results, primarily for the reason that none was drilled in a locality that was most favorable and that would determine final success or failure for this section. However, Stebinger states that "The negative results obtained at these widely scattered places along the base of the mountain front, and the geologic evidence that the formations on the west edge of the reservation are much disturbed, indicate that this part of the region is unfavorable for oil and gas prospecting.

North-Central Montana

Most of the following discussion is taken from Bulletin 641, U. S. Geological Survey, "Possibilities of Oil and Gas in North-Central Montana," by Eugene Stebinger. The article describes an area of approximately 22,000 square miles, beginning at the northern boundary of the state and running south as far as Great Falls, about 106 miles. Its western limit is R. 8 W. It extends eastward for about 192 miles to Range 24 E. It includes all of the counties of Blaine, Hill, Chester, Toole, and Chouteau, and parts of Fergus, Cascade, Pondera, Teton and Glacier.

The Kootenai formation appears to be the lowest to offer oil or gas possibilities in this section. Above the Kootenai is the Colorado shale, containing in its lower half a number of sandstone beds. Above the Colorado shale throughout north-central Montana there is a group of sandy beds from 250 to 400 ft. thick, which constitute the Eagle sandstone. The lower half is known as the Virgelle sandstone member. The Havre, Montana, and Medicine Hat, Alberta, natural gas comes from the Eagle sandstone. The higher and lower formations are probably more or less barren. The following details the characteristics noted:

21. *Sweet Grass Arch*—The western half of this area is characterized by a very broad anticline or arch. The arch extends southward from the Sweet Grass Hills to the region beyond Teton River, where it flattens out. It extends north into Canada, and the Bow Island gas field in southern Alberta lies near the center of it. The arch for the most part has not been examined geologically, and therefore the occurrence of minor folds has not been determined. Should such folds be found within the arch, they offer the possibility of getting oil or gas from the Colorado shale at comparatively shallow depths.

22. *Box Elder Anticlines*, Hill County—There are two parallel anticlines near Box Elder Creek extending across Sec. 8, 9, 16 and 17, T. 32 N., R. 17 E. Their limits on the northwest and southeast are not determinable, because of the cover of the glacial drift, but they are doubtless parallel to the Meili fault, and their extension toward the immediate vicinity of Havre, where the large quantity of gas has been found, is probable.

23. *Havre Natural Gas Pool*, Hill County—The principal gas well of the Havre Natural Gas Co., brought in early in July, 1915, is in the S.E. ¼ Sec. 33, T. 33 N., R. 16 E., about two miles northeast of Havre, just south of the Great Northern Ry. This well is 947 ft. deep, and had a flow of 10,000,000 cu.ft. in twenty-four hours. The pressure was about 490 lb. to the square inch in 1915. The gas pool in the district of Havre will probably have its greatest extension in a direction S. 70°-75° E.

The probable reason for the failures of wells drilled at Fort Assiniboine, Chinook, and other localities in the Milk River Valley was the lack of knowledge of the kind of structures to drill and of the disregard of expert advice.

24. *Signal Butte Anticline*, Hill County—This structure is in the west half of T. 37 N., R. 15 E. It extends in a direction approximately N. 25° W., and is broken along its crest by a fault.

25. *Hill County*—In many places north of the Bearpaw Mountains there are areas of tilted and folded rocks. The following localities are the most noted: T. 37 N., R. 15 E.; T. 36 N., R. 14 E.; T. 35 N., R. 12 E.; T. 35 N., R. 14 E.; T. 35 N., R. 16 E.; T. 34 N., R. 12 E.; T. 34 N., R. 13 E.; T. 34 N., R. 14 E.

26. *Tilted and Folded Rocks North of Chinook*, Blaine County—On Lodge Creek, in the southwestern part of T. 34 N., R. 19 E.; on Battle Creek in the northeastern part of T. 33 N., R. 19 E.; on Coal Creek, in the west half of T. 33 N., R. 20 E.

27. *Area of Tilted and Folded Rocks South of the Bearpaw Mountains*, Chouteau County—In the vicinity of Virgelle, in T. 26 N., Rs. 11 to 13 E., there are four areas of tilted rocks.

28. *Tilted Rocks of Lower Part of Judith River*, Fergus County—In the north half of T. 22 N., R. 16 E., there is an extensive fault and southwest of this fault there is a very large block.

29. *Oil Prospects in the Upper Stillwater Basin*, Stillwater County—Some years ago several holes were put down in the Upper Stillwater region. All the holes were dry, according to Calvert, although indications of oil were reported. One locality was in the northeastern part of Sec. 4, T. 6 S., R. 18 E., and the other in the S. E. ¼ Sec. 32 of the same township. After passing through surface wash and the lower sandy portion of the Eagle sandstone, the drilling was in dark shale and thin sandstone, presumably of Colorado age. It seems that this section of the southern part of Montana was not properly tested, for the reasons, first, that the holes were of insufficient depth, and, second, because they were put down on the pitching end of the anticline. Another well was drilled at Dean during the summer of 1917. It is reported that it went to a depth of about 1,800 ft. It was a dry hole.

30. *Possibilities of Oil in the Porcupine Dome*, Rosebud

County—The Porcupine dome lies north of Forsyth, east of the Chicago, Milwaukee & St. Paul Ry., and includes T. 7 to 12 N., R. 36 to 40 E. The dominant structure is that of an elongate, roughly triangular dome the outline of which is indicated by the inner margin of the Judith River formation. Within the margin the dome has a maximum north-south diameter of about thirty-three miles and a maximum east-west diameter of twenty-seven miles. Minor folds exist within the domed area. C. F. Bowen says, after a general discussion for and against conditions in this dome, that "The presence or absence of oil or gas in the Porcupine dome field can be demonstrated only by thorough and systematic exploration with the drill. The only positive statement that can now be made regarding their possible occurrence is that the structural and stratigraphic conditions are favorable for their accumulation." The most promising place, according to Bowen, is near the crest of the uplift on the divide between Porcupine and Little Porcupine creeks, probably T. 10 and 11 N., R. 38 E.

31. *The Bowdoin Dome*—This dome is situated on Milk River, partly in Phillips County and partly in Valley County. It is a broadly arched structure from which the strata dip away on all sides. This dome was described a few years ago by A. J. Collier, and a description of it may be found in Bulletin 661-E of the U. S. Geological Survey. The Bowdoin dome is large and of low dip. Collier states that the most favorable place to drill is near the northwest corner of T. 32 N., R. 33 E. Whether a test well has since been put down in this region I do not know. While drilling for water several years ago a small flow of gas was struck at a shallow depth. I do not look with much favor upon the Bowdoin dome, for the reason that the dip of the strata is entirely too low. The size of the Bowdoin dome compares favorably with the size of the Porcupine dome, Rosebud County.

Anticlines in a Part of the Musselshell Valley

In Bulletin 691, U. S. Geological Survey, Bowen describes the anticlines, and the following is taken largely from this bulletin. The area described in Bulletin 691 includes about 1,200 square miles lying chiefly in T. 7 to 9 N., R. 12 to 23 E. Montana principal meridian.

The Musselshell Valley is structurally part of a large syncline that lies between the Big Snowy and Little Belt Mountains on the north and the Crazy, Beartooth and Pryor Mountains on the south and southwest. There are many minor folds within this syncline caused by the compression of the rocks. The most prominent anticlines and domes are described in the following:

32. *Pole Creek Anticline*, Musselshell County—This structure has an extent from northwest to southeast of about sixteen miles, occupying the area from the north side of T. 8 N., R. 24 E., to the southeast quarter of T. 10 N., R. 22 E., where it loses its identity in the south limb of the Devil's Pocket anticline. It is not known whether the axis of the Pole Creek anticline merges with the south limb of the Devil's Pocket anticline or whether the two folds are more or less distinctly separated by a syncline. This relation is critical, for on it may depend the possible accumulation of oil in the Pole Creek anticline. So far as its relation to other structural features is concerned, the Pole Creek anticline is well situated. It has a large collecting ground to the northeast, east, and south. To the southeast the area is small, because of the close proximity of a synclinal axis in that direction. The most unfavorable factor to be weighed in this anticline is the possibility that the oil may have escaped in the direction of the Devil's Pocket anticline. In the opinion of Bowen, the Pole Creek anticline is worth testing.

33. *Devil's Pocket Anticline*, Musselshell County—This anticline is nine miles long and three miles wide. It lies north and west of the Pole Creek anticline, principally in T. 10 N., R. 22 E. It projects from the Big Snowy Mountains, and is open in that direction. In other directions its outline is marked by the Eagle sandstone, so that the Colorado shale is the surface formation over the entire basin. Therefore, this anticline is not a likely source of oil unless the sands below the Colorado are productive, and it is faulted off on the north side and the productive sands have been sealed along the fault plane.

34. *Woman's Pocket Anticline*, Musselshell County—This anticline is about eighteen miles long from northwest to southeast and a little less than four miles wide. It lies southwest of and parallel to the Pole Creek anticline, but, unlike that fold, it has a "closed structure." It occupies portions of T. 7, 8 and 9 N., R. 20, 21 and 22 E. Regarded as an isolated anticline, it seems a favorable one for oil accumulation, as the possibly productive sands in the Colorado are covered and sealed above. It has not, however, a large collecting area.

35. *Shawmut Anticline*, Musselshell County—This anticline is the one mentioned in the Musselshell Valley. It has an east-west extent of about thirty miles and a maximum width of more than eight miles. That part of the anticline east of and including Deadman's Basin is the most favorable place for testing and is the only one that is likely to produce oil from the sands of the Colorado. In the western part of the Shawmut anticline there are three small domes, the east, middle, and west. The east dome is a possible source of oil, if oil has accumulated in the Kootenai sands. All three of the domes present ideal structure if oil is ever discovered in this section in rocks older than the Kootenai.

36. *Big Elk Dome*, Wheatland County—This dome covers an area of approximately one township and lies a few miles south of the town of Twodot. The structure of the dome is almost ideal, but as the most promising sandstone in the Colorado, the Big Elk Member, is exposed in the center of the dome, and as the underlying sands are probably quartzitic and fine grained, it does not seem likely that oil or gas will be found in this formation. The Kootenai sands might be productive.

37. *Little Elk Dome*, Meagher and Wheatland Counties—This structure lies between Little Elk and Fawn Creeks in T. 7 N., R. 11 and 12 E. It has an east and west extent of about eight miles and a north-south extent of four miles. For the reason that the sedimentary rocks are cut by several dikes and masses of igneous rocks, and the most favorable sands of the Colorado are exposed in the center of the dome, it is not probable that oil will be obtained in this dome.

38. *Haymaker Anticline*, Wheatland County—This anticline lies chiefly north of Twodot. Its structure is not "closed." The chances for oil in this anticline are small.

39. *Daisy Dean Anticline*, Wheatland County—The anticline lies five or six miles northeast of Martindale. It is not regarded as being favorably situated for oil accumulation.

In Professional Paper 90-I, U. S. Geological Survey, C. F. Bowen mentions briefly anticlines and domes north and east of the folds described in Bulletin 691. These structures lie in Fergus and Musselshell counties, and are found on the broad symmetrical fold, the Big Snowy anticline. The axis of the Big Snowy anticline trends northwest and pitches to the southeast. The minor folds on the Big Snowy anticline are the Devil's Basin, Flat Willow and Cat Creek anticlines, with intervening synclines. They are symmetrical folds the axes of which pitch to the southeast and trend roughly northwest but are somewhat sinuous in outline. The dips on opposite limbs of the folds as a rule range from two to six degrees and rarely exceed ten degrees. Descriptions follow:

40. *Devil's Basin Anticline*—The fold is in Musselshell County, running through T. 10 and 11 N. and R. 24, 25, 26, 27, 28 and 29 E. At present the greatest development is in T. 11 N., R. 24 E. This is the location of the Van Dusen well, which recently brought in oil, and also of several other wells that are now being drilled.

41. *Flat Willow Anticline*, Fergus County—North of the Devil's Basin anticline, in Fergus County, is the Flat Willow anticline. The fold is but a few miles south of the town of Winnett, and Smith post office is situated directly

upon its crest. It passes through T. 13 and 14 N., and R. 26, 27, 28, and 29 E. The Eagle sandstone is the surface formation over its western portion; the Claggett outcrops over most of the eastern half.

42. *Cat Creek Anticline*, Fergus County—The crest of this fold is north of Winnett about eight miles. It runs through T. 15 and 16 N., and R. 26, 27, 28, and 29, and probably 30 E. It is recently reported that about six miles from Mosby, Fergus County, oil was struck in a well drilled on this fold. It is reported that a 600-bbl. well was brought in across the Musselshell River on March 17. The lands on and surrounding the fold are being or have been leased.

Lake Basin Field

In Bulletin 691, U. S. Geological Survey, E. T. Hancock has an article on the "Geology and Oil and Gas Prospects of the Lake Basin Field." This field is situated in south-central Montana, and includes portions of Sweet Grass, Stillwater, Musselshell, and Yellowstone counties. It embraces an area of about 1,000 square miles. It lies south and east of the Musselshell Valley area, which is mapped and described by Bowen in Bulletin 691.

The two dominating folds in the Lake Basin Field are the Big Coulee-Hailstone dome and the northwest end of the Big Horn Mountain anticline. The highest point of the dome appears to be near the center of the east side of T. 4 N., R. 19 E., and from that place the dome is somewhat elongated in the direction of the Broadview dome, a local uplift about seven miles southwest of Broadview. Only the Big Coulee-Hailstone and the Broadview domes will be discussed.

43. *The Big Coulee-Hailstone Dome*—The highest point of this dome is considered to be near the center of the east side of T. 4 N., R. 19 E., Stillwater County. There is little doubt that the formations present in north-central Wyoming which carry oil and gas extend northward and underlie the Lake Basin field. It is also reasonably certain that the sandstones in the Colorado and Kootenai formations are sufficiently near the surface to be tested by the drill under the most favorable structural features in the Lake Basin field. The principal element of uncertainty for oil is the nature and extent of the sands. From the number of well logs available it appears that well-defined sandstones such as those present in most of the productive Wyoming fields are lacking in the Lake Basin field. It may be, however, that the available drill records fail to represent the true nature of the Colorado sands and that future drilling will establish the existence of sandstones under parts of the Lake Basin field similar to those underlying certain portions of the Musselshell Valley, farther north.

From the well logs it appears that no sandstones were encountered comparable with those at Elk Basin, Wyo., and apparently only meager showings of oil and gas were obtained. In view of the size of the Big Coulee-Hailstone dome, and the location of the 79 Oil Co.'s well and the well in Sec. 17, T. 3 N., R. 21 E., in relation to the crest of the dome, together with the fact that many dry holes are found even in productive fields, it is reasonable to conclude that further drilling of the Big Coulee-Hailstone dome is justified.

44. *The Broadview Dome*—About seven miles southwest of Broadview there is a circular uplift which may be called the Broadview dome. This dome is crossed by the boundary line of Stillwater and Yellowstone counties. Its crest is in Sec. 13, T. 3 N., R. 22 E. The Eagle sandstone outcrops over nearly the entire dome. The dome is greatly faulted on its southeast side. Hancock states that "if the Big Coulee-Hailstone dome proves barren, the possibilities of oil and gas in commercial quantities in this dome and the Lola Basin field are believed to be very slight."

45. *Cedar Creek Anticline*, Prairie and Fallon Counties —In U. S. Geological Survey Bulletin 471, U. R. Colvert briefly described this anticline. He states that "a strongly pronounced anticline extends from Yellowstone River near the mouth of Cedar Creek southeast for about seventy miles into the Dakotas." The same anticline is briefly described on pp. 51 and 52 of the University of Montana Studies—Series No. 1, by J. P. Rowe and Roy A. Wilson. From developments since both of these articles were written, the presence of oil is extremely problematic, although the cities of Glendive and Baker are now supplied with natural gas from this structure. As previously stated, a deep well was drilled, a year or two ago, in a most favorable locality on the anticline, with negative results in respect to oil, although a good flow of gas was struck in one or two places.

46.—According to Bowen, in Professional Paper 125-B, U. S. Geological Survey, there are several local anticlines in T. 14 N., R. 32 and 33, 37 and 38 E. These are north of the Porcupine dome and east of the Flat Willow anticline, as previously described. The anticlines are in the Lance formation, and the distance to the Colorado might be of disadvantage in drilling. They are in the southern part of Garfield County near the Alice and Garfield post offices.

47. *Poplar Dome*—In Professional Paper 120, U. S. Geological Survey, Arthur J. Collier mentions the foregoing, although C. D. Smith had noted the same structure several years previous in the U. S Geological Survey Bulletin 381. Neither writer considers the Poplar Dome, or others which are in the surrounding country, as possible reservoirs for oil or gas. It seems, however, that this dome, unless it has too low a dip, has some promise, for the reason that it "brings up a large elliptical area of Bearpaw shale nearly surrounded by the Lance formation." The dome is a few miles east of Wolf Point, on the Great Northern Ry. The town of Poplar is, according to Smith, near the center of the dome.

48. *The Huntley Field*—There is an anticline south of Ten Mile Creek, in the western part of T. 1 N., R. 30 E., and the eastern part of T. 1 N., R. 29 E., partly in Yellowstone and partly in Big Horn counties. For several reasons this locality does not seem to promise much in the way of commercial oil.

49. *Wolf Point*—South of Wolf Point, in the northern part of McCone County, there is a low structure. It is found largely in T. 25 N., R. 46 E. Owing to its low dip, I do not look upon it with much favor.

The most recent U. S. Geological Survey bulletin on oil and gas in Montana is No. 711-G. It deals with the "Geology and Oil and Gas Prospects of the Huntley Field, in Yellowstone County." This bulletin mentions two or three structures where oil or gas might be found, but gives no special encouragement, for the reason that commercial oil or gas has not yet been discovered in the Lake Basin field.

Natural-Gas Curtailment

Conference of State Public Service Commissions Likely To Result in Restricting Supply to Domestic Requirements

By R. S. McBride

Written for *Engineering and Mining Journal*

PRIORITIES in natural-gas supply similar to those which are from time to time confronting petroleum interests are to be considered on Sept. 10 by a conference of five of the state public service commissions, which meet to decide important policies with respect to elimination of certain industrial users of natural gas. Fundamentally, the question is how to supply the domestic users whose requirements are practically equal to the total production during peak-load periods. The most obvious method is the elimination of industrial users, and unquestionably those who use natural gas under boilers of any appreciable size, and many industrial users in brick manufacture, glass making, carbon-black production, and ceramic industries, are to be affected.

The state commissions involved are those of Pennsylvania, West Virginia, Ohio, Maryland, and New York. The first three named have jurisdiction over districts where 70 per cent of the natural gas in the United States is consumed. Fig. 1 (prepared by E. G. Severs, of the U. S. Geological Survey) shows the importance of this particular territory.

The action of these commissions will, it appears, be based upon the resolutions recently adopted by the national committee on natural-gas conservation, which worked under the auspices of the Department of the Interior, and reported June 11, giving recommendations for the conservation and distribution of the available natural-gas supplies.

Pooling of Interests Will Eliminate Wasteful Oil-Field Methods

One phase of the situation which probably will not receive immediate attention, though it has often been discussed in this connection, is that of the pooling of field interests. Fig. 2, a chart by S. S. Wyer, shows the importance of this, for under the competitive conditions described, it is quite apparent that wasteful field methods in natural-gas development have been encouraged. Only by the pooling of interests in adjoining territory can these problems be solved sucessfully, it is claimed.

The immediate importance of attention to these matters is evident from Fig. 3 (also by Mr. Wyer), which shows the rapid decline in daily production of gas in the McKeesport, Pa., field. Other fields in this tri-state territory have not shown such striking declines, but in each case the production shows signs of early diminution.

Industrial users who can demonstrate special requirements for natural gas which are not easily met by other fuels will have to be prepared to make such demonstration to the state commissions at an early date, as otherwise they can expect that their natural-gas supplies soon will be ordered cut off. For example, it is claimed that certain glass-making processes, such as flattening and annealing of plate glass, require sulphur-free fuel, and for such work it is quite possible that continued service will be permitted.

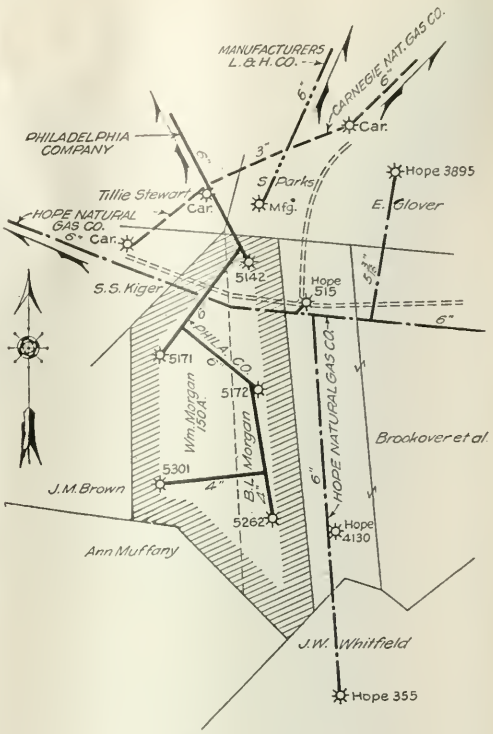


FIG. 2. SKETCH SHOWING COMPETITIVE CONDITIONS IN A NATURAL-GAS FIELD

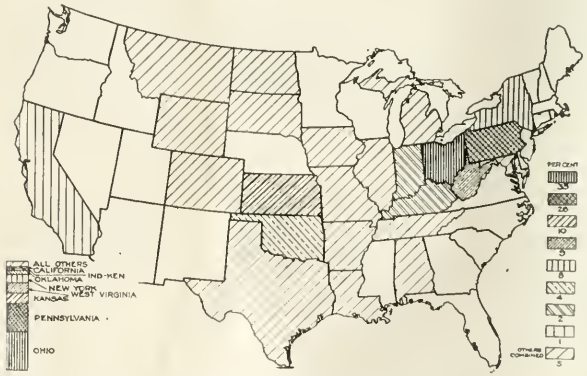


FIG. 1. MAP OF THE UNITED STATES, SHOWING BY STATES THE PERCENTAGE OF NATURAL GAS CONSUMED FOR DOMESTIC PURPOSES FROM 1906 TO 1918

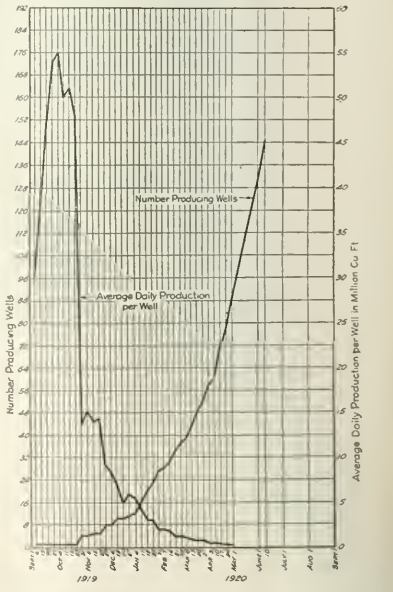


FIG. 3. DECLINE IN McKEESPORT NATURAL-GAS FIELD

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Council Seeks Advice on Classification of Engineers

Claims Question of Satisfactory Pay for Engineering Service Affects Public Most

Administrative officials of the various states and cities of the country, as well as of Federal bureaus having jurisdiction over engineering work, together with Civil Service Commissioners, were recently addressed by Engineering Council's Classification and Compensation Committee in an effort to secure their advice as to the practicability of putting the committee's proposed classification of engineers into effect in their various organizations. They were sent the following letter:

"It is doubtless known to you that engineers in all branches of the profession have suffered serious hardship during the past three years from the great decrease in buying power of the dollar. In few cases has their pay been increased sufficiently to offset any large proportion of the increased cost of living.

"Engineering Council, which represents over 45,000 engineers in all parts of the United States, has had this matter under investigation for over a year. We send you herewith an abstract of the report of the Council's special committee on the Classification and Compensation of Engineers. This report contains a standard classification of grading for engineering service, with a tentative schedule of standard rates of compensation in each of the proposed grades.

"Engineering Council has approved this classification, and it is believed to be applicable to all branches of engineering service.

"The classification was endorsed by the municipal engineers of the City of New York at a meeting of that society held on May 26, 1920, at which time a schedule was adopted providing for compensation at a rate approximately 20 per cent greater than that tentatively suggested by the committee. The classification has been closely followed by the Congressional Joint Commission of Reclassification of Salaries in its recommendations concerning engineers in the Federal service (see *Engineering News-Record*, April 15, 1920), and it was approved by the executive committee of the American Society for Testing Materials on April 13, 1920. The endorsement of the tentative schedule of compensation was recommended to the Boston Society of Civil Engineers by its Committee on Compensation at a meeting of that society held on May 19, 1920, and is now being made the subject of a letter ballot by the full membership. It will thus be seen that substantial progress has been made in bringing about a recognition of Engineering Council's classification as standard.

"The adopted classification and the corresponding schedule of compensation tentatively suggested are as follows:

Adopted Grades	Tentative Compensation Schedule
Junior Aid	$1,080 to $1,560
Aid	$1,680 to $2,400
Senior Aid	$2,520 to $3,240
Junior Assistant Engineer.....	$1,620 to $2,580
Assistant Engineer	$2,700 to $4,140
Senior Assistant Engineer.....	$4,320 to $5,760
Engineer.....	$5,940 and upwards
Chief Engineer . .	$8,100 and upwards

"We desire especially to urge upon you that this question of satisfactory compensation for engineering service is one which affects the public even more vitally than it does the engineers themselves. Upon the quality of service rendered by the engineers who design, plan and execute construction work, its cost and serviceability will largely depend. Our investigations have shown that the public is already suffering loss as a result of the great reduction in engineers' compensation.

"The need of a standard classification and standard rates of compensation which would be generally recognized as fair and just has long been felt by public authorities and other large employers of engineering service. We believe that this report is worthy of your very careful attention. In nearly all work on which technical engineering service is required, its cost is a very small percentage of the entire cost, so that an increase of engineers' pay to the standard scale will add a hardly noticeable amount to the total, and this in nearly all cases should be far more than offset by the economies which a higher grade of engineering service can effect.

"Nor can the importance be overlooked, at this time of general industrial and social unrest, of maintaining the loyalty of professional men who should be leaders of thought and action to the organizations which they serve. This continued loyalty to professional ideals cannot be expected when men of education and intelligence receive lower pay than many unskilled laborers."

The Mining and Metallurgical Society of America recently announced that the Gold Medal of the society, which will be awarded at the annual meeting in January, 1921, shall be given for: "Distinguished service in increasing the safety of men in mining and metallurgical operations."

Actualities in Industrial Russia Described by Expert

Raw Materials Stores Exhausted—Food and Fuel Vanishing—Disease Rampant

Many people are wondering "What the truth is about Russia." The *Compressed Air Magazine* publishes under the above title an account by one who has spent many years in Russia and, until the Bolshevik era, was associated in Petrograd with a well-known manufacturer of compressed-air machinery. Chaotic industrial conditions in 1917 put an end to this business, but he elected to remain in the country, hoping for improvement; and later he was unable to receive permission to leave. He has just succeeded in getting out of Russia, and has written an interesting description of conditions. We are sorry that we cannot quote the whole article.

"Everyone must be employed by law, particularly males from sixteen to fifty years of age; but to work according to the usual conception of the term simply is not done." They prefer to sit around, smoke, discuss their love affairs and how one can get something special to eat. "The educated middle-class school teachers, clerks and office assistants are having a very difficult existence because the brain-worker is very much underpaid."

The writer secured a job, through influence, in a chemical factory. Owing, however, to the complete lack of raw materials "this industry is at present at a complete standstill, except for the fact that the entire force of laborers and staff were maintained at full strength, doing very little. This factory has about 100 laborers on the payroll who worked only every once in a while at tearing down wooden structures and houses in the vicinity for the lumber, conveying it to the factory premises, where it was redistributed amongst the employees for use as firewood."

This is also the condition in other industrial establishments. "The Obouk-hoff Works are engaged only in repairing railway cars, no new cars are being built, because the necessary raw material and coal for fuel are la[illegible]" "... In order to obtain [illegible], all wooden houses, fences and other structures in the vicinity of the factories are torn down, and forests lying within an area of 20 versts (12 miles) radius from Petrograd are being felled, converted to firewood and transported to the factories and immediately consumed." In fact all has been consumed, as if by a pest of grasshoppers. "Now that the Bolsheviki have rounded up and consumed all known accumula-

tions of foreign supplies and stocks of raw materials, I do not hazard a guess as to how they shall be able to carry on in the immediate future. Everything seems to be lacking; nothing, absolutely nothing remains. I never could have believed that a country could be stripped so completely bare as has been accomplished in Russia within the relatively short period of two years that the Bolsheviki have been in power."

It is quite impossible to subsist on salaries of 5,000 to 8,000 roubles per month; one must have 30,000 to 40,000, and even so will not get enough to eat. Butter is 8,000 roubles per pound; bacon 2,500 to 3,000 roubles; one egg 200 roubles; flour at 800 roubles per pound; and so on. "In our family we had the good fortune to live in a house where the water pipes had not yet been burst by the frost, but in all neighboring houses it was necessary to carry up the water all the way from the street. . . No buildings are being repaired or maintained in condition, there being neither labor nor materials available for this purpose." Housing is governed by a special Soviet committee. "One room is allotted for an individual and so my parents with a family of three, who occupied a five-room apartment, were forced to take in two sailors as lodgers. . . . As things are, no one attempts to move, there being, in addition to the foregoing troubles, a great scarcity of lodging, due to the fact that almost all wooden houses have already been torn down and used as firewood; and also the luxury of moving costs from 20,000 to 30,000 roubles."

As far as wearing apparel is concerned, that is out of the question. A pair of shoes costs 12,000 to 15,000 roubles; overshoes from 9,000 to 10,000 roubles. These may be obtained from sailors, who are favored by the government. "In the month of February, 1920, the 'Skorokhod Shoe Factory' produced only enough shoes to enable them to negotiate an exchange for overshoes for themselves with the workers of the 'Treugolnik Rubber Factory.'"

There is, however, one flourishing industry: "Of all the industries in Russia, the state plant of printing and engraving reaches the greatest degree of efficiency, and is working to full capacity. Here the money or leninki is produced. Operation goes on day and night and printing proceeds without interruption. The workers in this plant are shown every consideration."

Of the city of Petrograd, a desolate picture is painted.

"Nevsky Prospekt, once Petrograd's pride [Petrograd's Fifth Avenue, and about four miles long], is now nothing but a country road. All shops have been closed and the windows sealed up with boards; the wooden paving blocks have long since been torn up (for fuel). . . . The sidewalks are crowded with degenerate loafers supposed to be soldiers, or Soviet employees. . . . Along its entire length there are not more than ten tny little shops still open."

Hackmen are scarce. "A truck driver charged 12,000 roubles to haul baggage from the Vassili Ostrov to the Finnish Railway Station. . . . Street cars were still running when I left, but most of them were broken down, and of the former 800 motor trams only about 100 are able to maintain operation. . . . There are only two passenger trains a week between Petrograd and Moscow and they take from five to seven days for the trip, formerly a ten-hour run, being about 400 miles."

However, life is not without its brighter sides. "All theatres are working full blast, and doing a tremendous business. Seats cost from 125 roubles up, and at the Mariensky all seats are permanently taken up by Communists of high rank, so that mere mortals are never so fortunate as to obtain admission, unless, just as in the former days of the Imperial Government, it is possible to procure the influence of some one of powerful position, with the exception that your protector will now possibly be a letter-carrier, whereas formerly he had to be at least a general. The audiences are mostly made up of sailors, soldiers and their feminine appendages. The women are loaded down with jewelry, and the new Mariensky Theater frequenters attempt to ape the brilliant audiences that formerly thronged the building."

There are, however, certain drawbacks. "Apropos of vermin . . . tram cars, railway cars, theatres, prisons, and hospitals swarm with them, and people are dying by hundreds of thousands on their account. In February of 1920, 65,000 died of spotted typhus in Petrograd."

Behold the "New Freedom" of the idealist: "The passport system has been re-established and is even stricter than it ever was during the days of the Imperial Government." "Petrograd has been policed for some time by girls of from 17 to 25 years of age. Male militiamen are rarely seen, because all able-bodied men have been drafted into the Red Army."

As to profiteers: "Running down speculators is a leading passion of the Bolsheviki, but it is to be recorded with sorrow that the worst offenders in this direction are frequently to be found among their own kind, such as unimportant Kommissars, sailors and factory workers originally sent by their own organizations into the provinces in order to obtain produce but who then refuse to relinquish any part thereof, without being assured a personal graft of several hundred per cent."

All schools are free, and literacy has been made mandatory by the government, "but this order, the same as others like it, is universally ignored and the masses remain just as uneducated as ever, only they are by far more rough and cruel. The way things are arranged, it is even possible for any one who is literate to receive what passes for an engineer's diploma after going through a course of study lasting four months."

Institute of Electrical Engineers Becomes Charter Member of F. A. E. S.

At the meeting of the Board of Directors of the American Institute of Electrical Engineers held in New York City recently, the following resolution was unanimously adopted:

"Resolved, That the American Institute of Electrical Engineers accepts the invitation to it to become a Charter Member of the Federated American Engineering Societies, and pledges its hearty co-operation in the work thereof."

This action brings up the present membership of the federation to four societies: American Society of Mechanical Engineers, Detroit Engineering Society, Technical Club of Dallas, Texas, and the American Institute of Electrical Engineers. There is no question as to whether the organization will be formed; the Federated American Engineering Societies already is the largest engineering organization in this country.

Emergency Currency of Madagascar

The *Bulletin du Commerce*, Nouméa, New Caledonia, for July 2, 1920, reports that in Madagascar the shortage in money is being met by using postage stamps. Adhesives are attached to one face of a piece of cardboard bearing on its other face an inscription stating its value, and the whole is given a coat of varnish. These "tickets" are issued in denominations of .05, .10, .25, .50, 1 and 2 francs. When badly soiled or damaged by usage "tickets" are redeemed gratis at any post office. This currency is reported meeting with success, and to be preferred by the natives over nickel coins.

In Papeete, Nouvelle-Caledonie, and Tahiti, the chambers of commerce are putting out paper coupons (coupures) as in France herself, and Nouméa has also decided on this course. The expense of printing an adequate supply of coupons in the United States (200,000 were printed for Papeete) is inclining these colonies toward the Madagascar plan.

The Minnesota Federation

The movement to federate the engineers and the allied technologists is to again bear fruit. Engineers and architects from all parts of the State of Minnesota met at Duluth, Minn., recently and took the first steps toward the formation of a state federation of engineers and architects. It is presumed that this organization will become a member of the Federated American Engineering Societies and it is hoped that the action in Minnesota will be followed by similar action in other states; only through united action of this character can the full strength of the solidarity of the engineering and the allied technical professions be realized.

Book Reviews

The Ore-Deposits of Utah. By B. S. Butler, G. F. Loughlin, V. C. Heikes, and others. Professional Paper 111, U. S. Geological Survey. 1920. pp. 659, 9 x 11½. Price $1.50, from the Superintendent of Documents, Washington, D. C.

We are glad to hail this substantial volume as in our opinion the most notable contribution to economic geology, and perhaps to geology in general, for the year. The geology of Utah is broadly discussed, necessarily involving considerable space, but the language is compressed to a laudable extent. The authors have, to be sure, had the advantage of all the preceding geological studies made in Utah, yet much of their material is original, and more of their deductions are. We recommend students, in and out of universities, to use this work as one of the textbooks of economic geology. We would furthermore suggest to the authors that an abridged edition, leaving out the descriptive part, still further boiling down the rest, and including all the pertinent illustrations, would be well worth while.

In his explanation of the origin and interrelation of most of the ores of Utah, the senior author presents the most elaborate array of facts yet put forward in support of the theory of ore deposition suggested by Spurr in 1904 (p. 200), although since that time many facts and deductions supporting the theory have been presented by numerous geologists, notably (and early) by Sales, at Butte; and also from time to time by the proponent of the theory. The theory argues for the origin of vein-forming solutions as the siliceous extreme differentiation product of crystallizing magmas; and for the successive deposition, with decrease of temperature and pressure, of different metals from these residual solutions. Mr. Butler, however, adds much that is partly or wholly novel in the way of searching analysis and thoughtful deduction. One line of thought, in which Mr. Butler is one of the pioneers, if not the pioneer, is in regard to the economic significance of different horizontal sections of igneous stocks or laccoliths as now truncated by erosion:

"Ore deposits associated with the laccoliths and deeper truncated stocks are of comparatively slight commercial importance, and those associated with the apically truncated stocks are of great value."

This is a classic proposition. We have not tested this in the field, as Mr. Butler has, but the course of reasoning seems sound; and if corroborated in other districts this has a direct and important economic application in prospecting and mining. We should like to have the author develop more clearly the field criteria by which we may know an apically truncated stock from a more deeply truncated one. Certain criteria suggest themselves at once; but in many instances it occurs to us that the distinction may be perplexing. Another valuable generalization, valuable in any case as a working hypothesis, is that the deeper truncated stocks are uniformly the more siliceous. "The apically truncated stocks range in composition from monzonite to diorite and the deeper truncated stocks from granodiorite to granite" (p. 20). This in itself would be a criterion of the truncation horizon, if demonstrated; and is also, as the author points out, a feature supporting the general theory of the origin of ore solutions by magmatic differentiation. Still lower, more basic phases would be expected, according to the author's reasoning.

Other sapient suggestions, among many which the author has put forth, without transgressing from bold inductive reasoning to unfettered fancy, are that "fractures in passing downward should disappear at a level where the material was too liquid to retain a fracture at the time they were formed" (p. 199). There will be many other reasons for "bottoming" a vein, of course, but this deserves to be held in mind. Also that "the extent of the ore deposits associated with laccolithic bodies, other things being equal, is dependent on the size of the laccolith" (p. 198).

A very valuable presentation is that of covering primary sulphates, including gypsum and alunite, as a deposition from magmatic emanations (pp. 181-195). This should be read by every student.

We congratulate the authors at having put the "contact deposits" in their proper position with other mineral deposits. "It is believed that the solutions producing the two types of deposits had a common origin. If the solutions forming the contact deposits and the deposits in the intrusive rocks had a common origin they resulted from differentiation of the magma that formed the main intrusive bodies" (p. 174). We also congratulate them on their sturdy advocacy of intrusion by dynamic force, instead of the "stoping and assimilation" theory, though we should have advised them not to discuss theories for which they find no evidence. There are too many "snakes in Ireland" essays in geological literature.

It is natural, perhaps, as in the above case, to pay at least the deference of opposition to current theories, and in obscure cases to let current theories stand. Nevertheless we wish to protest against the discussion of the "Basin range structure" question, on which the intimidation of authority has procured the acquiescence in views beyond the authors' knowledge. No proof is given of the conclusions as to the ranges having their relief due directly and primarily to faulting. It may or may not be true; possibly in some cases true and others not—certainly the evidence cited in this volume does not support the theory. Some day we hope to see this subject discussed more from a scientific and less from a spiritualistic standpoint than is now the general custom. Visions are swift, and observation is slow. Things like this are airy nothings: "The Sevier Valley, in its middle course at least, has been considered as resulting from the settling of a block between two great faults, forming a fault valley or graben." Geological literature is rotten with faults that "ain't there." For example, we quote from Memoir 117, Canada Department of Mines, 1920 (S. J. Schofield[1]) p. 62:

"The origin of the Purcell trench has been described by Daly[2] in the following words: 'The Rocky Mountain trench and the Purcell trench are likewise located on zones of profound faulting: in each case the constructional profiles may have been grabens as typical as that of the middle Rhine or that of the Dead Sea.' The geology of the Purcell trench in the neighborhood of the international boundary line was worked out in greater detail by the writer in 1913 and *it was found that the faults marked by Daly on the geological map as occurring on each side of the Purcell trench were not present and that the valley in this locality was not a graben.*"

We wish we had space to mention a few more of the good things in the volume: the description and interpretation of the folding, for example—an earlier east-west compression, marked by overthrown folds and faults; and a later series of vertical, in part domical uplifts, with or without faulting, due to a series of general east-west igneous intrusions. We suggest to Mr. Butler in this a possible answer to our east-west vein conundrum, set forth editorially in our issue of Feb. 28.

J. E. S.

Mine Bookkeeping. By Robert McGarraugh, E.M. Cloth, 6¼ x 9½, pp. 118. McGraw-Hill Book Co., New York. Price $2.

In his introduction to this little volume the author states, "The segregation and distribution of cost data is essentially an engineering undertaking, and, as such, should be under the supervision of some one who is familiar with all phases of the work and who clearly understands the results which are desired." This summarizes the intent and purposes of the book, for Mr. McGarraugh has presented his subject matter in a suggestive way which is open to such elaboration as the engineer may devise for his own particular needs. The essentials are not lacking, and the work is most acceptable, as it gives a comprehensive outline of bookkeeping and accounting methods applicable to the requirements of mining operations as carried on by the smaller and less well-organized companies.

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[1]Schofield, S. J.: Geol. Surv. Can. Sum. Rept. 1914, p. 41; Geol. Surv. Can. Mem. 76, 1915, p. 168.

[2]Daly, R.: Geol. Surv. Can. Mem. 38, pt. 2, 1912, p. 600.

MEN YOU SHOULD KNOW ABOUT

G. R. Mansfield is making geological field studies in southeastern Idaho.

W. P. Cloonan has resigned as mill superintendent of the Yellow Pine Mining Co. at Goodsprings, Nev.

C. E. Dobbine has been assigned to geological reconnaissance work in the Powder River region of Montana.

J. H. McLean, general manager, spent Aug. 4 and 5 at the Gogebic and Marquette range mines of the Oliver Iron Mining Co.

H. D. Miser is acting chief of the section of iron and steel alloys of the Geological Survey during the absence of E. F. Burchard.

Dorsey A. Lyon, supervisor of stations for the Bureau of Mines, is paying official visits to the Bartlesville and Pittsburgh stations of the Bureau.

Joseph F. Kunesh, who has been in charge of the office of the U. S. Geological Survey at Tucson, Ariz., has resigned to enter private employ.

Robert G. Wilson, formerly with the Tonopah-Belmont Mining Co., has been placed in charge of the taxation division of the American Mining Congress.

John D. Northrup, of Cheyenne, Wyo., was in New York recently, and expected to sail on Aug. 28 for Peru, where he will spend two years in oil-field examinations.

C. W. Newton, general manager of Consolidated Interstate-Callahan Mining Co., has returned to Wallace, Idaho, from the recent directors' meeting in New York City.

Edward Packard, who controls the Gemini and neighboring properties in Eureka, Utah, has been there recently conferring with the managers in charge of his interests.

J. R. Finlay, of New York, was on the Gogebic Range from August 6 to August 11, having driven there from the copper country, where he has been professionally engaged.

T. F. M. Fitzgerald, for some years with the Tonopah Belmont Development Co., is now in charge of the Homestake Placer Co. operations at Copper Canyon, near Battle Mountain, Nev.

C. Y. Hsieh, a member of the Geological Survey of China, has been employed temporarily by the U. S. Geological Survey and assigned to work with A. E. Fath in the Lost Soldier oil field of Wyoming.

Harry J. Wolf has been retained as consulting engineer to the Richard D. Wyckoff Analytical Staff, and will go West late in August to investigate mining properties in the interest of the staff's associate members.

Alex Grosberg, has resigned his position with the Patino tin mines, Uncia, Bolivia, and has accepted the general managership for D. G. Bricker, mine operator at La Paz. Mr. Grosberg sailed for Bolivia on July 28.

C. D. Woodward, chief electrician of the Anaconda Copper Mining Co., with headquarters at Butte, was recently at the Walker mine in Plumas County, Cal., to inspect the electric haulage tunnel which has been installed there.

Paul Moore, director of War Trade Board's information bureau, becomes secretary of research extension division, National Research Council, next October. He will give special attention to the promotion of research with reference to the industries.

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H. A. C. JENISON

H. A. C. Jenison, of the U. S. Geological Survey, who was recently assigned to assume charge of copper statistics, is in the West making a statistical and general study of our larger copper mines. His advance statement of the copper production of the United States in 1919 has just been distributed.

Bruce Middlemiss, assistant manager of the Chile Copper Co., visited in Hibbing recently after a three years' absence in South America. He was formerly general superintendent of the Mesabi Range operations of the Dean Iron Co. Mr. Middlemiss will return to South America early in September after several months' stay in the United States.

T. Nelson Dale, geologist, of Springfield, Mass., who retired from the U. S. Geological Survey on August 21, has spent six weeks this summer in active field work, collecting material for his bulletin on the limestones of Massachusetts, eastern New York and western Connecticut. Mr. Dale has also completed a revision of his work on New England's commercial granites, and a bulletin on southern commercial marbles.

J. W. D. Moodie, for many years general manager of Britannia Mines, has resigned and was succeeded on August 1 by B. B. Nieding, a mining man now living in Washington State. Mr. Moodie will take a long holiday and will go to California to reside. He has been in charge of operations at Britannia during the era of greatest development there and the company now owns a zone from Howe Sound to Indian River, at the northern end of the north arm of Burrard Inlet.

OBITUARY

F. L. Barker, mining engineer, and professor of mining and geology in Pei Yang University, Tientsin, China, died there on June 9, 1920, of smallpox. Professor Barker had taught in that university for the past five years, and had held a similar position in the University of Oregon from 1908 to 1913.

SOCIETY MEETINGS ANNOUNCED

Independent Oil Men's Association will hold its 12th annual national convention and a petroleum exposition at Denver, Col., on Sept. 28 to Oct. 1 next. The program includes, besides numerous characteristic hospitalities, cinematograph demonstrations of today's oil industry at work, an address of welcome by Governor Shoup, and communications on "International Aspect of the Oil Industry" by Van. H. Manning; "Specifications and Nomenclature," by W. F. Parish; "Production," by J. O. Lewis and A. W. Ambrose; "Present Condition of the Shale Industry in England and Scotland," by V. C. Alderson; "Relation of Bureau of Mines to Oil Industry," by F. C. Cottrell. Headquarters will be at New Albany Hotel, Denver, Col., and the sessions will be held at the Denver Auditorium Building, Curtis and Champa Streets. Secretary E. E. Grant's address is 110 Westminster Building, Chicago, Ill.

The Sixth National Exposition of Chemical Industries, at Grand Central Palace, New York City, Sept. 20 to 25, inclusive, has accepted nearly 400 applications for space. The program, aside from the exhibition proper, is also extensive. The American Institute of Chemical Engineers will hold a meeting in the Palace Sept. 23, and interesting papers will be read. In the evening the engineers will have a dinner at the Technology Club. Three other symposiums will be held during the week, one on fuel economy, one on materials handling, and one on industrial management.

A feature of this year's exposition will be moving pictures showing how American chemistry has advanced and the difficulties that have been overcome.

THE MINING NEWS

LEADING EVENTS

Lawsuit Outgrowth of Cuyuna Range Transaction

H. J. Kruse Seeks Share in Royalty on Ore Land Deal from C. D. Tripp, Former Partner

Claiming that he has been defrauded of valuable royalty rights in property on the Cuyuna Range in Minnesota by the manipulations of his former business associate, Henry J. Kruse has brought suit in district court at Duluth to recover from Chester D. Tripp, of Chicago, $219,744.35 damages. The purchase, optioning and leasing of eighty acres of mineral land in Crow Wing County is involved and dates back to 1910 and 1911 when Tripp and Kruse were both employees of the Rogers Brown Iron Co. in his complaint Kruse claims that on May 21, 1910, he purchased the surface rights of the eighty acres of land described as the south half of the northwest quarter of Sec. 11, 46-29, Crow Wing County, from a farmer with the intention of platting it into townsite and selling lots. Kruse alleges that, pending the closing of this deal, he was informed by Tripp that the latter was negotiating for the purchase of a mining option on a property lying west of the eighty-acre tract and that he would want the surface rights to the property which Kruse had purchased. Kruse claims that at that time it was not known to anyone that there was ore on his property and that it had no apparent value except for platting purposes.

The plaintiff alleges that he was induced to enter into an agreement to let Tripp handle the property on shares, Tripp having informed him that the mining company had abandoned all plans with regard to the eighty. He further alleges that the first arrangement was that Tripp was to handle the sale of the property on equal shares, but that later Tripp informed him that it would be necessary to handle it on thirds and still later on fifths in order to put the deal over through the agency of the Soo railroad. Believing Tripp, he agreed. Later, he alleges, Tripp induced him to deed away his surface rights to the Soo railroad, it being understood that he should receive $6,400, after which the surface rights would be deeded back to him less a strip for right-of-way. This was done in accordance with the plans and after deducting $1,655.65, the original cost of the property to him, he turned the balance of the $6,400 over to Tripp for negotiating the deal.

Kruse claims that Tripp then secretly negotiated with the Weyerhauser interests for an option for lease which later ripened into a lease through which Tripp was to receive 10c. per ton on all ore mined, all of which was part of a fraudulent scheme to cheat him out of his property. Kruse holds the value of the property, out of which he claims to have been defrauded, to be $219,744.35, including interest accrued.

WEEKLY RÉSUMÉ

Manganese ore from Brazil has arrived at Mobile, Ala., for consumers in the Birmingham district. In the Minnesota iron country, suit has been brought by H. J. Kruse against a former partner, C. D. Tripp, to recover a share in royalties from an iron ore land transaction on the Cuyuna Range. In the Joplin-Miami district, the Baker-Howell mine, near Baxter Springs, Kan., has been sold. Zinc operators are seeking to relieve the pressing car shortage by cutting the time in half allowed for unloading. The mine safety contest recently conducted in the Butte district has been won by the Emma mine.

In Washington the U. S. Bureau of Mines has selected Tuscaloosa, Ala., as the site for the new southern mine experiment station. The U. S. Geological Survey is planning greater activity for its foreign minerals section. Frank L. Hess, of the Survey, has returned from Bolivia.

Joplin Zinc Operators Seek To Relieve Car Shortage

An attempt to relieve the car shortage in the Joplin-Miami district is being made by operators through efforts of their own. Ordinarily freight cars that come into the field loaded with coal or other material are given four days for unloading. The mine operators, by mutual agreement, are endeavoring to cut this period exactly in two. Many coal cars are being unloaded at night and loaded with zinc concentrates the following day. An appeal for this effort on the part of the operators was made by Lee Willius, chairman of the car committee of the American Zinc Institute, at the meeting on August 18, and was met with prompt reponse on the part of the operators.

Emma Mine Wins Safety First Contest at Butte

The Emma mine, operated by the Anaconda Copper Mining Co., but owned by the Butte Copper & Zinc Co., was adjudged the winner of the safety-first contest recently held in the Butte district, extending for a period of 30 days. The Emma scored no accidents and was awarded a pennant by C. F. Kelley, president of the Anaconda. Even a scratch suffered by the miners was reported. During the period of the contest accidents in the Butte mines were reduced two-thirds. Sixteen of the mines in the district engaged in the race.

Baker-Howell Mine, Near Baxter Springs, Kan., Sold

Sale of Zinc Property Marks Activity in District Resulting from Chanute Spelter's Rich Strike

Sale of the Baker-Howell mine, situated in Oklahoma about three miles south of Baxter, has been announced. E. R. McClelland and J. W. Perry, of Kansas City, were the purchasers and the price paid is said to have been $50,000. The mine has been developed by T. B. Baker and John W. Howell, principal owner and manager, respectively, of the Connor hotel at Joplin. For a long time development of the property was handicapped by heavy water, but the pumping operations of the Chanute Spelter Co. at its Hartley mine, about two miles to the northwest, solved this problem, and the Baker-Howell Co. had recently been showing a profit on operations with hand jigs only. The new owners, who have operated successfully in this district, plan to erect a concentrator immediately. Their properties also include the St. Regis No. 1, at Duenweg; the No. 2, at Joplin, and the Quebec and Commonwealth mines at Picher.

This sale is the principal feature of the increasing activity in the Baxter camp, following the rich developments at Chanute Spelter Co.'s Hartley mine. At this latter property a drill hole has recently cut rich ore, indicating the existence of an entirely separate orebody from that being worked at present. The company is making approximately 75 tons of concentrates per day, operating single shift, and easily double that could be made, it is said.

Henry Ford Mum on Mining Plans in Michigan Iron Country

Now that Henry Ford has purchased the 400,000 acres of the Michigan Land & Iron Co. in northern Michigan, and is to start a large factory at Iron Mountain, Mich., on the Menominee Range, mining men are wondering what he is to do with the mineral holdings which have come into his possession. There are a few mines which have been worked, including the Imperial, at Michigamme, on the Marquette Range, a producer of limonite ores, and the U. S. Steel Corporation holds the lease on a deposit in the village of Alpha, near Crystal Falls, which has never been touched except by drills. Some of the lands are very likely iron ore, but no statement has been made by Mr. Ford regarding his mining plans. He has furnaces near Detroit and it is believed that he will later enter the mining field.

Manager of Esperanza Co., El Oro, Held for Ransom, Then Released

Captured by Pedro Zamora While on Examination in Jalisco — W. A. Gardiner Still Held by Bandit

Charles Hoyle, general manager of Esperanza, Ltd., of El Oro, Mex., his wife, and W. A. Gardiner, mill superintendent for the Esperanza company at El Oro, were reported on Aug. 21 to have been captured in Jalisco several days before by the bandit, Pedro Zamora, and held for ransom. Mr. Hoyle and a party of diamond drillers had gone to Jalisco before the Zamora revolt to inspect some properties there. Late reports had it that the rest of the party escaped.

An Associated Press dispatch, dated Mexico City, Aug. 23, announcing the release of Mr. and Mrs. Hoyle, reads as follows:

"Pedro Zamora has released six of the Americans who were kidnapped recently by him in the State of Jalisco, but is holding one American, W. A. Gardiner, superintendent of the Esperanza Mining Co., for 100,000 pesos ransom, and W. B. Johnson, a British subject, for 50,000 pesos, according to advices received here today.

"Charles Hoyle, manager of the Esperanza Mining Co. at El Oro, said to be a nephew of John Hays Hammond, and Mrs. Hoyle have been released and are now safe at Penas, on Banderas Bay. The names of the other four Americans set free by Zamora are given as Dietrich, Gillis, Culvert and Nels. These four are at Mesa del Corazon."

The Mexican Embassy at Washington admitted on Aug. 14 that a rebellion against the De la Huerta government had started in the State of Jalisco, the leader of the rebels being Pedro Zamora. It was then stated that the president had ordered 7,000 men to be sent to Jalisco under General Enrique Estrada to quell the rebellion.

Northern Light Title Dispute Decided

The case of C. W. Montague against S. P. McDonald and others, involving the title to what is known as the Northern Light mine, 14 miles from Yerington, Nev., has been decided in favor of the defendants by Judge Emmet Walsh, who has had it under advisement since it was tried some months ago. The mine was at one time under bond to the Mason Valley Mines Co. The plaintiff has asked for a new trial and states that he will appeal if it is denied.

Stockmen in southeastern Arizona have found a menace in the abandoned mine openings of the section, asserting that the old tunnels are the natural winter abiding places and summer breeding grounds of the blowfly, now menacing their herds. It is suggested that all such unused mine openings should be closed tightly.

Manganese Ore from Brazil for Birmingham District

Received at Mobile, Ala.—Intended for Tennessee C. I. & R. R. and Southern Manganese Companies

A shipment of 7,000 tons of high-grade manganese ore arrived recently at Mobile, Ala., bound for the Birmingham district. This ore will be used by the Tennessee Coal, Iron & R.R. Co. and the Southern Manganese Corporation. It is to be transferred to barges, which will come up the Warrior River and also to railroad cars. These shipments from Brazil will continue now that transportation facilities up into the district have been established.

The Government is taking steps to erect a big coal storage plant at Mobile, to handle coal shipped down from the Birmingham district on the Warrior River to permit the coaling of ships touching at that port. A portion of the storage plant is to be set aside for the ore that will be imported. With this apparatus in use unloading the ships and loading the ore on railroad cars or on barges for the river traffic, much expense and trouble will be overcome. The Southern Manganese Corporation has a plant at Anniston and is operating steadily, its product being taken by the Tennessee Coal, Iron & R.R. Co. almost exclusively.

To Study Ore and Peat Reserves on Minnesota State Lands

The committee of the Minnesota senate in charge of the state ore lands has established headquarters at Hibbing, Minn., and will spend considerable time investigating the ore and peat reserves on state lands. It is proposed to enact legislation at this year's session placing the remaining unsold state leases on mineral lands on the market. The leases have been off the market for thirteen years and if they are again offered for sale it is probable that the terms of the lease will be changed. One of the most interesting suggestions for the new leases is that royalties be based on a sliding scale. Under this proposal all ore on state lands would be classified as to quality and accessibility and royalties paid accordingly. Shipments from state properties during the last week totaled 204,745 tons of which the Missabe Mountain pit, at Virginia, shipped 94,944 tons.

Bulkeley Wells To Start Dredge at Dayton, Nev., Soon

September 5 is the date set for beginning operations with the big dredge that has been installed in the placer fields near Dayton, Nev., by Bulkeley Wells and associates. It is planned to make it a gala occasion. Mr. Wells and many of his friends will make the journey to watch the dredge start scooping up the gold-bearing gravel, and, of course, the Governor will be there to make a speech. It was at this place that gold was first discovered in Nevada.

Ontario Mining Association Meets in Sudbury

Members Visit International Nickel's Creighton Mine—New High Falls Dam Completed

The Ontario Mining Association, whose membership comprises over 95 per cent of the operating mines of the province, had its first general meeting in Sudbury on Aug. 17 and 18. The members were the guests of the International Nickel Co., who arranged a visit through the Creighton mine, the smelter and the power plant. The Creighton is supposed to be the largest high-grade mine in the world. Ore reserves are between twelve and fifteen million tons, and the ore carries between 5 and 6 per cent combined copper and nickel, in the proportion of two parts nickel to one of copper. At the present time about 3,000 tons per day is being hoisted and passed through the rock house, and 2,500 tons per day are being shipped to the smelter. At the power plant at High Falls, about 25 miles from the town of Copper Cliff and the smelter, a new storage dam is practically completed. This dam, while not quite so high, is longer than the famous Roosevelt dam in the Southwest, and when completed is expected to cost about $3,000,000. It is of the latest type of construction, and when the storage reservoir is filled with water, a lake 25 miles long will be formed.

On the following day a number of the members stayed over to accept the invitation of the British America Nickel Corporation to visit its mine and smelter at Nickelton.

Recent Production Reports

Calumet & Hecla produced 8,312,025 lb. copper in July. Production by subsidiary companies was as follows: Ahmeek, 1,572,838; Allouez, 262,400; C. & H., 4,684,972; Centennial, 34,600; Isle Royale, 775,200; La Salle, 0.; Osceola, 735,900; Superior, 85,800; and White Pine, 160,315.

Wolverine produced 246,343 lb. copper in July, against 327,683 in June. Mohawk's output in July was 698,558 lb. copper, compared with 754,304 in June.

Burma Corporation produced 3,416,000 lb. refined lead and 190,070 oz. silver in July, compared with 4,733,120 lb. refined lead and 265,620 oz. silver in July. The decrease was owing to changes necessitated by putting the mill in operation.

Butte & Superior in July produced 7,914,024 lb. of zinc in concentrates and 159,778 oz. silver, compared with 8,250,000 lb. zinc in concentrates and 160,000 oz. silver in June.

Cie du Boleo, Santa Rosalía, Baja California, produced 781,613 lb. copper in July, compared with 802,474 in June.

Cerro de Pasco produced 3,652,000 lb. copper in July, against 3,994,000 in June.

East Butte produced 1,537,880 lb. copper in July, compared with 1,396,140 in June.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Geological Survey Has Plans for Foreign Minerals Section

Domestic Producers Should Be Informed on Matters of Economic Significance Abroad

Since early in the war, the U. S. Geological Survey has entertained ambitious plans for its section of foreign minerals. During the war, this section did a large amount of work and from its data many economic conclusions with regard to mineral resources were reached. With the passing of the urgent war demand for this data, the difficulties of securing appropriations and personnel have prevented any great amount of work on the part of the foreign minerals section. The work has been kept going, however, and in the near future an important announcement as to the plans of the section is expected.

It is a very generally held belief that the United States has been particularly slow in acquainting itself with the mineral resources of other countries and in keeping abreast with their development. Had the United States been diligent in that regard during the last decade or two, it is pointed out, it would be in a better position now to compete in the world-wide quest for petroleum. At any rate, it is agreed that the mineral industries of this country are entitled to the help that the Government can extend by keeping them carefully informed on matters of economic importance in foreign countries which affect them. While some of the more highly organized companies may be in a position to keep sufficiently well-advised as to the foreign situation to conduct their operations in a most intelligent manner, it is certain that the smaller operators oftentimes do not become aware of important foreign developments having a bearing on their particular activities until losses have resulted. Many of these losses could have been prevented, had the information become available earlier.

Mining Conditions in Bolivia Discussed by Frank L. Hess

The mining industry in Bolivia has expanded to the point where labor supply has become a limiting factor of unusual seriousness. This is the opinion of Frank L. Hess, of the U. S. Geological Survey, who has just returned from an extended profesisonal visit to that tin-producing republic. Owing to the fact that much of Bolivia's mineral production comes from an altitude in excess of 14,000 ft. and very little of it from below 12,000 ft., the labor can be performed only by persons indigenous to those attitudes.

Because of the rigors of atmospheric conditions, the lack of fuel, proper housing and sufficient nourishment, the population on the high plateaus has been diminishing. Mr. Hess believes that the only solution to the problem is for the mining industry to make it possible for the Indians of that region to better their living conditions. The American companies and others of the more progressive mining concerns have been taking good care of their own employees for some years, but he believes that the welfare work must go further than that and include the entire populations of the upper plateaus.

There is promise of reducing the obstacles of lack of transportation and lack of fuel. The development of petroleum on the eastern side of the Andes in Bolivia, which now seems a certainty, will mean a near-by supply of fuel oil. The Guggenheims, in building a motor road from Eucaliptus, on the railroad, to Caracoles, have demonstrated that automobile transportation is possible. Water power is already being used successfully and important expansion is predicted by Mr. Hess.

The tin mining industry has continued its expansion which began with the war demand. A number of new properties are being opened, the district north of La Paz being the most active. The price of silver has given unprecedented stimulus to that industry. The whole of the famous Potosi hill is now being sampled and probably will be the scene of modern development on a very large scale.

The large amount of tungsten mining done during the war has developed beyond all question the value of the extensive tungsten deposits in Bolivia. When Mr. Hess left that country a few weeks ago, none of the tungsten properties was being operated, but he believes that some of them can be operated at present prices. He anticipates that Bolivia will be an important factor in the tungsten situation in the future.

Mr. Hess' geological studies in tin properties while in Bolivia lead him to think that it is becoming clearer and clearer that tin deposition in Bolivia is governed by the same processes as govern deposition of tin at other places, which is quite contrary to the opinion expressed by geologists who made earlier investigations of this problem.

Purchases of silver, under the Pittman Act, during the week ended Aug. 21, totalled 296,000 fine oz. This brings the total purchases under the act to 11,718,638 oz. The only purchases were made in the early days of the week, as it became apparent that the price of silver in the open market was going above $1 an ounce and no further offerings were made.

Tuscaloosa, Ala., Gets New Mine Experiment Station

Will Co-operate With University of Alabama—May Do Ferrous and By-product Work

Tuscaloosa, Ala., has been selected as the site for the U. S. Bureau of Mines experiment station that is to be established in the South. This station will co-operate with the University of Alabama at Tuscaloosa. The nature of the experimental work to be done remains to be decided. It was the intention originally to make this station distinctly a chemical one—that is, to confine its activities largely to the nonmetals. There is such demand, however, for ferrous and byproduct work in the South that it is not improbable that this class of experimentation will be undertaken almost exclusively. It is suggested that as Tuscaloosa is near areas producing graphite, talc, clays and fertilizer materials, these subjects should be taken up at the new station.

The University of Alabama has offered laboratory, office and library facilities and will allow general co-operation in the work on the part of its technical staff. Tuscaloosa is 60 miles southwest of Birmingham.

Other contenders for the station were the University of North Carolina, at Chapel Hill, N. C.; Georgia School of Technology, at Atlanta; University of Tennessee, at Knoxville, and the city of Birmingham. Birmingham already has the office of the Bureau of Mines district engineer and a mine rescue station.

Bureau of Mines Must Have More Money

Otherwise Impossible To Make More Intensive Study of Metal-Mining Methods and Conditions

If the U. S. Bureau of Mines is to meet the increased demand for a more intensive study, from the economic viewpoint, of metal mining methods and conditions, appropriations for that purpose will have to be forthcoming. Officials of the bureau apparently are of the opinion that there can be no important curtailment of the existing program, certainly not enough to provide for substantial additional expenditures for a metal mining program if the total fund available is to remain the same. Roughly, the bureau's appropriation is divided among the following activities: Investigations as to the cause of mine explosions; the prevention of accidents in mines; technologic investigations pertinent to the mining industry; investigation of mineral fuels for the use of the United States; metallurgical investigations; petroleum work; min-

ing experiment work at stations and the operation of mine-rescue cars. The Government fuel yard is self-sustaining.

It is practically certain that the next Congress will be more generous in the matter of appropriations than was the last, so far as the Government's civil activities are concerned. With the pressure that is certain to come from the metal-mining sections of the country, it is regarded as highly probable that Congress will provide for an expansion of the Bureau of Mines' metal mining activities.

War Minerals Relief Awards

Awards recommended by the War Minerals Relief Commission, during the week ended Aug. 14, totalled $6,397.12, were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): Munitions Metals Co., chrome, $496.72, 8 per cent; G. C. Grimmett, chrome and manganese, $1,633.37, 41 per cent; C. G. Hughes, chrome, $1,052.40, 42 per cent; Moyle & Secco, chrome, $631.30, 95 per cent; Puterbaugh & Tuohy, chrome, $6,273.88, 78 per cent; J. S. Shepherd, manganese, $1,331.53, 86 per cent; A. H. Noyes, chrome, $971.80, 27 per cent. In the claim of Puterbaugh & Tuohy, the amount shown includes $280, which has been added to an award already reported during the week ended July 17.

The U. S. Bureau of Mines has agreed to furnish an exhibit at the convention of the American Mining Congress, which will be held this fall in Denver, Colo.

NEWS BY MINING DISTRICTS

MEXICO

Sonora

Las Chispas Property Examined

Las Chispas — Frank M. Manson, president of the Western Ore Purchasing Co., of Reno, Nev., recently inspected mining properties in the State of Sonora. One of the objects of his trip was to look into the desirability of establishing several samplers in Mexico and Arizona, but he took the opportunity to make a thorough examination of the property of the Las Chispas Extension Mining Co. in which he is interested. The mine is located in the Arizpe mining district, Sonora, 140 miles south of the border at Naco, and is the western extension of the Minas Pedrazzini holdings, the veins of which pass through it, according to the report of Frank W. Royer, who made an examination of both properties.

The country rock in which the productive veins of the district are found is a series of lava flows, consisting, in order, of rhyolite breccia, trachyte, another rhyolite breccia called locally "606" breccia, and then other trachytes. From the surface down to about 600 ft. depth the country rock consists of horizontally-bedded rhyolite breccia and tuffs, and it is in this formation that most of the large bonanza orebodies in the Minas Pedrazzini have been found. Immediately below the rhyolites and bedded tuffs is from 300 to 400 ft. of white trachyte. The vein continues through this formation but the orebodies found are, as a rule, not as big as those found in the rhyolite breccia. The vein continues into the "606" breccia and some bodies of ore are found. The lower trachyte has not been opened in any of the workings, so it is impossible to say if the veins continue into this formation.

The San Gotardo tunnel of the Pedrazzini Company opens up the Las Chispas vein at a depth of 600 ft. below the surface for a length of 4,000 ft. along its strike. The vein at this depth runs from the thickness of a knife blade up to 6 and 8 ft. wide.

The orebodies encountered in the Las Chispas vein, as related in Mr. Royer's report, are usually found by following quartz stringers which are scarcely more than seams in the rock; after following for several hundred feet, the vein opens up into an orebody. These stringers frequently contain no values whatever. The orebodies when opened up are from one to 6 and 8 ft. wide, and several hundred feet long, and as high as $3,500,000 is claimed to have been taken from some of the bodies first opened near the surface. The ore consists of quartz containing argentite, and the two antimonial silver sulphides polybasite and stephanite.

There has not been a great deal of development on the ground of the Las Chispas Extension company, but as it is said to have the extension of the Las Chispas vein, from which practically the entire production of the Pedrazzini company has been obtained, and as it is in the same ore-bearing formation, the outlook is thought to be encouraging. For a length of 200 ft. on Extension ground the Las Chispas vein is intersected by numerous cross veins and stringers, and it is expected that as depth is gained there shipping ore will be encountered. The vein was sampled, where exposed, by Mr. Royer and $88 values obtained from a 2-ft. streak and as high as $284 from a 2-in. streak. The samples were of soft, oxidized, leached material.

There is also a large vein, from two to 15 ft. wide, on Extension ground, along a contact of rhyolite breccia and andesite. Two 1-ft. samples from this vein gave returns of $23 and $60.80 per ton and while it probably will not be as productive as the Las Chispas vein, Mr. Royer has recommended its development.

Zacatecas

El Refugio mine, Pinos district, Zacatecas, 15 kilometers from the station of Sotol on the Aguascalientes-San Luis line, and adjoining the Benito Juarez property, is putting up a 50-ton mill and the owners expect to be operating by the end of the year. The district has been quiet for the last seven years on account of the depredation of small groups of bandits.

The Camp Bird (British) interests are doing a large amount of development work at Fresnillo, where they have taken over several large low-grade propositions, which have been idle for years owing to low price of silver and difficulties of handling the ores. A large cyanide plant is in course of construction for working the ores of the district and it is expected to be in operation by Dec. 1.

The old Mina Grande, on the outskirts of Zacatecas, has been taken under option and extensive development work is being done with the intention of erecting a crushing and cyanide plant in the near future. It is also understood that the Mina Grande people propose to build a railway between Salinas and the main line of the old Central railway at or near the city of Zacatecas for the purpose of avoiding the long haul for fuel oil that is at present being pulled from Salinas to Aguascalientes and back to Zacatecas.

The Mexican Mines Development Co. has taken a working option on the Noria property of Walter C. Palmer and has a considerable force of engineers on the ground making examinations. New York capital has also taken options on several less important properties in the same district (Sombrerete) and has its engineers there now making examinations and reports.

CHILE

At Chuquicamata the Chile Copper Co. is installing 35 fuel oil tanks, a new crushing plant, a dust-removal and recovery plant, 48-in. conveyors and feeders, three additional leaching vats and eight more solution sumps. This work is to be completed before next year. The output in June decreased, owing to the failure of the Union Oil Co. of California to deliver fuel oil according to contract. From 50,000 to 80,000 bbl. of fuel oil are used monthly at the company's power station at Tocopilla and 25,000 to 30,000 at Chuquicamata for the smelter and locomotives.

CANADA

British Columbia

Delta Copper To Be Drilled—Consolidated's Emma Mine To Resume

Hazleton—The Delta Copper Co.'s property, on Rocher de Boule Mountain, is to be diamond drilled. Tunneling that was being done has been found too slow and a drill will be installed as soon as possible. If results are satisfactory further tunneling will be done.

J. D. Galloway, resident engineer with headquarters at Hazleton, has been continuing Keystone drilling operations on the placer areas at Harper's Camp. This work was started last year but, for various reasons, could not be finished. An expert crew of men has been engaged by Mr. Galloway and operations have been underway for some weeks.

Trail—Four men were more or less seriously hurt recently in the copper refinery of the Consolidated Mining & Smelting Co. All were burned about the face and one may not recover his sight.

Ore shipments received at the Consolidated smelter during the week ended Aug. 7 are given in the following table:

Mine.	Location.	Gross tons
Canada Copper,	Greenwood	11
Index,	Zwicky	12
Josie,	Rossland	228
Mandy, Le Pas,	Man.	733
North Star,	Kimberley	120
Providence,	Greenwood	42
Velvet,	Velvet	34
Company mines		9,038
Total		10,221

Nelson—The Emma mine of the Consolidated Mining & Smelting Co. will resume operations immediately with 50 men. This property formerly shipped about six cars of ore a week but work ceased last year when production was discontinued at the Rossland mines. Now that the latter have been placed on a shipping basis Emma ore is required as flux. The ore is low-grade gold, silver and copper.

Vancouver—Conditions at Keno Hill, Mayo District, Yukon Territory, where the discovery of rich silver ore has been reported, are described by a miner recently returned from the North, who is quoted as saying:

"Preliminary prospecting has uncovered evidence of as many as nine separate leads of silver-galena shipping ore. The present known depth and length of these are such that shipping ore now in sight will require many years of considerable activity to mine.

"Taken from one of the leads on the plateau of Keno Hill is what the miners call the 'War Baby' silver galena nugget. It is one oblong piece of solid silver galena, similar in shape to a large potato, weight estimated to be 1,200 lb. From the same vein or ledge from which this piece came are four other nuggets or slabs. These are nearly solid silver galena and by comparison the weight of the smallest is easily 800 lb.

"On either side of these slabs and also below and above, the vein is in evidence, with manganese capping, carbonates and footwall.

"Owing to the surface character of some of the leads it has been possible to develop with comparatively little effort to a point where ore can be shipped. In places one man can pick down or mine a quarter of a ton of shipping ore per working day."

It is stated by the same individual that the holdings of the Yukon Silver Lead Mining Co. were located and partially developed before the discovery of the Keno Hill properties. The former are situated on Mount Haldane or Lookout Mountain and are in direct line with Keno Hill and the Silver King, from one pocket of which silver is said to have been taken valued at $500,000. Much development has been done on Lookout Mountain, tunnels and shafts having been driven aggregating 1,200 ft. It is stated that the vein has been followed for 400 ft. perpendicularly, disclosing good shipping ore. Development on such properties as the Silver King, Mount Rambler and others in the section, as well as in the Twelve Mile area, should prove the extent of the area of the silver-lead orebodies in the Yukon.

Ontario

Dome Shareholders Asked to Ratify Purchase of Dome Extension—Conditions at Cobalt Improved

Porcupine—A diamond drill hole put down recently by Hollinger to test geological conditions cut ore at a depth of 2,400 ft. It is understood that an English syndicate has acquired a number of claims lying west of the Hollinger. These are in a sand plain and are covered by about 70 ft. of overburden. About 20,000 ft. of diamond drilling will be done in an effort to locate the contacts and the extension of the Hollinger orebodies.

A special shareholders' meeting of the Dome has been called for Sept. 4 to ratify the purchase of the Dome Extension property by the issue of 76,000 shares of Dome. The purchase has received the unanimous approval of the directors.

The Davidson, which is now closed, is understood to have received sufficient English money, through the sale of stock, to permit the resumption of operations on an extensive scale.

On Sept. 7 a special shareholders meeting of the Vipond will be held for the purpose of ratifying the proposal to sell a block of treasury shares to a syndicate headed by H. B. Wills. The mine will be pumped out and the shaft deepened from the 600 to 900-ft. level.

The supply of labor in the camp, though still below the demand, is increasing. An influx of British miners is anticipated owing to the dullness of the English mining industry, and it is stated that the Hollinger Consolidated has already arranged to take on fifty English mine workers.

Kirkland Lake—The Granby Kirkland has uncovered six veins on the Bain. Telluride is said to have been found in a vein 15 ft. wide.

Boston Creek—The Miller Independence is offering 40,000 shares of treasury stock to present shareholders at $1 per share. Development work latterly has consisted chiefly in cross-cutting and drifting on the 500 level. The main cross cut is in 300 ft., and is believed to be within 70 ft. of the gold telluride deposit opened in an incline.

Gowganda—The mines of this district with the exception of the Miller Lake-O'Brien, the Castle and a few others are inactive, operations having been suspended in the majority of cases owing to the excessive cost of labor and supplies and the drop in the price of silver.

The management of the Big Four mine has decided to employ oil-burning engines to overcome the fuel difficulty. A shaft is down 40 ft. and has cut ore.

Cobalt—In Cobalt, the rising price of silver has caused a more optimistic feeling, and this, together with a better labor supply, is responsible for increased activity throughout the district. A certain amount of foreign labor is coming in and despite the heavy drain of men for the harvesting in the West, the supply for the mines is sufficient.

The Crown Reserve will do 5,000 ft. of diamond drilling to locate the diabase sill definitely.

The Kerr Lake is now treating dump ore in the Dominion Reduction mill and results are understood to be better than had been estimated.

The Peterson Lake has struck three narrow veins in cross cutting on the 200 level. A large orebody is being blocked out.

The Provincial, situated in the Gillies timber limit, has opened up a high-grade vein on the 200 level for 50 ft. Raises show that the vein extends upwards for at least 50 ft.

The July ore shipments over the T. & N. O. Ry. were as follows: Coniagas, 64; Dom. Reduction, 65; Hudson Bay, 30; La Rose, 89; Mining Corporation, 64; McKinley-Darragh, 42; Northern Customs, 48; Nipissing, 447; O'Brien, 97; and Temiskaming, 41; total 988. This was consigned as follows: Deloro S. & R., 763 tons; Coniagas Reduction Co., 33 tons; A. S. & R., Perth Amboy plant, 42; A. S. & R., Pueblo plant 150 tons.

Manitoba

Gold Pan and Pan Extension Form Agreement

Rice Lake—The Gold Pan and Pan Extension Companies have come to an agreement under which the Pan Extension will supply power to the Gold Pan. J. A. Borthwick, superintendent of the Pan Extension, will have charge of both mines, which will both work double shifts. The shaft of the Pan Extension will be put down from its present depth of 115 ft. to the 500-ft. level.

NORWAY

Glomfjord Smelter To Start Zinc Refining on German Shell Cases

Glomfjord—The new hydro-electric plant is ready to furnish 50,000 hp. and the capacity is being increased. The smelter company, which has a capital of 12,000,000 kroner, will start operations next month with zinc refining. The zinc consists of shell cases purchased from Germany, of which the company has several shiploads. The Germans had to revert to zinc for their cases when the supply of copper ran out. Later the smelter will treat zinc ore purchased from Sweden. The company has leased about 50,000 hp. from the state power station, which is ready at any time to furnish it.

It has been decided to operate the Dunderland mines again in about a year's time. A new method of dealing with the ore has been experimentally tried, but high freights and coal prices have necessitated a waiting period before recommencing work. The company has expended 40,000,000 kroner in construction and mining, including the 22-kilometer Dunderland railway. Since the mines closed down in 1908 a number of men have been employed in maintenance and repair work in connection with the buildings and equipment.

MINNESOTA

Cuyuna Range

North Range Iron Co. Leases Onondaga Co.'s Land

Ironton—The North Range Iron Co., controlled by R. M. Adams, has taken a lease of Lots 1, 2 and 5 of Section 4—46—29, from the Onondaga Iron Co., of Duluth, controlled by G. G. Hartley. The property will in turn become part of the Marquette Ore Co.'s operations. The land just leased fronts on Mahnomen Lake, and will be valuable for water supply for hydraulic stripping and for wastage of tailings from the washing plant now being erected at the Maroco mine of the Marquette company. The shaft at the Maroco has reached a depth of 210 ft. The property will be stripped hydraulically.

The Cuyuna-Duluth mine has completed installation of a triplex electric pump on the new 340-ft. level. The operators are planning to use motors for haulage on the new main level.

Crosby—The Croft mine will sink two new shafts for drainage and handling of timber purposes. One shaft, 6 ft. by 9 ft., has been started at a point about 1,000 ft. east of the main shaft.

Mesabi Range

Shipments Increasing from Hibbing District—Thirty-Five Drill Holes on Stubler Project Find Ore

Hibbing—Shipments from this district, although not yet up to capacity, have increased considerably during the last two weeks. The Oliver Iron Mining Co. is shipping from 1,200 to 1,500 cars daily from the Hull-Rust, Morris, Sellers, Kerr, Sweeny, and Philbin mines. Screening is in progress at the Morris and Webb mines and at the latter the screening plant product is also being washed.

Winston-Deare have finished the drag-line excavator work at the Scranton and are tearing the machine down for shipment to the Sagamore pit on the Cuyuna Range where they now have a similar machine in operation.

Buhl—The Great Northern Power Co. is completing a central power-distributing station to serve the Wabigon, Frantz and Thorne properties of the Hanna Ore Mining Co. The Wabigon will be the scene of the first electrical shovel operation on the Mesabi Range and it is expected that stripping will start early this fall.

The forty-fifth hole has been completed at the Stubler exploration project and it is reported that thirty-five of the holes have found ore. It is now proposed to sink a small shaft for the purpose of exploratory drifting.

Mountain Iron—The U. S. Bureau of Mines car is at Brunt mine of the Hanna Ore Mining Co. where it will remain four or five days, later going to Hibbing where it will be stationed at the Leetonia mine.

MICHIGAN

Marquette Range

Cliffs Shaft Change House Burned—Diamond Drilling Standard Property

Republic—Cole & McDonald have two diamond drills working on the old Standard property, but no information has been given out regarding those who are back of the project. Considerable work was done in this vicinity several years back, but no mines of importance were ever opened. Some ore was found, but not in sufficient quantity.

Ishpeming—On August 17 a part of the change house at the Cliffs Shaft mine was destroyed by fire. Many of the several hundred miners who make use of the building lost their underground clothes. The building is to be rebuilt immediately.

Menominee Range

Crystal Falls—The railroad serving the Odgers was tied up recently for a time because of a cave in of the surface at the Bristol mine. The St. Paul road is not using the North Western tracks to the mine and will probably not be able to use them for the remainder of the season. The cave was expected at the Bristol and caused no interruption of mining work.

ALABAMA

Iron Ore and Lands in Demand by Interests Outside Birmingham District

Birmingham—Representatives of interests outside the Birmingham district have been examining certain iron-ore lands in Alabama. Most of the iron land in the state is already under lease to or owned by companies using the output. There are a few independent ore mining companies which have no trouble in selling their output. When the Gulf States Steel Co. gets its deep mining project at the Shannon mines under way, it will be unnecessary for it to look to independent companies for any of its needs. At present the Gulf States company is getting some ore from the Crudup mines near Gadsden. The owners of the Crudup property are said to be not in the least disturbed at the prospect of losing a customer, as there are almost daily inquiries for ore and various propositions for taking over the mines altogether have been heard of lately. The property has been recently appraised, inquiries being made looking to the purchase of the Trussville blast furnace, which would make it necessary to secure ore from the Crudup mines.

Development of brown ore in the vicinity of Russellville, in northwestern Alabama, is being pushed, the Sloss-Sheffield Steel & Iron Co., the Sheffield Coal & Iron Co., the Alabama Fuel & Iron Co. and others being operated steadily in this section. Brown ores in the vicinity of Woodstock, Ala., property of the Republic Iron & Steel Co., are also under development.

Ashland—The new plant of the Dixie Consolidated Graphite Co. is nearing completion. It will have a capacity of 400 tons of ore per day.

ARIZONA

Van Dyke Shaft Bottomed — Jerome Verde Property Closed Down—U.V.X. Commissary for Jerome

Ajo—Two 25-ton Trent cyanide machines have been purchased by A. W. Bramwell, to recover values lost in amalgamating silver-gold ores of a Gunsight property operated by him.

Globe—The Van Dyke Copper Co.'s shaft has been bottomed at 1,692 ft. and levels will be opened at 1,215 and 1,550 ft. The shaft cut ore on the dip at 1,180 ft. which continued for 40 ft.

Tombstone—The Solstice M. & M. Co. has made final payment to L. F. Winters of the purchase price of its local holdings, in which it is claimed that $120,000 worth of ore has been blocked out. Plans are being made for a 50-ton mill, with cyanide equipment and for a hoist and compressor. The ore is said to run $18 a ton.

Bisbee—About three-fourths of the overburden of the Sacramento Hill has now been removed by the steam shovels that have been operating on the hill benches for several years past, and it is expected that the copper-bearing schist will be exposed for mining early in the new year, about the same time that the new concentrator is completed. Although an enormous tonnage of low-grade disseminated schist will be available at Sacramento Hill, more will come to the mill from the Copper Queen stopes, where the ore has already been developed, though passed by as too poor for profitable smelting. The

Sacramento Hill operations will extend up Mule Pass almost into the city of Bisbee and will radically change the face of nature in their locality.

Jerome—Samples taken across the 5-ft. face of the Shea tunnel are reported to average 15.6 per cent copper, 15 oz. silver, 1.04 oz. gold, or a total of $88.30 a ton. The face of the tunnel is in chalcopyrite.

U. V. Extension has bought a lot in Jerome and is expected to build a commissary on it such as the one at Clemenceau.

Joe Cavanaugh and Harold Caldwell, of Jerome, are reported to be preparing to erect a flotation plant on the Blue John property at Walker. They are shipping some ore.

The Jerome Verde property has been closed down indefinitely and the pumps pulled. Lack of funds is given as the reason.

Turkey — The Howard Copper Co. states that it is not affiliated with the Howard Silver Mining Co., in the Black Canyon district, as reported in the issue of July 31.

Poland—Only the ties and rails of the abandoned Poland railroad are to be removed. Under an agreement with Yavapai County the road bed and bridges will be left intact and will be used for making a county road, over which ore may be trucked to the nearest railway shipping point.

Bouse—Plans have been made for development of water power on Bill Williams Fork by R. M. Stene and associates, as an annex to the operations of the Stene Consolidated Copper Co., which has a large acreage of low-grade carbonate ores in the southeastern corner of Mohave County. Plans have been filed with the State Water Commissioner for a dam 144 ft. long, its crest to be 110 ft. above the river bed, and for a concrete conduit leading to irrigable lands situated near Bouse.

Greaterville — The Liberty Silver Mining Co., operating the Saint Louis group, has its main shaft down 200 ft on a vein that shows 3 ft. of silver-leaf ore, with copper coming in on the footwall.

Tucson—S. W. Purcell has bought a fluorspar deposit in the Sierritas from the estate of Gus Holstein.

NEW MEXICO

Co-operative Ships High Grade—Unwatering Silver King Near Central

Lordsburg—The Bonney Consolidated Copper Co. is working about 40 men on outside development work with good results. Several new strikes of high-grade surface ores carrying copper and silver have been made. A strong vein of silver-lead ore opened on the east end of the property will be further developed.

The main shaft of Calumet & Arizona's 85 mine is reported to have reached the 900-ft. level.

The Co-operative mine shipped a car of ore, half of it high grade, to the El Paso smelter on Aug. 12.

The Octo is pushing work on the new drift on the 300-ft. level. Good carbonate copper ore was struck in cutting the station. About thirty men are working. Fred C. Semmek is superintendent.

Silver City—T. C. McSherry and eastern associates have started operations at the Silver King near Central. At present the mine is being unwatered. The property consists of five claims and has been worked occasionally since the 80's. Development consists of a main shaft, 117 ft. deep, and several hundred feet of drifts and cross-cuts.

The Silver Spot mine is continuing to open good ore. No. 2 shaft has been sunk to 73 ft. and the silver-bearing vein has opened to 10 inches.

LOOKING NORTH OVER PLANT OF UNITED VERDE EXTENSION MINING CO., JEROME, ARIZ. DOUGLAS RESIDENCE AT RIGHT

COLORADO

Valley View Concentrator Completed—North Boulder Creek Co. Erecting Mill

San Bernardo—The new 100-ton concentrator of the Valley View Leasing & Mining Co. has been completed and test mill runs are being made for the purpose of adjusting the machinery. Walter L. Reid, of Telluride, is designer of the plant, and Harry Doyle was engineer in charge of construction. The mill will treat ore from the San Bernardo mine. The milling process includes ball mill crushing and oil flotation.

Telluride—Shipments of concentrates from Telluride for July were as follows: Tomboy, 60 cars; Smuggler-Union, 35 cars; total, 95 cars.

Ophir—Development of a lease on the Favorite mine under the direction of Gideon Baril has opened payable shipping ore. A carload has been shipped to the smelter at Durango.

Boulder—Shaft sinking is under way on the Blue Bird mine, of the North Boulder Creek Mines Co. A new mill is under construction. The foundations are completed, and some of the machinery is being installed. The process to be used will require the installation of flotation equipment.

Mayday—Curtet & Moigg, lessees on the Southern Boy, have completed their cross cut, having penetrated the ore-body after eight-months' work. The vein is 1 ft. wide and is said to run in gold.

The Mayday Leasing Co. continues operations on the Mayday dumps. Two cars have been shipped to the Durango smelter. The screenings run $16 to $28.50, with some crude assaying as high as $70 per ton in gold and silver.

The Jumbo continues shipping from the 800-oz. silver vein recently found in the raise. Another raise is being driven to explore the fissure vein and lime stratum at contact.

W. A. Becker, manager of the Little La Plata and Boren Gulch, is having a compressor installed at the latter property. Mine operation will then be resumed.

The cross cut at the Little La Plata property, which has been pushed continuously since last winter, has not proved as beneficial as was expected. Part of the force employed on this has been put to work on the vein at surface, from where lessees have made shipments of ore.

R. E. Hutchinson, of Durango, owner of the Puzzle in La Plata Canon, is to begin work soon on the property. The 700-ft. tunnel will be extended to cut the Southern Boy vein. Hutchinson is owner of the Southern Boy, which is being worked by lessees who are mining some good ore from a small streak.

Work of installing a 12-mile telephone line from Mayday to La Plata has been completed. This line was built by the operators in La Plata Canon, and will be connected with the Cumberland, Allard and Ten Broeck, as well as with the postoffice at La Plata.

MONTANA

Work Stopped at Mt. Washington Mine in Wickes District—Planned To Reopen Comet

Butte—Drifting upon the orebody recently opened by Anaconda at a depth of 3,800 ft. in the Stewart shaft shows a shoot 10 ft. wide averaging 12 per cent copper. Portions of the orebody will run up to 20 per cent. Anaconda has opened an orebody said to be 80 ft. wide in the Nettie mine that carries good milling values in silver, lead, zinc and gold, together with considerable first class ore. The July production of Anaconda was 1,000,000 lb. of copper less than in June. Operations are curtailed over 50 per cent.

Butte & Superior's Black Rock mine in July produced 31,702 tons of ore from which 7,348 tons of concentrates was made, as compared with 34,200 and 7,800 respectively the preceding month. The output of zinc in concentrates was 7,914,024 lb. with the silver yield 159,778 oz. as against 8,250,000 lb. zinc and 160,000 oz. silver in June. Mill recovery in July was 97 per cent. This is somewhat greater (about 3 per cent) than in recent months owing to a general mill cleanup that was made, in the course of which small lots of ore more amenable to treatment were handled.

The North Butte company's Granite Mountain mine in July produced 1,555,079 lb. of copper, 65,324.92 oz. of silver and 98.88 oz. of gold as compared with 1,616,822 lb. copper, 67,534.45 oz. silver and 97.65 oz. gold in June. A feature of development work at present at the Granite Mountain is the driving for the Edith May vein on the 3,600-ft. level to reach points under the 3,400 and the 3,200-ft. levels, where a high-grade showing of ore in substantial tonnage is in evidence.

Shipments from Tuolumne Copper's Main Range mine continue at a rate of from 100 to 150 tons daily. A good tonnage is reported either in sight or indicated. Arrangements are being made with a view of starting to sink the Main Range shaft from the 1,200 to the 2,000-ft. level.

The ore showing on the 2,700-ft. level of the Colorado mine is said to be the best in the property's history as regards the tonnage of high grade indicated. The output is being held down to 200 tons daily with the grade ranging from 7 to 8 per cent copper and 6 to 8 oz. silver.

Sinking of the Plutus shaft has reached a depth of 300 ft., with the 400 level as the objective, at which point crosscutting for the Norwich vein will be started.

Shipments from the Crystal Copper Co.'s Goldsmith mine are continuing regularly with the 600-ft. level showing well.

East Butte plans to resume drifting on a new orebody on the 1,800-ft. level opened several months ago. The flow of water has been so heavy that it has been almost impossible to keep men at work in the face, but the situation is improving.

The Barnes-King Development Co.'s North Moccasin mine in Fergus County produced $1,350 in gold bullion in July and the Shannon, in the Marysville district, produced $24,600. The Piegan-Gloster mine was closed during the month, its operations last year having cost the company about $80,000.

Champion District—Ten cars of ore have been shipped by Butte Jardine from the Champion mine since the company took over the operation of the property. The ore showing in the tunnel level has been disclosed for a distance of 400 ft., with the milling ore as much as 8 ft. wide, and with high-grade ore about 18 in. wide. This is at a depth of 550 ft. The winze from this tunnel is about 20 ft. deep and shows a continuation of the present ore. Milling ore is averaging about 18 oz. of silver and $1.20 gold.

Wickes District—Operations at the Mount Washington property have been suspended, apparently awaiting the construction of a mill. A large tonnage of first class ore has been shipped from the upper levels.

Comet District—The Montana Consolidated is planning to resume operations at the Comet mine, an old time silver producer. The presence of considerable zinc in years past served to prevent profitable treatment.

Schoettner Studios, Butte

PLANT OF TUOLUMNE COPPER CO.'S BUTTE MAIN RANGE MINE, BUTTE

Lump Gulch District—Opening of a high-grade body of silver ore is reported at the Free Coinage mine of the Amalgamated Silver Mines.

Regular shipments of silver ore of good grade are being made by Liverpool Mines, the orebody on the 700-ft. level showing an improvement with drifting.

The ore continues to show well on the 100-ft. level of the Vera Cruz property.

IDAHO

Sandpoint—The Ten of Diamonds and Lone Star claims have been sold by J. W. Lloyd to the Trail Mining Co., of Sandpoint. The property is on Pine Creek in the Priest River district.

Wallace—The Pine Creek R.R. will be extended to the forks of the creek and about four miles up the west fork, by Fred Herrick, of the Milwaukee Lumber Co.

UTAH

Chief Consolidated Finds New Ore Near Plutus Ground—Judge M. & S. Commissary in Operation

Eureka—Low-grade ore with streaks of higher grade has been opened in the Chief Consolidated, promising a new ore zone, as the find, made on the 1,800 level, about 1,200 ft. from the new shaft, is 1,300 ft. to the east of known ore deposits. This new development is of interest in prospecting the Plutus holdings of the company, as the new ore zone, if developed, would make directly through this ground. Accompanying the list dividend checks, paid Aug. 3 and amounting to $88,423, was a statement presaging a possible reduction or omission of the dividend for the coming quarter, owing to the drop in the price of silver, which had left the quarter practically without net earnings. The management expressed itself as expecting to be able to make adjustments such as would bring about a restoration of earnings, but deemed it best to issue the precautionary note.

Shipments from the Tintic district amounted to 150 cars the week ended Aug. 7 as compared with 140 cars the week preceding.

The Griggs-Huish mill has been warmed up, and is reported to have made a good saving on ore from the May Day dumps. Connections are being made with the Yankee workings, so that the mill may be able to handle low-grade ore accumulated here. The Yankee has never before made any attempt to utilize its low-grade ores.

It is reported that some of the freight cars handling ores from the Tintic district may be diverted to the coal fields, which might cause a car shortage for the metal mines. Work is going on as usual at the Eureka Bullion following the brief shut-down for repairs.

At the Bullion Beck seven cars of ore have been shipped since the retimbering of the shaft. More leases have been given. There is considerable ore left in old workings here.

Salt Lake City—The U. S. Geological Survey is making preparations to continue the survey of the mines of the Cottonwood district. This survey, begun last year, will be resumed in American Fork Cañon, also.

Park City—The store of Judge Mining & Smelting Co., furnishing supplies to employees at cost, is now in operation.

The Park-Utah shipped a car of ore the week ended Aug. 7. The company has secured enough miners for one full shift, and as soon as more men are available, will put on two shifts.

Shipments from Park City for the week ended Aug. 7 were 2,328 tons of ore and concentrates as compared with 1,901 tons the week preceding. Shippers were: Judge Mining & Smelting, 721 tons; Judge Mining & Smelting (spelter), 20 tons; Ontario Silver, 540 tons; Silver King Coalition, 524 tons; Daly West, 339 tons; Park-Utah, 64 tons; and Naildriver, 120 tons.

CALIFORNIA

Extension of Walker Orebody Cut by Diamond Drills—Unwatering of Fremont Progressing

Drytown—Dewatering of the Fremont near Drytown is advancing at the rate of 25 ft. daily. It will be possible to resume development soon. The Gover shaft has been put in good shape. The new owners are planning extensive development.

Amador City—The new orebody recently found on the 2,800 level of the Bunker Hill is reported to be developing satisfactorily. The deposit is being opened by drifts and cross cuts and shows much ribbon quartz. The money derived from the new assessment, delinquent August 24, will be used in seeking extensions of the new ledge for development.

Portola—Diamond drilling has opened extensions of the Walker copper lode 2,100 ft. north of the Walker mine. The first drill holes cut the deposit 1,500 ft. north of the Walker group, and a second series of holes tapped the lode 500 ft. farther north. The discovery has stirred much interest throughout the Plumas copper field. In the Walker mine proper the main orebody has been opened to a depth of 300 ft. and shows a width of 18 to 20 ft. on the third level, with the ore sampling 4 per cent copper and $2.20 gold and silver per ton.

Preparations are being completed for extensive operation of the Five Bears, Tri-Metallic, Copper Cliff and Eagle Groups.

The Five Bears claims have passed into the hands of a syndicate of Arizona copper men, and the Tri-Metallic is controlled by San Francisco interests. Nevada capital has acquired the Copper Cliff, and Seattle interests have taken over the Eagle.

The Gruss mill is now in place and when oil is obtained the new plant will be put in commission. Large reserves of excellent ore are awaiting treatment at the present time.

Prospecting of the Poor Boy with drills is proceeding preliminary to driving a 3,000-foot tunnel. The present work is designed to establish the depth of the bedrock and probable dimensions of the channel.

Keeler—A drift has been advanced 75 ft. in an oreshoot at 100-ft. depth in a winze from the Morning Glory tunnel of the Estelle Mining Co., whose property adjoins the Cerro Gordo mine. A raise has been put up 25 ft., at which point the ore is 15 ft. wide. This new oreshoot, which is from 9 to 16 feet in width, shows higher lead values than other shoots, the ore averaging about $45 per ton in gold, silver and lead. It also carries some copper, bismuth and antimony. Shipment is by means of a tramway, 7,000 ft. long, to the Cerro Gordo road and thence by trucks four miles to Keeler. It is planned to ship about 20 tons per day but truck trouble has been experienced, which is apt to delay the program.

NEVADA

Rochester Silver's Report Out—Holmquist Mine Near Ely Shipping Manganese Ore

Rochester—The Rochester Silver Corporation has just released the report signed by F. M. Manson, chairman of the executive committee, and C. D. Kaeding, consulting engineer, for the period from January 1, to June 30, 1920, together with a statement of earnings, and an outline of conditions existing at this date. The report shows a profit of $151,614.77 for the six months but attention is called to conditions which will preclude the probability of making equal profits during the current six months—among them being the drop in silver and the cessation of milling operations owing to lack of power.

In all 26,570 tons was milled averaging 12.91 oz. silver and 0.153 oz. gold per ton. The bullion recovery per ton milled was $14.94. Ninety-two per cent of the gold and 81.3 per cent of the silver were recovered. The value of the bullion sold was $396,955.76. Five and four-tenths tons of ore was milled per foot of development.

The total operating expenses were at the rate of $9.23 per ton, of which $2.45 is charged to stoping, $1.80 to development, and $2.81 to milling and refining. Of the net operating profit of $151,614.77 there was credited to depletion and depreciation reserve $36,145.01 and $115,469.76 as net surplus to balance sheet.

Mr. Kaeding calls attention to the unusually large amount of development for a mine producing only 150 tons daily—the footage being 4,871—but adds that "the results of this work have not been nearly so favorable as during the last quarter of 1919." He estimates that there is not more than six months' reserve of ore in the mine, much that was considered ore when silver was selling at $1.25 or better being now below pay.

The balance sheet shows an excess of current assets over current liabilities of $269,991.19—most of which is in the form of cash, bullion or working for mines and mill.

Goldfield—The Deep Mines Co. has started a small force at work preliminary to sinking an old shaft on the southern end of the Combination claim, east of the Atlanta ground. The present shaft has two compartments and is down nearly 600 ft. It is planned to enlarge to four compartments and [illegible] to the 3,000 level.

Spruce Monarch—From 70 to 100 tons of ore is now going out from the Spruce Monarch mine daily, some going to Tobar on the Western Pacific and some to Currie on the Nevada Northern, but all going to Utah smelters. One caterpillar, hauling from 25 to 30 tons of ore, is said to make the round trip to Tobar every 24 hours.

Sulphur—A. J. Crowley, former superintendent of the Nevada Sulphur Mining Co., has interested the Red

River Lumber Co. in the property and it has advanced $50,000 for necessary additional machinery and improvements. He will put in an electric lighting plant, and has ordered a Chicago Pneumatic compressor, Cochise drills, ore cars, and other equipment from the Western Machinery & Engineering Co., of Reno. The Red River is one of the largest lumber companies and is owned by Walker Brothers, of Minneapolis.

Reno—Work will begin at once on a 1½-mile transmission line to the Black Panther mine, three miles north of Reno. It is planned to put in an electric hoist and pump. The shaft is down 190 ft. and shows some good copper ore. Al Marsal is manager.

The mill of the Standard Metals, 12 miles north of Reno, is shut down and only development work is being carried on at the mine.

Ely—A report issued from the office of the White Pine County assessor shows that the gross yield from the mines of White Pine County for the quarter ended July 31 amounted to 794,030 tons of ore of a total value of $2,663,576.22.

Three hundred tons of manganese ore per month is to be shipped to Chicago from the Holmquist mine near Ely, under a contract recently entered into by Schultz, Clark & Hamilton, lessees. The first shipment went forward recently.

Death Valley—The Standard Oil Co. has purchased a deposit of sandstone in Death Valley, north of the deposits owned by the Associated Oil Co. according to John T. Overbury who is interested in that section.

Carlin—The Tri-O-Lite Products Co. expects to start the mill soon that was recently completed for handling the kieselguhr deposits near Carlin.

Schellbourne—Two trucks have been hauling ore from the old Siegel mines at Schellbourne, in Spring Valley, in eastern Nevada, but bad roads resulting from recent storms have delayed shipments.

Mina—Milling ore and what is believed to be the downward extension of the hanging-wall orebody developed on the 4th, 5th and 6th levels of the Simon Silver-Lead mine has been struck in a raise 50 ft. above the 7th level. It has been driven on for a width of 17 ft. with no wall in sight. Assays show it to be of better grade than the average milling ore on the upper levels. Crosscutting has been started to the northwest in which direction the orebody pitches and it is expected that it will be cut within 40 ft. Surveying for the mill site is under way and grading will begin in the near future. An initial unit of 100-125 tons capacity will be built. Lloyd C. White, of Burch, Hershey & White, San Francisco, is designing the mill.

New Pass—The mill on the gold property at New Pass, 25 miles across the Reese River valley from Austin, is being dismantled by W. C. Pitt, controlling owner. The quantity and grade of ore were insufficient.

Boyd Siding—I. R. Landis, of Los Angeles, has purchased some kaolin claims near Boyd Siding, on the Salt Lake Railroad, from N. E. Williams and T. J. Parker. The price is said to have been $30,000, with $5,000 paid down. Landis is said to have contracted to sell the output to the Empire China Co., Los Angeles. The deal was made on the report of John C. Charles, of Hollywood, Cal.

Jackrabbit District—The Bay State Mining & Leasing Co. is shipping high-grade silver, lead and copper ore from the Ida May property in this district. Arthur Murphy is president and manager.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Rakowsky Sinking on Blue Bird Lease —Anna Beaver Using First Surface "Hopper" at Tar River

Webb City, Mo.—The Webb City & Carterville Development Co. reports finding lead in two drill holes put down on "Sucker Flats," southeast of Webb City, and will sink a shaft on the lease at once.

Baxter Springs, Kan.—Miller & Holcomb are driving a drift on the 102-ft. level of the Lucky Joe property at Sunnyside to a drill hole put down some time ago. A Cornish lift pump is handling the water. The mill at this mine was sold to the Wolverine Co. some months ago and has been moved to the Portis land, west of Quapaw, where it has been re-erected and is now in operation. I. M. Holcomb, manager of M. & H. Co., plans to erect a small custom mill at old Lucky Joe site.

George Meese, of Joplin, is preparing to sink a shaft on the Ebbenstein land, a short distance west of the Chanute property.

Victor Rakowsky and associates are putting down a shaft on what is to be known as the Blue Bird lease, immediately north of the Chanute.

Tar River, Okla.—The Anna Beaver Mining Co. is successfully handling ore from its No. 3 mine by a surface railroad and a surface hopper at No. 2 mill. This is the first surface hopper in the field. About 75 tons of ore is being hoisted per hour and more could be handled by the new equipment if the hoisting capacity were greater. The output of the mine is now largely lead, owing to the uncovering of rich lead-bearing ground at No. 1 mine.

WASHINGTON

Valley—The American Minerals Production Co. is shipping 6,000 tons of crude magnesite a month, according to H. F. Wierum, general manager. "The company has a kiln designed for making a superior calcined product for flooring and use in the stucco trades," said Mr. Weirum. "It was designed after about $20,000 had been expended in determining how to design it. About 80 per cent of the construction on the plant has been completed. The remainder awaits the receipt of machinery ordered in the East and shipped in May. This machine will produce a calcined product that will make stucco for floors superior to any produced."

CHRONOLOGY OF MINING JULY, 1920

July 1.—Experiment station of U. S. Bureau of Mines, forced to move from Golden, Col., by action of Colorado School of Mines, relocated at Reno, Nev.—British Columbia's Placer Mining Act amendments went into effect.—Federal Mining & Smelting Co., Wallace, Idaho, insured lives of employees for benefit of their dependents.

July 4.—Drilling contest at Idaho Springs, Col.

July 6.—Minerals Separation, Ltd., hearings resumed in San Francisco, Cal., continued to July 10.

July 9.—Metals Extraction Corporation's baghouse at Joplin, Mo., damaged by fire.

July 10.—Northern Minnesota Ore Co. closed down Northland mine and pulled pumps.—Ferro mine buildings and equipment near Trommald, Minn., sold by sheriff.

July 13.—Minerals Separation, Ltd.'s, petition to hold Miami Copper Co. in contempt dismissed by Judge Morris, U. S. District Court, Wilmington, Del. —Minerals Separation, Ltd., hearings adjourned from San Francisco, resumed at Salt Lake City, Utah.

July 14.—United Verde Copper Co.'s old coke bins and quantity of fuel oil burned.

July 15.—Philippine Islands Mint at Manila began operations.

July 18.—Central Eureka shaft at Sutter Creek, Cal., completed.—Lightning and fire destroyed Omaha Mining Co.'s compressor building at Wallace, Idaho.

July 19.—Northwest Magnesite Co. dividends to amount of $500,000 involved in suit brought by R. S. Talbot, Spokane, Wash., against William H. Crocker, San Francisco, Cal.

July 20.—International Mining Convention held for third time at Nelson, B. C.—Safety-first contest started in Butte, Mont., district, to end Aug. 21. —Mexican decree concerning delinquent mining taxes published in Diario Oficial.

July 23.—American Mining Congress' Utah Chapter discussed with H. N. Lawrie plan for premium of $10 per ounce on newly mined gold.

July 26—New York State purchased 2.25 gm. of radium for use of state research at Buffalo, N. Y.

July 27.—Striking mine and oil workers of Mexico return to work in large numbers at request of President. —American Smelting & Refining Co.'s sampling mill No. 4 at Murray, Utah, burned down.—Vipond-North-Thompson (Porcupine, Ont.) shareholders ratified sale of 600,000 shares to an English syndicate.

THE MARKET REPORT

Daily Prices of Metals in New York

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
19	18.25@18.35	43.25	47.00@47.75	8.75@9.00	8.85	7.90@7.95
20	18.25	43.00@43.50	46.75@47.25	8.50@9.00	8.75	7.95@8.00
21	18.10@18.25	43.00@43.50	46.75@47.25	8.50@9.00	8.75	8.00@8.05
23	18.10@18.25	42.50@43.50	46.50@46.75	8.25@9.00	8.50@8.75	8.00@8.05
24	18.10@18.25	41.75@42.75	45.50@45.75	8.25@9.00	8.50@8.75	7.95@8.00
25	18.10@18.25	41.75@42.75	45.50@45.75	8.25@9.00	8.50@8.75	7.95@8.00

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered" which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction is made from the "delivered" price. At present the average cost of delivery from New York refineries is 0.15c. per lb., and that deduction is made to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a diacount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
19	93½	95	111	275¼	282	35½	36	41	42½
20	93½	95¼	111	270	278	35¾	36⅛	41⅛	42⅜
21	....	....	....	....	....	....	....	....	....
23	94	95½	111	267½	274	35⅞	36½	40¾	42½
24	94½	95⅝	111	262¼	269½	35⅞	36¼	40¼	41¾
25	94¼	95¾	111	262½	269½	35¾	36	40	41½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver			Aug.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
19	360	99½	98½	61	23	358	99½	97¼	60⅞
20	358½	101⅜	101⅜	63⅜	24	354	99½	96	60⅞
21	359	101⅜	101⅜	63⅜	25	354½	99½	97	61

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Aug. 25, 1920

Conditions show little change from last week. In general, buying is on a small scale, and only the immediate requirements of consumers are apparently being provided for. Potential buyers consider that, with the general price decline and tight money conditions, purchases can well be postponed. It is extremely unlikely, however, that the price of any of the major metals will experience any drop of consequence during the next few months. The big depressing influence just now is the London market.

Transportation conditions are generally satisfactory, and movements to and from the Eastern refineries are approaching normal. Transatlantic freight rates are weaker.

Copper

The stagnation has continued during the last week, with selling confined to small lots of spot metal by second-hands who were forced to unload at 18¼c. delivered. Some of the smaller producers were asking 18½@18¾c. and the larger producers 18¾c. The latter, however, did no business except in special shapes, such as billets, which could not be procured elsewhere. Prices for forward delivery are purely nominal.

Lead

Importations from Europe have gone far to satisfy the demand for prompt lead due to increased consumption and decreased domestic production. About 6,000 to 8,000 tons have been purchased abroad so far this month. Those who have imported direct have been able to secure metal for September delivery at about 8¼c., duty paid, New York, or even less, but when bought through dealers here 8½@8¾c. has been asked. Surprise has been shown that the price of lead in London has not advanced. Available stocks seem to be larger than supposed and Spanish lead is being received in England which formerly went to France. Very heavy offers, fifteen to eighteen thousand tons, have been made in this market of antimonial lead, as used for shrapnel bullets, at as low as 6¼c. duty paid. This contains 9 to 12 per cent of antimony and is suitable for certain purposes, such as type metal. Forward lead is quoted at 8@8¼c. New York and St. Louis, depending upon time of delivery.

Zinc

The large producers got ahead of the market during the last week and quoted 8.20@8.25c. but were unable to make sales, for all of the smaller interests were busy unloading at close to 8c. Yesterday a new factor entered the market in the shape of European offers of American and other zinc at slightly under 8c., duty paid, New York. Two lots of 500 tons each are reported taken. It is difficult to see how importation of this zinc can pay under current conditions, for it is unlikely that it can be proved not to be dutiable. Its effect may be more sentimental than direct, but the fact remains that it has temporarily killed the domestic market, just when producers were beginning to feel more cheerful. The statistical position of domestic zinc continues strong, and slight premiums are being asked for forward delivery.

Tin

The dearth of interest in tin continues. The London price governs the New York market and the price there has dropped continuously during the last week. Former large consumers are buying only from hand to mouth.

Straits tin for future delivery: Aug. 19th, 47.50@48.00c.; 20th, 47.00@47.50c.; 21st, 47.00@47.25c.; 23d, 46.50@47.00c.; 24th, 45.50@46.00; 25th, 45.75@46.00c.

Arrivals of tin in long tons: Aug. 17th, London, 20; 19th, Straits, 40; 20th, Liverpool, 95; Singapore, 100; 21st,

China, 400; Liverpool, 35; Straits, 975: 24th, London, 25.

Silver

The silver market last week continued strong, with advancing tendency on buying for China account, with China banks paying prices in New York which were higher than the equivalent of the London quotation. On Aug. 20 and 21, however, the London market jumped to 63¾d., which made the London bid price about 2c. higher than the U. S. Treasury price for silver under the Pittman Act. This sharp advance brought out large offerings of silver, both "Domestic" and "Foreign," which were thrown on the London market, with the result that buyers were satisfied and a sharp reaction occurred on Aug. 23 to 60⅞d. Since the culmination of this advance the market has been quiet, with small business, but the closing tendency appears to be firmer on improvement of both London and Far Eastern exchanges.

Mexican Dollars—Aug. 19th, 75; 20th, 76⅛; 21st, 76⅛; 23d, 74¼; 24th, 73⅜; 25th, 74¼.

Gold

Gold in London on Aug 19th, 114s. 7d.; 20th, 115s.; 23d, 115s. 3d.; 24th, 115s. 6d.; 25th, 116s.

Foreign Exchange

Weakness, due to conditions mentioned before, continues. Yesterday francs were 6.84c.; lire, 4.55c.; and marks, 1.94c. New York funds in Montreal, 13⅛ per cent premium.

Other Metals

Aluminum — Ingot, 99 per cent and purer, 35.1c.; 98@99 per cent, 34.9c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Market continues weak. Spot, 7c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7c. W. C. C. brand, 9@9½c. [1]Chinese needle antimony, lump, firm at 8@9c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum** Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100@$110 per oz.

Platinum — Firm at $115@$120 per oz. $105 per oz. in 100 oz. lots.

Quicksilver — Market quiet; $83 per 75-lb. flask. San Francisco wires $81. Dull.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black, powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. The movement of ore to inland furnaces is not satisfactory.

Manganese Ore — 70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum ore—85 per cent MoS_2, 75@85c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

[1] Furnished by **Foote Mineral Co.**, Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 21.—Zinc blende, per ton, high, $51.40; basis 60 per cent zinc, premium, $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50. calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $46.25; calamine, $38.20; all zinc ores, $46.

Lead, high, $107.50; basis 80 per cent lead, $100@$110; average settling price, all grades of lead, $102.40 per ton.

Shipments for the week: Blende, 10,543; calamine, 195; lead, 1,355 tons. Value, all ores the week, $633,710.

The receipt of a larger number of cars this week afforded slight relief to the transportation shortage.

Platteville, Wis., Aug. 21.—Blende, basis 60 per cent zinc, $51@$53 per ton for high-grade. Lead ore, basis 80 per cent lead, $105 per ton. Shipments for the week: Blende, 1,146; lead, 33 tons. Shipments for the year: Blende, 45,770; calamine, 2,330; lead, 3,840; sulphur ore, 1,209 tons. Shipped during the week to separating plants, 1,685 tons blende.

Non-Metallic Minerals

Asbestos — Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots. Market very strong, owing to heavy demand and a production that is 25 per cent below normal. Higher prices for all grades of material are expected soon.

Barytes — Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $22@$25 in bags, carload lots; (off-color) $18@$20 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground,

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $25@$30 car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9¼c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. The last price quoted for plaster of paris in carload lots was $4.25 per 250-lb. bbl., alongside dock, New York; but a new price, not yet made public, went into effect on Aug. 26.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 17½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76@80 per cent, prompt delivery, $200@$210, freight allowed; last half, $200@$220; English, $190@$200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75@$80, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35-50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30-40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22½@23c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ½ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $145 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$90@$100 per net ton, carload lots, eastern shipping points.

Chrome Cement—45 to 50 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $50@$55 per thousand, Pennsylvania, Ohio, and Kentucky works; second quality, $45@$50. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$100@$110 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—9-in. per 1,000, $51@$55, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $55, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 24, 1920

With a dull market in the iron and steel trade generally, an advance of $4 a ton in the quotation price of foundry pig iron at Valley furnaces, to a $50 level, stands out as spectacular, and the advance is none the less interesting through its being based upon relatively light transactions.

Pig Iron.—Sales of foundry iron totaling probably between 5,000 and 10,000 tons have been made at $50, Valley, chiefly for early deliveries, but in a few instances for shipment during the remainder of the year, and the market is thus established at a $4 advance. Bessemer and basic are reported to have sold at $50 or thereabouts, but transactions have been too light to establish a new basis definitely, and the market is quotable as follows: Bessemer, nominal, $47; basic, nominal, $46.50; foundry, $50, f.o.b. Valley furnaces, existing freight to Pittsburgh being $1.40, to advance this week by 10 per cent. Most pig-iron buyers are disposed to avoid the market, doubting whether present prices are justified.

Steel.—Several sales of sheet bars have been made at $67.50, Pittsburgh, and some buyers now in the market express confidence that they will be able to do $65. The market is quotable at $67.50@$70 for sheet bars, with billets at $60@$65, and quite inactive.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

The Importance of European Copper Purchases

Copper Industry Would Be Relieved of Its Difficulties If Export Trade Increased — Other Nations Must Replace Germany's Important Position Before Pre-War Scale of Buying Is Assured—Electrical Developments Portend Important Copper Purchases

THE copper industry is waiting for the important export trade which it possessed in the years before the war, to assist it out of its present difficulties. Some measure of relief from the unfortunate condition of the copper industry was afforded through export business during the last half year, and domestic business also helped magnificently. The great obstacle to dependence upon foreign copper orders is not only the important financial disabilities that must be overcome, but the uncertainty attached to European and Asiatic requirements and to the ability of foreign countries to use more copper than that required for their own needs. The assumption that Europe is generally bare of copper stocks, or nearly so, may be true, but there are undoubtedly large stocks of scrap metal and second-hand material left over from the war which are ready to be consumed in peace-time use.

Aside from the question of scrap copper, the record of the various European nations as importers of American copper is highly significant. Roughly, over half of all the refined copper produced in the United States was shipped abroad in the five years before the war. At the same time the annual domestic consumption of copper was a little under 50 per cent of production. Practically all of the copper exported was shipped to Europe, Canada being the only other consumer of note, but only to a relatively small extent, taking about 3,000,000 lb. of refined copper monthly. England, France, Germany, The Netherlands, and Italy were the important destinations for exported copper, and all combined to sustain a brisk and exceedingly important export trade. The accompanying table gives a record of the quantities of copper consumed by these countries during the last ten years.

The most important customers from 1910 to 1914 were Germany and The Netherlands, both together accounting for over half the exports of copper from the United States. However, it is now generally understood that the heavy purchases of The Netherlands and also some other European countries were principally for the German market. Thus, to obtain the true significance of German copper importations, the copper imports of The Netherlands, Belgium, and Denmark should be added to those of Germany. Proceeding a logical step farther, and including the buying of Austria-Hungary (35,000,000 lb. annually), the foreign copper consumption by the Central Powers is much more than that of all other countries combined. Enormous quantities of copper were required by these countries. A warrantable estimate would be 500,000,000 to 550,000,000 lb. annually. This great buying power is now withdrawn from the market, except for driblets of copper that occasionally find their way to the former enemy countries. Nor is there immediate prospect of a resumption of this trade. The German price of United States copper at 9 to 10 marks per pound is prohibitive. Furthermore, financial and industrial conditions in Germany are in no condition to warrant hope that the nation will soon resume the development and expansion of her electrical industries on a scale approaching that prevailing before the war.

If Germany is unable to occupy her former important position in the copper market, are any other countries likely to supplant her? The indications point to just such a state of affairs at this time. The United States is consuming copper at an unprecedented peace-time scale, and although a good portion of this consumption is answering the call of construction curtailed during the war, much of it is being used in the electrical and other manufacturing trades for export purposes. The United States undoubtedly has a splendid opportunity to capture export fields formerly monopolized by other powers, and the copper industry will readily reflect the measure of success coming from such an attempt.

The demand for copper by the European nations was originally predicated upon their being compelled to replace the copper lost through the devastation of the war—not upon the ability of these nations to export copper manufactures, which is a subordinate consideration and an opportunity thrust upon them by the results of the war. The financial difficulties which must be overcome, and which were thought to have been surmounted by the plans of the Copper Export Association, are evidently still of serious moment, for consistent buying from France and Europe in general has not been manifested. Foreign support from unusual quarters—from Japan and Scandinavia—was a feature of the market in the last eighteen months. Japan had never figured prominently in export trade, but consumed large quantities of copper in 1919 and 1920 in anticipation of satisfying Asiatic requirements for copper and copper manufactures, thereby replacing Germany in a field which that country formerly tried to monopolize. The financial crash in Japan, and its attendant results, have put a temporary brake on such Japanese plans for expansion. Incidentally, there is little reason why American manufacturers cannot become strong contenders for Asiatic markets for copper and copper goods.

Another element in foreign copper purchases is the fact that industry and commerce are adopting electricity in an effort to conserve fuel. The acute coal shortage in Europe —and in the United States—is forcing nations to resort to "white coal," the fuel of the future. France, Italy and Switzerland have outlined extensive programs for hydro-electric development which if consummated should use large quantities of copper.

The world is turning more and more to oil and electricity for a solution of its fuel problems, and of these two, electricity will become of continually greater importance. Hydro-electric projects all over the world should draw increasing amounts of copper from the United States. But everything depends upon Europe obtaining the financial assistance which it needs before it is in a position to purchase much copper. An official of an important copper-producing company aptly summed up the situation a few days ago to this effect: "Foreign exchange rates are seriously hampering these countries in their efforts at reconstruction, so that their purchases of raw materials, such as copper, of which they are vitally in need, will be delayed until such time as they can more advantageously fill their requirements."

EXPORTS OF METALLIC COPPER FROM THE UNITED STATES IN POUNDS

				(A) Exports in Per Cent of United States Production.									
Year	To England	(A)	To France	(A)	To Germany	(A)	To Netherlands	(A)	To Italy	(A)	Total Exports	(A)
1910	98,000,000	6.8	116,000,000	8 1	176,000,000	12 2	222,000,000	15 5	34,000,000	2 4	708,000,000	49.8
1911	108,000,000	7 5	135,000,000	9 4	190,000,000	13 3	231,000,000	16 0	38,000,000	2 7	787,000,000	55.0
1912	95,000,000	6 1	131,000,000	8 4	252,000,000	16 2	153,000,000	9 7	47,000,000	3 0	775,000,000	49 5
1913	34,000,000	2 1	160,000,000	9.9	307,000,000	19 0	179,000,000	11 1	41,000,000	2 6	926,000,000	52.4
1914	198,000,000	12 9	150,000,000	9.8	177,000,000	11.5	126,000,000	8 2	67,000,000	4 4	840,000,000	54.8
1915	201,000,000	12 3	236,000,000	14 5	.....	....	4,000,000	2	107,000,000	6 6	682,000,000	41.8
1916	173,000,000	7.7	318,000,000	14 1	.....	....	.....		98,000,000	4 3	784,000,000	34.8
1917	373,000,000	15 3	366,000,000	15 1	.....	....	.....		153,000,000	6 3	1,126,000,000	46.5
1918	252,000,000	10 4	265,000,000	10.9	.....	....	.....		122,000,000	5 0	744,000,000	30.7
1919	106,000,000	5.9	89,000,000	5.1	.....	....	.....		65,000,000	3 7	516,000,000	29.3

In pre-war years Austria-Hungary imported about 35,000,000 lb. United States copper, and Belgium 7,000,000 lb., annually.

COMPANY REPORTS

Second Quarter of 1920

Utah Copper Co.

Copper; Utah

A comparative production statement of the Utah Copper Co. follows:

Second Quarter 1920	Lb.	First Quarter 1920	Lb.
April	9,313,227	January	9,151,144
May	9,829,781	February	9,211,806
June	9,554,119	March	8,894,596
Totals	28,697,127		27,257,546
Average monthly production	9,565,709		9,085,849

In addition to the above, 307,254 lb. of copper was contained in precipitates from the leaching plant.

The average cost per pound of net copper produced, including plant depreciation and all fixed and general charges, but excluding Federal taxes, and without credit for gold and silver or miscellaneous income, was 13.697c., as compared with 13.202c. for the previous quarter, calculated in the same way. The value of the gold and silver in the concentrates totaled $235,544.54, and the miscellaneous income amounted to $300,767.25. These items combined are equal to 1.929c. per net lb. of copper produced.

Financial results compare as follows:

	Second Quarter 1920	First Quarter 1920
Net profit from copper production only	$1,254,033.15	$2,291,012.91
Miscellaneous income, including payment for precious metals	536,311.79	329,451.95
Income from Nevada Consolidated Copper Co.	250,125.00	250,125.00
Income from Bingham & Garfield Railway Co.	200,000.00	.....
Total net profit	$2,240,469.94	$2,870,589.86
Disbursements to stockholders	2,436,735.00	2,436,735.00
Net surplus for the first quarter		$ 433,854.86
Net deficit for the second quarter	$ 196,265.06	

The earnings for the second quarter are computed on the basis of 18.209c. for copper, as against 21.994c. for the previous quarter. The regular quarterly disbursement of $1.50 per share was paid on June 30.

Nevada Consolidated Copper Co.

Copper; Nevada

Nevada Consolidated Copper Co.'s production compares:

Second Quarter 1920	Lb.	First Quarter 1920	Lb.
April	4,061,237	January	3,687,098
May	4,351,712	February	3,700,106
June	4,650,718	March	3,751,021
Totals	13,063,667		11,138,225
Average monthly production	4,354,556		3,712,742

The cost of production of copper for the quarter, including the fixed charges to cover depreciation of plant and equipment and all administrative and general overhead expenses, and after crediting miscellaneous income, was 15.56c. per lb., as compared with a cost of 20.72c. per lb. for the preceding quarter.

Financial results compare as follows:

	Second Quarter 1920	First Quarter 1920
Operating profit	$17,276.49	$132,529.28
Miscellaneous income, including that from Nevada Northern Railway Co. and payment for precious metals	336,723.69	83,053.86
Net gain	$384,000.18	$215,583.14
Distributions to stockholders	499,864.25	499,864.25
Net deficit	$115,864.07	$284,281.11

The operating earnings for the quarter are based upon an average carrying price of 18.50c. per lb. of copper produced, as compared with an average basing price of 22.66c. per lb. for the quarter ending March 31, 1920. A quarterly distribution of 25c. per share was made on June 30.

Chino Copper Co.

Copper; New Mexico

Chino Copper Co.'s production compares as follows:

Second Quarter 1920	Lb.	First Quarter 1920	Lb.
April	3,750,975	January	3,081,937
May	3,916,684	February	3,129,776
June	4,282,956	March	4,409,563
Totals	11,980,615		10,621,276
Average monthly production	3,993,538		3,540,425

In addition to the copper derived from the concentrating ores, a total of 8,836 lb. of copper was contained in ores sent direct to the smelter.

The cost per pound of net copper produced during the second quarter of 1920, including plant depreciation and all other items except charges for Federal taxes, but without credit for precious metals and miscellaneous income, was 15.90c., compared with 14.62c. for the first quarter of 1920. The value of gold and silver and miscellaneous earnings was $70,120.39, or 0.61c. per lb. of net copper produced.

Financial results compare as follows:

	Second Quarter 1920	First Quarter 1920
Net income from copper production only	$260,031.67	$737,605.40
Miscellaneous income, including payments for precious metals	70,120.39	72,121.75
Totals	$330,152.06	$809,727.15
Distribution to stockholders	326,242.50	326,242.50
Surplus after distribution to stockholders	$ 3,909.56	$483,484.65

The earnings for the second quarter of 1920 are based on a price for copper of 18.175c. per lb., compared with 21.88c. for the first quarter of the year. A quarterly distribution to stockholders amounting to 37½c. per share was paid.

Ray Consolidated Copper Co.

Copper; Arizona

Ray Consolidated Copper Co.'s production compares:

Second Quarter 1920	Lb.	First Quarter 1920	Lb.
April	4,153,305	January	3,891,710
May	4,211,886	February	3,781,044
June	4,515,414	March	3,872,349
Totals	12,880,605		11,547,103
Average monthly production	4,293,535		3,849,034

In addition to the copper derived from concentrating ores, a total of 84,991 lb. of copper was contained in ores sent direct to the smelter. The average cost per pound of all net copper produced for the quarter was 15.688c. This does not take into account any credit for the gold and silver or for miscellaneous income, and compares with a cost of 16.745c. for the previous quarter. These costs include a charge of 15c. per ton of ore treated, for the retirement of mine development expense, but are exclusive of estimate of Federal income and profit taxes. Miscellaneous income for the quarter, including net income from gold and silver produced, amounted to 0.347c. per lb.

Financial results compare as follows:

	Second Quarter 1920	First Quarter 1920
Operating profit	$343,650.73	$587,146.50
Miscellaneous income	43,604.72	50,134.59
Totals	$387,255.45	$637,281.09
Disbursement to stockholders	394,294.75	394,294.75
Net surplus for the quarter	$ 7,039.30*	$243,000.34

*Deficit.

The average carrying price of copper for the quarter was 18.426c., as compared with 21.960c. for the previous quarter. A quarterly distribution to stockholders of 25c. per share was paid June 30, 1920, and amounted to $394,294.75.

MINING STOCKS

Week Ended August 21, 1920

Stock	Exch	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	*50	*50	*50	
Ahmeek	Boston	...	...	58	June '20, Q .50
Alaska-B.C.	N. Y. Curb	1	1	1	
Allouez	Boston	21	21	21	Mar. '19, ... 1.00
Anaconda	N. Y.	52⅛	50⅞	52⅛	Aug. '20, Q 1.00
Ariz. Com'l	Boston	9⅛	9	9	Oct. '18 .50
Big Ledge	N. Y. Curb	1/32	1/32	1/32	
Bingham Mines	Boston	8⅛	8⅛	8⅛	Sept. '19, Q .25
Calumet & Ariz.	Boston	54⅞	54	54⅞	June '20, Q 1.00
Calumet & Hecla	Boston	300	290	300	June '20, Q 5.00
Canada Copper	N. Y. Curb	1/16	1/32	1/32	
Centennial	Boston	...	...	11	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	38	37	38	June '20, Q 1.00
Chief Consol.	Boston Curb	3	3	3	Feb. '20, Q .10
Chile Cop.	N. Y.	14	13⅞	14	
Chino	N. Y.	26	25	26	June '20, Q .37½
Columbus Rexall	Salt Lake	*40	*38	*38	
Con. Ariz.	N. Y. Curb	1/16	1/32	1/32	Dec. '18, Q .05
Con. Copper M	N. Y. Curb	...	...	2⅛	
Copper Range	Boston	34⅛	32⅞	33⅜	June '20, Q .50
Crystal Copper	Boston Curb	*38	*26	*37	
Davis-Daly	Boston	7⅛	7⅛	7⅛	Mar. '20, Q .25
East Butte	Boston	10⅛	9⅞	10	Dec. '19, A .50
First Nat'l	Boston Curb	*90	*76	*85	Feb. '19, SA .15
Franklin	Boston	...	...	*50	
Gadsden Copper	N. Y. Curb	...	...	*71	
Granby Consol.	N. Y.	36	31⅞	36	May '19, Q 1.25
Greene-Cananea	N. Y.	24⅝	23⅝	24¼	Aug. '20, Q .50
Hancock	Boston	3⅜	3	3	
Houghton	Boston Curb	...	...	*40	
Howe Sound	N. Y. Curb	...	...	3⅜	July '20, Q .05
Inspiration Con.	N. Y.	46	44⅞	46	July '20, Q 1.00
Iron Cap	Boston Curb	8⅜	8⅛	8⅛	Feb. '19, M .25
Isle Royale	Boston	27⅛	26⅝	27	Sept. '19, SA .50
Kennecott	N. Y.	24	23⅛	23⅞	June '20, Q .50
Kewcenaw	Boston	1⅜	1⅞	1⅜	
Lake Copper	Boston	3	3	3	
La Salle	Boston	...	...	2½	
Magma Chief	N. Y. Curb	...	...	*21	
Magma Copper	N. Y. Curb	26	25	25½	Jan. '19, Q .50
Majestic	Boston Curb	...	...	*12	
Mason Valley	N. Y. Curb	...	...	2⅛	
Mass. Con.	Boston	3	3	3	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	5⅛	4⅞	5⅛	
Miami	N. Y.	19	18⅝	19	Aug. '20, Q .50
Michigan	Boston	4	3⅞	3⅞	
Mohawk	Boston	59	57	58⅛	Aug. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	5⅞	5⅞	5⅞	
Nevada Con.	N. Y.	11	10⅜	11	June '20, Q .25
New Arcadian	Boston	...	...	3	
New Baltic	Boston Curb	...	...	3	
New Cornelia	Boston	17	16½	16⅜	Aug. '20, .25
Nixon Nev.	N. Y. Curb	...	...	*9	
North Butte	Boston	14⅛	14	14⅜	Oct. '18, Q .25
North Lake	Boston	...	...	3	
Ohio Copper	N. Y. Curb	...	...	1 1/16	
Onibway	Boston	...	...	1⅛	
Old Dominion	Boston	22	20	20	Dec. '18, Q 1.00
Osceola	Boston	37	36	36	June '20, Q .50
Phelps Dodge	Open Mar.	†195	†180	...	July '20, Q 2.50
Quincy	Boston	44	44	44	Mar. '20, Q 1.00
Ray Con.	N. Y.	14⅜	14⅛	14⅜	June '20, Q .25
Ray Hercules	Boston Curb	...	...	*60	
St. Mary's M. L.	Boston	36⅜	35	35⅜	June '20, K 2.00
Seneca	Boston	15	12⅞	13⅜	
Shannon	Boston	...	...	1⅛	Nov. '17, Q .25
Shattuck Ariz.	N. Y.	...	...	8⅛	Jan. '20, Q .25
South Lake	Boston	...	...	2	
South Utah	Boston	*15	*15	*15	
Superior	Boston	4	4	4	Apr. '17, 1.00
Superior & Boston	Boston	3	3	3	
Tenn. C. & C.	N. Y.	9⅜	9⅜	9⅜	May '18, I 1.00
Tuolumne	Boston	*65	*60	*65	May '13, .10
United Verde Ex.	Boston Curb	30⅛	29⅛	30	Aug. '20, Q .50
Utah Con.	Boston	6⅜	6⅛	6⅜	Sept. '18, .25
Utah Copper	N. Y.	61	57⅜	61	June '20, Q 1.50
Utah M. & T.	Boston	1⅛	1	1⅛	Dec. '17, .30
Victoria	Boston	2⅛	2	2	
Winona	Boston	*40	*30	*40	
Wolverine	Boston	...	...	13	Jan. '20, Q .50
LEAD					
Hecla	N. Y. Curb	4⅛	4	4⅛	June '20, QX .20
St. Joseph Lead	N. Y.	16⅛	15	16⅛	June '20, QX .50
Stewart	Boston Curb	...	...	*16	Dec. '15, .05
Utah Apex	Boston	1⅜	1⅛	1⅛	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	12⅞	11⅛	12⅞	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	45	45	45	Aug. '20, Q 1.50
Butte C. & Z.	N. Y.	7⅛	6⅝	6⅞	June 18, I .50
Butte & Superior	N. Y.	19⅛	18⅛	19	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	11⅛	9⅛	11⅛	June '20, Q .50
New Jersey Z.	N. Y. Curb	185	183	184	Aug. '20, Q 4.00
Success	N. Y. Curb	*4⅛	*4	*4⅛	July '16, .03
Yellow Pine	Los Angeles	‡	...	1.01	June '20, Q .03

Stock	Exch.	High	Low	Last	Last D.v.
GOLD					
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	
Alaska Juneau	N. Y.	1⅝	1⅜	1⅝	
Carson Hill	N. Y. Curb	...	...	24⅜	
Cresson Consol. G	N. Y. Curb	1⅛	1/32	1⅛	June '20, Q .10
Dome Ex.	Toronto	*38	*31	*36	
Dome Mines	N. Y.	12	11⅛	11⅞	July '20, Q .25
Golden Cycle	Colo. Sprgs.	‡	...	*73	May '20, Q .02
Goldfield Con.	N. Y. Curb	*10	*8	*10	Dec. '19, .05
Hedley	Boston	...	...	4⅛	June '19, .10
Hollinger Con.	Toronto	5.75	5.50	5.50	Aug. '20, BM .05
Homestake	N. Y.	50	50	50	Sept. '19, .50
Kirkland Lake	Toronto	*59	*54	*54	
Lake Shore	Toronto	1.20	1.10	1.14	Oct. '19, .02½
McIntyre-Porcupine	Toronto	2.06	2.00	2.00	May '20, K .05
Porcupine Crown	Toronto	*30	*25	*25	July '17, .03
Portland	Colo. Sprgs.	‡	...	*60	July '20, Q .01½
Reorgan. Booth	N. Y. Curb	5	3⅛	5	May '19, .05
Silver Pick	N. Y. Curb	*6	*5	*5⅛	
Teck Hughes	Toronto	*10⅛	*7	*8	
Tom Reed	Los Angeles	‡	...	1.08	Dec. '19, .02
United Eastern	N. Y. Curb	2⅛	2	2⅛	Apr. '20, Q .21
Vindicator Consol.	Colo. Sprgs.	‡	...	*18	Jan. '20, Q .01
West Dome Consol.	Toronto	*7⅛	*5⅞	*6⅛	
White Caps Min.	N. Y. Curb	*8	*6	*8	
Yukon Gold	Boston Curb	...	...	1⅛	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*15	*10	*14	Apr. '20, M .03
Beaver Con.	Toronto	*47	*43	*43⅜	May '20, K .03
Conagas	Toronto	3.00	2.25	2.65	Aug. '20, Q .12½
Crown Reserve	Toronto	25	20	*21⅛	Jan. '17, .05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept. '19, 1.00
La Rose	Toronto	*34	*32	*32	Apr. '18, .02
McKinley-Dar	N. Y. Curb	...	...	*51	July '20, Q .03
Mining Corp.	Toronto	1.85	1.70	1.75	June '20, Q .12½
Nipissing	N. Y. Curb	8⅛	8⅛	8⅛	July '20, Q .25
Ontario Silver	N. Y.	5⅛	5⅛	5⅛	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	1/16	1/32	1/16	Jan. '12, .10
Peterson Lake	Toronto	*13⅛	*12⅛	*12⅛	Jan. '17, .01½
Temiskaming	Toronto	*37	*34	*36	Jan. '20, K .04
Trethewey	Toronto	*30	*26	*25	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2⅛	*1⅛	*2	
Barnes-King	Butte	‡	...	1.11	Aug. '20, Q .05
Bost & Mont.	Boston	...	...	*63	
Casbboy	N. Y. Curb	*7	*6⅛	*7	
El Salvador	N. Y. Curb	1⅝	1⅜	1⅛	
Jim Butler	N. Y. Curb	*13	*10	*12⅛	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*5	*4⅛	*5	June '16, .05
Louisiana Con.	N. Y. Curb	⅛	1/32	1/32	
MacNamara M.	N. Y. Curb	1/32	1/32	1/32	May '10, .02½
N.Y. Hond. Rosar	Open Mar.	†13	†11	...	July '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '20, Q .05
Tonopah-Davide	N. Y. Curb	2	1⅞	1⅞	
Tonopah Ex.	N. Y. Curb	2	1⅞	1⅞	July '20, Q .05
Tonopah Extening	N. Y. Curb	1⅞	1	1⅛	Oct. '19, SA .15
West End Con.	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb.	*21	*18	*20	July, '20, M .01
Consol. M. & S.	Montreal	25⅞	24⅛	25⅞	July '20, Q .62½
Daly Mining	Salt Lake	2.65	2.65	2.65	July '20, Q .10
Daly-West	Boston	4⅛	4⅛	4⅛	July '20, Q .25
Eagle & Blue Bell	Boston Curb	...	...	2⅛	Apr. '20, Q .10
Electric Point	Spokane	*34	*29	*29	May '20, SA .03
Fed. M. & S.	N. Y.	...	...	10	Jan. '09, 1.50
Fed. M. & S. pf	N. Y.	35	35	35	June, '20, Q 1.75
Florence Silver	Spokane	*34	*34	*34	Apr. '19, .01⅛
Grand Central	Salt Lake	...	...	*37	June '20, K .03
Iron Blossom	N. Y. Curb	*33⅜	*22	*22	Apr. '20, Q .02½
Judge M. & S.	Salt Lake	...	...	4.00	July '20, Q .12½
Marsh Mines	N. Y. Curb	*13⅛	*12	*13	
Prince Consol.	N. Y. Curb	1/16	1/32	1/32	Nov. '17, .02½
Rambler-Cariboo	Spokane	*14	*13	*13	Feb. '19, .01
Rex Con	N. Y. Curb	...	...	*6	
South Hecla	Salt Lake	*95	*94	*94	Sept. '19, K 0.15
Stand. S. L.	N. Y. Curb	1/16	1/32	1/32	Oct. '17, .05
Tamarack-Custer	Spokane	2.40	2.25	2.25	Dec. '19, K .03
Tintic Standard	Salt Lake	3.45	3.32½	3.35	June '20, Q 0.10
Wilbert	N. Y. Curb	*4	*3	*4	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	20⅛	18⅛	20	Mar. '19, .50
Internat'l Nick.pf.	N. Y.	...	...	80⅛	Aug. '20, Q 1.50
QUICKSILVER					
New Idria	Boston	...	...	5	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb	*14	*10	*13	
VANADIUM					
Vanadium Corp.	N. Y.	72⅛	64	72⅛	July '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	88	82	82	July '20, Q 1.50
Asbestos Corp. pf.	Montreal	94	92	93	July '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	55⅛	53⅜	55⅛	June '20, Q 1.00
Am. S. & R.pf.	N. Y.	88⅛	88	88⅛	June '20, Q 1.75
Am. Sm. pf. A.	N. Y.	71	71	71	July '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	51⅛	50⅛	51	July '20, Q 1.50
U.S.S.R.& M. pf.	Boston	43⅛	42⅛	43	July '20, Q .87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

INDUSTRIAL NEWS

The Easton Car & Construction Co. announces the opening of a new office in the Peoples Gas Building, Chicago, to take care of the increasing business in the West and Middle West districts.

Denver Rock Drill Manufacturing Co., of Colorado, announces the opening, on Aug. 1, of a branch office at 421 Manhattan Building, Duluth, Minn.

Olin H. Landreth, consulting engineer, 156 Fifth Ave., New York City, announces that he is now consulting engineer to the Eastern Potash Corporation, New Brunswick, N. J., and therefore has time available for other engagements in like capacity. ('phone Chelsea 9992).

T. Nelson Dale, geologist, recently with the U. S. Geological Survey, announces that on Aug. 21 last he took up the work of a consulting geologist in problems pertaining to slate, granite, marble, lime-rocks, and drilling for water. Mr. Dale is the author of many authoritative papers on ornamental and building stones of the eastern United States. His address is "The Oaks," Springfield, Mass.

Yale & Towne Manufacturing Co., Stamford, Conn., has moved its general offices to Stamford, Conn., to which all mail should be addressed.

New Convertible Shovel Has Six Changes Simply Made

The Bucyrus Co., South Milwaukee, Wis., has recently described in its bulletin C-301 a new revolving shovel, known as the 30-B, which supersedes the company's 18-B ¾-yard revolving shovel. The 30-B is in fact a universal machine. It may be used as a revolving shovel, or, with the addition of a few extra parts, as a dragline excavator, a clamshell excavator, a locomotive crane, a sewer shovel, or with a long boom and dipper sticks for work requiring unusually high lifts. It is so designed that these changes may be made with the minimum of labor, delay, and expense by those who have provided the necessary parts in advance.

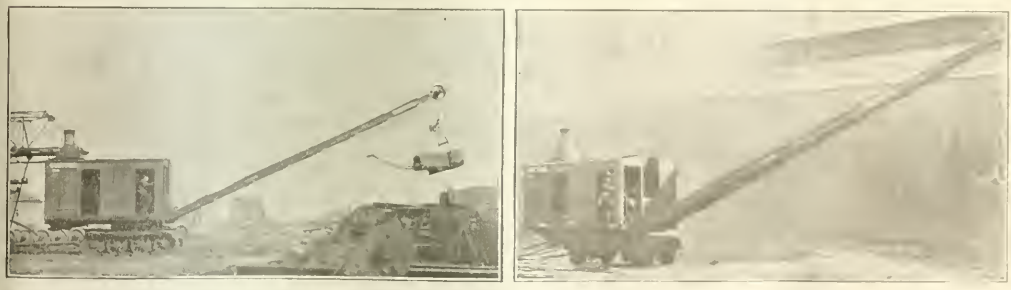
As Clamshell Excavator

The hand machine will carry a 1-yard clamshell bucket with a 35-ft. boom or a ¾-yd. clamshell bucket with a 40-ft. boom. All the change required in this installation is an additional drum on the main hoist shaft, with the necessary brake, clutch, thrust cylinder, and operating levers, additional ropes, boom, bucket, tag line, and trolley. The changes are simply and readily made.

As Crane

As a crane this shovel has a capacity of 9¾ tons at 20 ft. when mounted on caterpillars, and 9 tons at the same radius when mounted on trucks or traction wheels. To make this change, the same parts are required as for the clamshell machine, with the addition of the hook.

BUCYRUS 30-B AS A REVOLVING SHOVEL AND AS A CLAMSHELL EXCAVATOR



BUCYRUS 30-B AS A DRAGLINE EXCAVATOR AND AS A CRANE

As a Revolving Shovel

As a revolving shovel it carries a 1-yard dipper truck measure. When heaped up, this capacity is about 1¼ cu.yd. Its truck frame is so designed that it will accommodate caterpillar traction, traction wheels or railroad trucks of any gage from 3 ft. 3 in. to 5 ft. These three mountings are absolutely interchangeable. Such a change can be made in the field at a small expense. The working weight of the 30-B shovel on caterpillars is about thirty-four tons, on traction wheels thirty-one tons, and on railroad trucks 29½ tons. It has sufficient ruggedness and possesses ample power for work in clay pits, rock quarries, and for mining and stripping operations.

As Dragline Excavator

To convert to a dragline excavator requires the changes named for the clamshell except that the tag line and trolley are not necessary and a fair lead, drag-bucket and rope must be ordered. It carries a 1-yd. bucket on a 35-ft. boom, or ¾-yd. bucket on a 40-ft. boom.

As Sewer Excavator

The conversion to a sewer shovel is simple. Two combinations of dipper handles are offered. With a 30-ft. handle it will dig a trench 20 ft. deep and with a 24-ft. handle a trench 14 ft. in depth. It carries a special ¾-yd. sewer dipper, although it may be noted that the standard steam-shovel dipper

may be used for this purpose when the sewer work is not extensive. It may be seen in the illustration that this dipper has no bail, the padlock being pin-connected directly to the dipper-back and the side frames being eliminated. This gives an unobstructed cutting edge with the corners, as well as with the front of the dipper.

FOR HIGH LIFTS

It often happens that a contractor desires an exceptionally high lift and reach, as his work may require loading wagons from deep excavation or for special work of some character. To fulfill this demand, a 26-ft. boom and 17-ft. handle may be purchased.

Special Post-Graduate Training for Technical Men

Arrangements have been completed by the educational authorities of the Western Electric Co. and the faculty of Columbia University, to enable employees of the former to carry on post-graduate courses coincident with their regular duties. This system has been limited to the members of the engineering department, where more than three thousand technical students are eligible to take advantage of the offer. Approved graduates of colleges and scientific schools may pursue graduate work for masters' degrees and fulfill the requirements in two calendar years under certain conditions.

Admission is dependent on an adequate grounding in mathematics and physics. After the candidates are nominated by the officials of their departments, they must meet the academic qualifications of the university. A special course of training in technical work has also been started by the company itself to instruct graduates of arts colleges in its engineering methods. A month is set aside by the educational authorities for groundwork, which is followed by work in the laboratories. The entire course takes nine months. Outside reading and lectures are required during that period.

International Refrigeration Institute

An International Conference of Refrigeration, at which 42 governments, states, dominions and colonies were represented, was held in Paris, on June 21, the French Minister of Agriculture, M. Picard, presiding. The object of the conference was the signing of a convention which creates an International Institute of Refrigeration in Paris, supported by annual subsidies from all the participant states. The aim of this Institute is to stimulate the progress of the science and technics of refrigeration.

The director of the Institute is Emile Gouault and the chairman of the executive committee is André Lebon. They may be addressed care of Institute International du Froid, 9, avenue Carnot, Paris, France.

Some Refillable Fuses Are Reliable

A circular letter recently sent out by the Associated Factory Mutual Laboratories to its associated companies makes the following very important statement affecting every manufacturer in the United States:

"We believe that this test of Underwriters Laboratories on refillable (insertion of new links by consumer) fuses does not bring out the real hazard in the field connected with the type of fuse in question. The Underwriters Laboratories assume no responsibility for the action of the fuses after they have been refilled by the users. Improper refilling can easily occur.

"The Factory Mutual Laboratories are not planning to follow the course of the Underwriters Laboratories. We do not believe that our laboratory should approve a type of fuse whose satisfactory operation depends so greatly upon the treatment it receives by the users."

There is much food for thought in this statement and no manufacturer can ignore its far reaching possibilities and the question each manufacturer should ask himself is, What can I gain by continuing the use of a fuse which *may* cause trouble? Better avoid this possibility by using a fuse which the Factory Mutual Laboratories *approve*, particularly when you can save money by so doing. Factory Mutual Laboratories approve "Atlas" fuses in both 250 and 600 v. up to 100 amp.

Improved Water-Softener Eliminates Scale and Sludge

The hot-process water softener is described in a book recently issued by the H. S. B. W.-Cochrane Corporation, formerly the Harrison Safety Boiler Works, of Philadelphia, Pa. The device differs from the well-known lime-soda process softener, in that the chemicals are added to the water only after it has been heated to 205 deg. F. or higher, which results in a considerable reduction in the time required for the sedimentation, so that the apparatus can usually be installed within power-plant buildings and without requiring special foundations or housing. The feed-water heater is a part of the apparatus, thus reducing the complication and the expense of piping. It is also claimed that there is no after-precipitation of scale and sludge in pumps, piping, feedwater heaters, and boilers and that the minimum amount of sludge-forming solids enters the boiler and the tendency to priming and foaming is consequently minimized.

Uehling Instrument Co., 71 Broadway, New York, N. Y., combustion chemists, will exhibit fuel-saving devices at the Chemical Industries Exposition, Grand Central Palace on Sept. 20-26, and at the National Association of Stationary Engineers convention to be held at Milwaukee, Wis., Sept. 13 to 17, next.

TRADE CATALOGS

Flanged and Screened Fittings.—The Reading Valve Fittings Co., Reading, Pa., has issued a catalog of steel and iron flanged and screwed fittings and flanges.

Crushers.—The Kennedy-Van Saun Manufacturing and Engineering Corporation, 120 Broadway, New York City, illustrate and describe the Kennedy Gearless Crusher in a ten-page bulletin, No. 2. The advantages of this construction are greater speed and capacity resulting from rope or belt drive, reversible concaves because set vertically, improved material and design of construction, relatively low power consumption, and minimum abrasion of the stone-breaking parts. Garfield & Co., Hearst Building, San Francisco, are the Western general agents.

Separators. — The Griscom - Russell Co., 90 West St., New York City, is manufacturing a line of oil and steam separators of ingenious design which is described in the company's illustrated bulletins Nos. 1,120 and 1,140. The Stratton Junior Oil Separator (Bulletin 1,120) separating oil from oil-charged steam, has a special modification for use when pressures are below one atmosphere. The standard Stratton steam separator (Bulletin 1,140) removes water from the steam centrifugally, also, and stands guard between steam pulsation, flying water, sand, and scale, and the engine or turbine. Illustrations and tables in both bulletins aid in selecting the device suited for the particular need.

Dewaterer.—H. R. Wahl & Co., milling and mining machinery, First National Bank Building, Chicago, is building a simple machine for dewatering granular solids, which is fully illustrated and described in the company's bulletin D-1. The machine operates without scraping action, does not create slimes, lifts and drains the solids without contamination at any point, and permits close regulation of the water discharged with the solids. Three models are built, to meet varying conditions of size of material, tonnage per hour, dilution of feed, and limiting size of particle escaping with overflow.

Air Compressors—The Pennsylvania Pump & Compressor Co., Easton, Pa., has issued Bulletin No. 100, "Pennsylvania Air Compressors," which describes the company's Class A, power driven, single-stage, straight-line air compressors. Attention is called to a new type of ring plate valve, and an oil float gage for determining at all times the level of oil in the crank basin. The compressors embody, in addition to the above, a number of improved features of design, such as the use of a solid forged crank-shaft, forged connecting rod with solid box eyes, and removable bronze shell main bearings.

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 110 New York, September 4, 1920 *Number* 10

The Difference Between Silver And Other Commodities

ONE of the strongest arguments advanced by those who feel that "dollar silver" is inimical to the best interests of the country and the trade in general implies that the action of the Government in purchasing domestic silver at the fixed dollar price—which has now ruled generally above the foreign price—is a policy that might logically be extended to cover other industries, particularly those that had the value of their product, be it wheat, copper, or other commodity, stabilized during the war. It assumes that the same conditions held for silver as for other natural products, and that inasmuch as stabilization during wartime was followed by a repeal of any restrictive price measures in the post-war period for all commodities except silver, the Pittman Act should also be repealed.

It is true that under the present economic system silver is considered a commodity and subject to the same economic laws governing trade in any other mineral or agricultural product, but there are important differences between the precious metals and other commodities which make necessary sharp distinction between their treatment. The demand for silver—gold also—is subservient to the vicissitudes of governmental requirements—both metals discharge important functions and responsibilities in monetary matters, predominating characteristics in their use which cannot be underestimated in considering the moving influences in the silver market. It is not the demand in the arts which is the controlling market factor. Furthermore, quantities of silver and gold, unlike other most ordinary commodities, are being continually added to the world's wealth, and do not deteriorate like the ferrous or nonferrous metals, and are not consumed like wheat or leather, for instance. The precious metals also represent, in small volume and weight, a concentration of relatively great value, a concentration that can be readily accumulated and circulated.

With these essential points in mind the disparity between the precious metals and other commodities indicates why different treatment must be accorded them. Any generalization which sweepingly applies the rules and regulations governing trade in commodities without allowing for any intrinsic differences in certain ones, such as the precious metals, easily leads to the erroneous conclusions mentioned above.

During the last year of the war, the United States, with its large stock of silver, was able to be of very material assistance to the British government and the winning of the war, and under the authority of the Pittman Act unloaded upon the silver market some 207,000,000 oz. of silver, which ultimately found its way to India. In other words, through a governmental agency there was released upon the market about 7 per cent more silver than the entire world's production for that year. Imagine some other agency accumulating stocks of a commodity such as wheat or copper equivalent to the whole world's output and then dumping it upon the market! That is virtually a parallel to what happened in silver. The United States Government stabilized the silver market at $1 per ounce, but only by using a tremendous stock of silver for the purpose.

The necessity of stabilization during wartime is self-apparent, but the benefit accruing from stabilization in periods of peace may not be so clear, although it was shown last year how perilously near the varying price of silver came to upsetting existing currency systems by sending silver coins to the melting pot. It is of lasting good to governments to have a price for silver that is not amenable to speculative manipulation by bullion dealers, whether foreign or domestic. We are inclined to believe that the present silver situation, whereby the entire production of the United States is diverted to the Treasury at a fixed price, is not to the liking of those interests which have always been looked upon as controlling the world's silver market. No longer does the silver producer in this country find that manipulation with the market is playing havoc with his silver. Even foreign silver is exhibiting great reluctance to break more than a few cents away from the dollar quotation, and is strongly feeling the effect of the smaller available world supply.

News From Mexico

TAKEN at its face value, the news received from many parts of Mexico is encouraging and indicates that attempts are being made to revive mining projects, long dormant, but which now, under a seemingly friendlier government, stand a chance of getting a square deal. During the long period of revolutionary unrest taxes accumulated and many claims were jumped. The new government, however, to induce small owners to resume paying taxes, recently issued a decree annulling all previous edicts confiscating property for non-payment, and will permit arrears to be paid in easy instalments. This is not benevolence, it is said, but rather a method of enrolling property owners, for in many sections the official records have been completely destroyed. Those whose claims have been jumped thus have a means of regaining possession of their property.

Statistics of varying nature are issued at intervals from official sources. Indeed, in this respect, the new government, as seen from a distance, appears to be functioning normally. Recently it was announced that 365 companies, working 3,138 mines, are actually operating in the republic today. This, with the information that in many districts the records have been completely destroyed, is to be taken with a grain of salt. Other figures giving the total valuation of the oil, mining, and textile industries in Mexico have recently been issued, but here, too, the data are to be accepted with due reservations.

Some individuals are professedly skeptical of the present government's intentions, saying that it is seeking to secure American recognition by promising everything and giving but little. Such opinions at this time, however, seem most unjust, for in what other way could a new government make its start than this? Assuredly all it can do at the present time is to promise and announce its good intentions. Economic conditions are still too badly upset to permit it to do more.

It would doubtless be hard to find any one person who is sufficiently familiar with all sections of Mexico to judge with complete accuracy of the reliability of news received regarding the widely varying conditions there. The *Engineering and Mining Journal* is seeking to give its readers information obtained from reliable correspondents in this respect, but too much cannot be expected. Indulgence is asked, therefore, until such time as the rehabilitation of rail, telegraph, and postal facilities across the Rio Grande will permit more intimate communication with the southern republic.

Smelting With Enriched Air

ENRICHING the air blown into blast furnaces by the addition of pure oxygen has often been considered, but so far as we know has never been tried on a commercial scale, at least in non-ferrous metallurgical practice. Dr. F. G. Cottrell prepared a short paper on the subject for the New York meeting of the American Iron and Steel Institute last May, though the discussion was confined to the application of the practice to iron blast furnace work.

The reason that the idea has not received wider experimental or commercial application lies, of course, in the cost of the oxygen. Present production in this country amounts to about 3,000,000 cu.ft., or 130 tons of oxygen, per day. About 25 per cent of this is manufactured by the electrical decomposition of water. Theoretically, such oxygen should be produced at about $12 per ton for the electric energy consumed, assuming electric power at 0.2c. per horsepower-hour. The remainder is made by the liquefaction and distillation of air by the Linde and Claude methods, and sells, in large quantities, for 1c. per cu.ft., or about $225 per ton.

The largest single installation for air separation, according to Dr. Cottrell, is at the Government nitrogen plant at Muscle Shoals, Ala., which could produce about 3,000,000 cu.ft. per day, though at what cost we do not know. The use of ozone has also been considered by the International Nickel Co., which collected considerable data on the subject a few years ago, but the cost of production seemed to be too great to offset the indefinite improvement in furnace operation which would be secured by its use.

The use of oxygen-enriched air would result in a more intense heat in the combustion zone of a furnace. Coke could probably be reduced. Its use as an aid to secure pyritic smelting may well be considered. It might prove valuable in connection with the firing of copper and lead blast furnaces with pulverized coal, especially if the ore were refractory. Some of the new volatilization methods might make use of it. Enriched air might also be temporarily used to restore a cold or badly blocked furnace to normal running; in case of blower trouble it might mean the saving of a furnace which would otherwise have to be dug out. The field for experimental work is large, and arrangements could possibly be made with one of the two large producers of oxygen, or manufacturers of ozonizing equipment, for securing the necessary supplies or equipment at cost.

Dressing a Mine for Sale

SALTING is a subject which perforce is continually on the mind of the examining engineer, but which does not receive much mention in the literature of the profession. It may even be held by some that it is dangerous to introduce it into literature, on account of the suggestion which may lead to the practice of fraud, and because of the instruction which it might afford to those who are willing to cheat but are not fully acquainted with the art. However, it is probable that for those who have actually given much thought to the matter as a preliminary for practice, there is little that can be learned. The wiles of trickery are age-old, and they have flourished in the soil of mining venture and mining speculation as everywhere else.

There are all kinds of salting—some questionable, some wholly depraved. What of the very common practice of "dressing" a mine for sale, for example? The recipe is easy: Stop all faces in wide and good ore. The mine makes thereby an unduly good impression on any but the most expert, and in just so far, an incorrect impression is calculatingly produced. Is that reprehensible? It will not fool the wise; but is it not the "children and fools," the half-baked of mining, who should be especially protected, granted that Providence, which otherwise is supposed to take care of this class, apparently abandons them when they pass the portals of a mining tunnel, or step (if so bold) into the bucket to be let down the shaft? On the other hand, the window-dressers would argue, you could not expect them to take out all the visible ore and stop the faces at lean points, when every chance points to other orebodies on further development. They would hold this an unfair and false presentation. They would argue that when a man presents himself to a prospective employer he takes care to shave, put on his best clothes, and make the best impression possible; that the prospective employer assumes this, and would underestimate a man who appears in the guise he often assumes at the end of a particularly hard day's work.

The truth, of course, is midway. The man who courts his prospective wife with vast show of presents, and unduly deferential chivalry, which he does not intend to last forever or perhaps cannot possibly keep up after marriage, is laying the foundation for future disillusionment on the part of the wife, and accusations of having failed to make good. The sample which he displays of his pecuniary and personal resources and attributes must be an average sample, of the kind that will wear. The prospective employee must not by implication or otherwise make impressions or promises which he cannot make absolutely good in the long run. Many choose rather the opposite course, preferring to let deeds speak instead of promises. A mine should not be dressed for sale, but should remain as operation left it; or should be continued working as good judgment suggests, without thought of the impression it may make on a purchaser. A competent purchaser will see and take consideration; and a mine owner should not seek to deceive an incompetent.

The experienced miner who understands the tricks of his mine may use many wiles other than the simple

one noted above. He may progress a step further along the road to iniquity, and suppress bad showings. Winzes may be filled with waste or flooded, because they show the disappearance of ore at the bottom. "Caves" may be allowed to take place by calculated neglect, or helped along, more or less, so as to make inaccessible faults or intrusions which cut off the ore; while the cheerful parts of the mine may be more especially kept open for inspection. Often the unwatering of winzes, or the cleaning out of caves, would take more time than the prospective purchaser has at his disposal, and he must guess at what is not shown and decide with this evidence in doubt.

Sometimes a mine "dresses" itself automatically for sale, and the dishonesty of the owner comes in not explaining to the examining engineer the mine's peculiarities. If the engineer is secretive and given to rebuff, and advises the owner that he knows more than the owner can ever tell him about the mine, and wants to pointers, then indeed the duty of the owner is harder to define.

We remember a case where lead-silver ore replaced limestone, working out from certain almost invisible straight and regular fractures, vertical and intersecting one another at right angles; and the mineralization was confined to a certain limestone bed about ten feet thick. Drifts had been driven along the center of each of the principal fractures, and the natural ore thus stoped out: but the walls were still ore, though of lower grade. The mine was thus developed into blocks by the intersecting drifts, as if all the bed were ore and had been systematically blocked out as a scheme of development; and so the owner dishonestly gave the investigator to understand. Obviously sampling would have indicated a great body of mill ore, on the latter assumption; but with a knowledge of the ore occurrence it would be realized that the assay values would fade away from the walls of the drifts toward a barren center in each block. The fact that ore is blocked out on four sides does not make it safe to calculate it as there, unless one understands the occurrence; but with such expert knowledge, ore exposed on one side only may sometimes more safely be assumed. The only real "ore in sight" is that which is broken down and sampled; and in sampling a mine, the main thing is not the necessary mechanical sampling of faces, with all the usual expert safeguards, but a knowledge of how the ore lies; and in this way the closest approximation to the amount and value of standing ore may be made.

Welfare Work as an Investment

WELFARE work has been defined as the "humanizing of industry." Production, as generally understood, implies the result of industrial application. We have, all told, made tremendous strides in the standardization and improvement of the methods of doing things, with the result, in general, that production has increased; at any rate the necessary program has been outlined for the securing of greater output. Instances where the latter has not kept stride with a rising curve have been due to the failure of some contributing factor: lack of motive power, inability of machines to meet capacity, shortage of raw materials, or the whims of labor and capital.

Increased production usually means lowered costs, and a calculation of the net financial return can usually be made. Money spent in welfare work is productive of no monetary returns; no tangible cash dividends are paid out to the individuals or companies engaging in the work. But the expenditure of money for "humanizing industry" goes on apace, and each year shows greater and greater sums spent for the work. Why? The protection of the workman from accidents, the encouragement of personal and community hygiene, the care of the sick, financial aid to those who are disabled or who have grown old in service, the upbuilding and instruction of a coming generation, Americanization—all these benefits, which are the result of effort in human engineering, are the returns of the investment. Certainly no work that has been done for this object has failed to give bigger and more satisfactory returns.

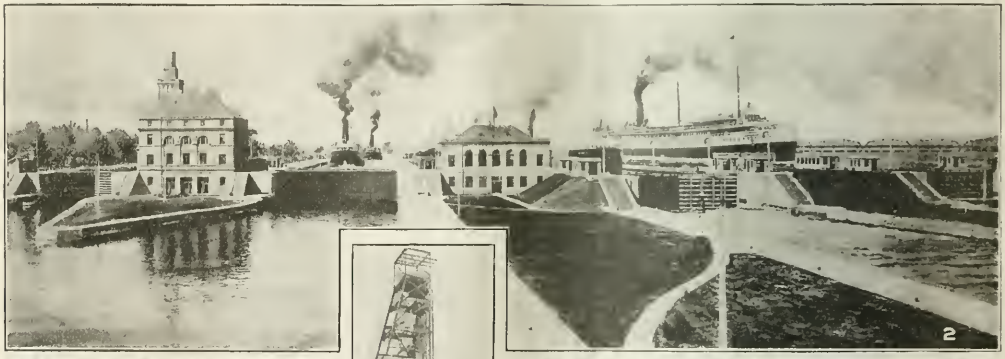
Labor-Saving Equipment

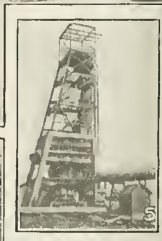
A CHANGE in point of view on the part of the technical managers of plants, due to present economic and labor conditions, is worthy of note. Formerly there were two distinct motives for the introduction of mechanical equipment. One was the reduction in the amount of manual labor and the other decrease in unit cost. As tonnages handled increased, the practicability of introducing mechanical handling of material, with consequent lowering of unit costs, became more and more apparent.

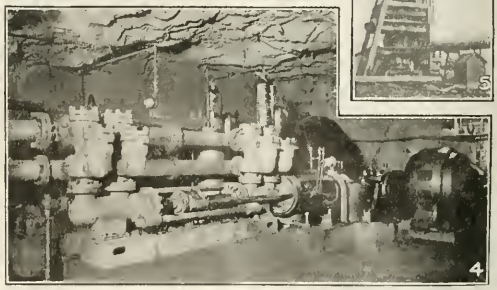
The last fifteen years represents a notable epoch in the mining industry in that there was extensive mechanization of surface and underground plants. Recently the superintendent of a smelting plant said, "I have just put in an additional conveyor belt in my ore-handling equipment and as a result have saved the labor of eight men. These men I will use elsewhere in the plant where they are greatly needed." The dearth of common labor, as well as its increased cost, not to mention the lessened efficiency so apparent, has caused superintendents of plants to study more minutely the detail of handling ore and ore products with the objective of conserving labor. Numerous appliances are available, but owing to the already intensive application of labor-saving devices the opportunities for further installations are comparatively restricted.

The problem in each individual plant will warrant close study, with a view to improving existing conditions and adding extensions. With an increase in the amount of mechanical equipment the repair force of a plant becomes of additional importance. Mechanical equipment without thorough maintenance may increase gross expense to a prohibitive degree through delays and interference with sequential operations. Maintenance of mechanical equipment under existing economic and labor difficulties has not been easy. There is a scarcity of good mechanics, and here as elsewhere efficiency has fallen off. Plant superintendents are under the necessity of thoroughly developing their mechanical maintenance force, and mechanical engineers can contribute their share by simplifying mechanical devices and substituting better materials for their construction. There is a wide field here for machinery that will stand up to the work with a minimum of maintenance. Manufacturers who can meet this condition will co-operate in a broad way with the industry and assist mining companies in maintaining proper margins between income and outgo.

Some Points of Interest on the

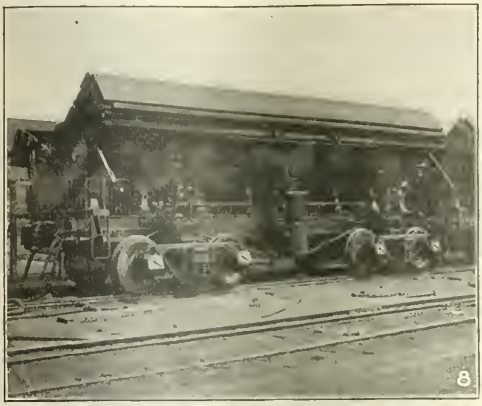






1. Unloading iron ore for Eastern furnaces, Ashtabula, Ohio. 2. Canal and locks at Sault Ste. Marie, Mich. 3. Hoist house, No. 2 Shaft, Quincy Mining Co., Hancock, Mich. 4. Underground pumps at Athens mine of Cleveland-Cliffs Iron Co., Negaunee, Mich. 5. Concrete and steel headframe at Curry mine, Vulcan, Mich. 6. School of Mines Building, University of Minnesota,

Lake Superior Trip of the Institute



Minneapolis. 7. Concentrating plant of Oliver Iron Mining Co., Coleraine, Minn. 8. Twenty-yard, air-operated dump cars used on stripping, Mesabi Range. 9. 350-ton revolving steam shovel, Mesabi Range. 10. Street in Morgan Park, Duluth, Minn., built by the Minnesota Steel Co. for employees. 11. The Minnesota Steel Co.'s plant; Morgan Park, near Duluth, at left.

THE Lake trip from Buffalo to Houghton included part of the route taken by iron-ore and other carriers in their journey from and to the iron- and copper-shipping points of the Lake Superior districts. At Sault Ste. Marie the "Tionesta" passed through the famous locks. A partial conception of the commerce through these canals may be gathered from recent statistics prepared by the Bureau of Foreign and Domestic Commerce which state that during June, 1920, a total tonnage of 10,647,819 was registered. Of this 3,063 tons was copper and 8,725,046 tons iron ore. An excellent example of reinforced-concrete construction is shown at the No. 2 shaft hoist house of the Quincy Mining Co., Hancock, Mich. The walls of this building are of brick veneer and the roof is covered with green tile. Among notable pump installations in the Lake Superior district is that at the Athens mine. In illustration 4 one of the 500-gal. pumps is shown. At the Curry mine, in the Menominee district, a reinforced-concrete structure has been built into and around the steel headframe for the purpose of supporting a gyratory crusher and bin installation. At Minneapolis several of the technical sessions were held at the Mining Building of the University of Minnesota. The Trout Lake concentrator of the Oliver Iron Mining Co. at Coleraine, Minn., has a maximum capacity of 900 tons of crude ore per hour. Mesabi Range stripping equipment has rapidly increased in capacity. In the early operations, cars of 1-cu.yd. capacity were used, whereas modern practice specifies the 20-cu.yd. cars, as shown. This is also true of steam shovels. A 70-ton shovel with a 2-cu.yd. bucket is now replaced by a 350-ton shovel with a 7-cu.ft. bucket.

Lake Superior Meeting A. I. M. E.

Institute Holds 122d Conclave in Michigan Copper and Iron Country — Enunciation of Constructive National Policy by Hoover at Close of Technical Sessions Pledges Engineers to Public Service — Gathering Noteworthy for Display of Patriotic Spirit and Hospitality of Local Industries and Officials

THE 122d meeting of the American Institute of Mining and Metallurgical Engineers was held in the Lake Superior region on Aug. 23 to 28, with the principal stop and banquet at Minneapolis. Technical sessions were held in Minneapolis and Houghton, Mich., and in Hibbing., Minn.

A large party of members of the Institute sailed from Buffalo on Friday, Aug. 20, on the steamship "Tionesta," and were met at Houghton, Mich., by another large group, including the president, Herbert Hoover. At Houghton, the center of Lake Superior mining, elaborate hospitality was provided in the form of facilities for investigation of mines, mills, and smelters. The party then split into two sections, which went each by special train to the Marquette and Menominee iron ranges in Michigan; and each of these trips was replete with interesting technical exhibits and with courteous consideration. The united parties then proceeded to Minneapolis, where technical sessions were held, together with an official lunch in St. Paul and a banquet at Minneapolis. Hoover's speech was the feature of the banquet. The party then proceeded to the Mesabi Range in its special train, where the wonders of the world's greatest iron-mining region were displayed. Returning to Duluth, the engineers of that port arranged a program; and the trip ended at that city.

THE successful meeting of the Institute demonstrates anew the advantages of mixing. For such a summer excursion, the benefits may be summarized as follows, according to importance:

1. The contact and conversation with other engineers, with different themes of specialization, and different geographic experience.

2. The inspiration of mining districts and the study of mining details with which we are not familiar.

3. The reading and discussion of technical papers.

In the winter meetings, the third division, of course, moves up into second place, with the corresponding importance.

It is a condition of further human growth and evolution, collectively and individually, that we shall keep in constant contact with individuals representing other sectors of the component whole, which alone is competent for rounded action; and that out of that contact mutual understanding and concerted action shall arise. In the mining industry we shall more and more need this broader understanding.

The Boat Trip

LEWIS CARROL once wrote something about "T'was brillig——" we forget just how it goes—but in that short bit of nonsense we somehow or other gathered the fact that it was hot; that there was heat of an oppressive and depressive sort. And it was with a similar feeling that the New York contingent of the A. I. M. E. left the Grand Central terminal the evening of Aug. 19. The sweltering heat of the last ten days had done much to upset the normally affable disposition of the mining engineer, so that it was not to be expected that he would "warm up"—that is, in the broad sense. Bnt despite the heat there was some show of enthusiasm, and toward bedtime it began to be evident that the "heat-treated" shell showed signs of breaking.

At Buffalo, amid new surroundings and well fortified with a good breakfast, we were met by other engineers from various points, and made our way to the wharf of the Great Lakes Transit Corporation, where the "Tionesta" was docked. After the usual formalities had been completed, the boat got under way and the first lap of the Lake Superior trip began.

About 150 members and guests made the trip. Those on board included:

Miss Anna W. Jewett,
Miss Louise R. Jewett,
Mrs. John S. Watson,
Mr. and Mrs. Harrison Souder,
Mr. and Mrs. Frank C. Hooper,
Mr. and Mrs. Ell T. Conner,
Mr. and Mrs. J. R. Underwood,
Robert Linton,
Charlton Reynders,
A. J. Strane,
Mr. and Mrs. H. N. Spicer,
Mr. and Mrs. F. L. Estep,
V. E. Edwards,
D. Oliver Brooke,
Mr. and Mrs. P. E. Barbour,
C. P. Perin,
T. W. Tuhyiler,
A. R. Bench,
Walter M. Sanders,
G. F. Woodsmith,
J. Stephenson,
Arthur Thacher,
J. W. Richards,
Mr. and Mrs. J. C. Dick,
G. H. Clevenger,
Alfred W. G. Wilson,
Mr. and Mrs. R. C. Greenfield,
W. R. Hibbard,
Mr. and Mrs. R. V. Norris,
John Stephenson, Jr.,
Geo. L. Collord,
Wm. C. Snyder, Jr.,
Mr. and Mrs. G. H. R. Harris,
J. T. Morrow,
Geo. A. Guess,
H. E. T. Haultain,
H. A. Coy,
R. Dawson Hall,
John T. Breunich,
Arthur L. Walker,
A. M. Cummings,
Earl C. Henry,
Stuart Hazlewood,
J. W. Knowlton,
E. P. McCrorken,
R. H. Richards,
Mr. and Mrs. A. C. Parsons,
S. LeFevre,
H. Kamura,
Philip N. Moore,
J. F. Culbreath,
Mr. and Mrs. J. S. Cunningham,
Mr. and Mrs. W. W. Miller,
Col. and Mrs. A. S. Dwight,
Mr. and Mrs. F. W. O'Neil
Prof. H. Stock and
Miss Stock,
Mr. and Mrs. F. G. Jewett,
John R. Freeman, Jr.,
E. E. Thum,
Bradley Stoughton,
R. C. Allen,
Mr. and Mrs. C. C. Burger,
Mr. and Mrs. C. K. Baldwin,
Mr. and Mrs. Geo. D. Barren,
Richard G. Wood,
J. E. Spurr,
D. E. A. Charlton.

According to a custom which is excellent, the members wore badges in which their last names were prominently displayed, as Hall, Dudley, Siebenthal, and Croasdale. A few, however, apparently elected to use their first names, evidently assuming that they were sufficiently well known. Among these were noted Dick, Arthur, James, Henry, and Ruth.

To those engineers who have not been so fortunate as to include in their list of travels a trip on the Great Lakes we offer condolence, for it will always be with pleasure that we recall that brief journey on the great inland sea. The big blue expanse stretching out in every direction, the splashing of the waves against the ship, the steady throb of the engines—but why continue, for we grow poetical, and, indeed, all we intend to do is to emphasize the delightful calm and the pleasure which accompanied those hours of relaxation. Be it said of Lake Erie that not once did that great body of water express its disapproval of American engineers.

Cleveland was passed during the late hours, so that there was little opportunity for impressions of that thriving Lake city, known the world over as one of the greatest iron-ore receiving ports. At Detroit, the engineers were more fortunate, for promptly at 7 (standard time, although the inhabitants set their Ingersolls one hour ahead, thereby taking advantage of the extra light and good Michigan air) the boat docked, and various parties took advantage of the busses to get a glimpse of the fourth city of our United States. In this connection—we are speaking now of Detroit—it is a matter of regret that Mr. Ford did not avail himself of the opportunity to join the engineers on a visit to the iron ranges, where he has recently acquired extensive interests.

Making Heavy Weather

Leaving Detroit about noon we wound our way through the St. Clair Flats, generally known as the Venice of America, where, according to Ed Wynn, the comedian, any good swimmer can get a job as a traffic cop. Lake Huron, not so well disposed as her southern neighbor, Lake Erie, saw fit to offer a little variation to our previous placid existence. It may be well to pass briefly over this period. There were a few vacant chairs at dinner, some scattering absentees at breakfast, but by noon, as we approached Mackinac Island, all hands were on deck. The storm lasted most of the night, resulted in a delay of four hours, and gave ample evidence of the fact that the landlubber isn't the only one who has his ups and downs.

Mackinac Island boasts of two things: its history and the fact that there are no automobiles on the place. The first is pardonable, because every place must have its beginning. The second is inconceivable, and we are at a loss to understand why Henry Ford and the rest of Michigan's automobile autocracy exert such a slight influence in state politics and permit the passage of laws that allot this domain to the exclusive use of the horse and open victoria.

Owing to the lateness of the hour it was impossible for the visitors to obtain a good view of the Soo locks, which we passed through at 11. In the bright moonlight, however, there was opportunity to view the huge concrete trough into which we slid; the lock-gates closed behind us, the water rose, bringing us up to the level of the water in the channel above, and slowly we moved out into the great expanse of the mighty Superior. Forgotten then, and for some time before, was the heat and sultriness of the city, for the invigorating air raced the pulse, and those who had not already sought their berths were well aware that to stand still was to shiver.

Ocha Potter, who came aboard at the Soo, stated that the copper country delegation whom he represented had ordered a special brand of weather for our benefit. This, be it said, was in absolute harmony with the usual class of entertainment that those good people offer. To one who is familiar with the vagaries of temperature, wind, storm, sleet, and snow that abound in the North Country, it is a remarkable fact that our hosts proved to be such good prophets, for certainly a better stage could not have been set for our reception.

At the present writing—1:30 p.m.—(It is remarkable how this air gets one's appetite, the latter being a very good reason why we will "continue in our next"), we are entering Keweenaw Bay, soon to wind our way through Portage Lake and dock at Houghton.

The Copper Country Meeting

COPPER COUNTRY people do not stint themselves when preparing for or entertaining visitors, and the last gathering of the A. I. M. E. was no exception. Those aboard the "Tionesta" were given a rousing welcome, the whistles of the various plants bursting into sound at the first sign of the boat and continuing until the docking was complete. And this reception was only a beginning, for the streets were decorated with bunting; students of the Michigan College of Mines attended to the transfer of baggage; automobiles were on hand to convey the visitors to Institute headquarters at the Houghton Club or other points—in fact no detail was overlooked to make the stay of the engineers a most pleasant and long-remembered one. The arrangements were in charge of the copper country section of the Alumni Association of the Michigan College of Mines, under the chairmanship of John Knox and the assistance of prominent citizens of Houghton, Hancock, and Calumet.

Registration of delegates began Monday morning at the Houghton Club headquarters. Herbert Hoover, president of the A. I. M. E., arrived by train early in the day and others on the noon train. Owing to the late arrival of the "Tionesta," it was impossible to carry out the complete plans for the day, although those arriving by train were able to visit the Quincy stamp mills, Calumet & Hecla smelter, electrolytic refinery, stamp mills and reclamation plant. After dinner, which was served to members and their guests on dining cars attached to the special train, the visitors were taken to the Onigaming Yacht Club, where an informal dance was held.

Tuesday's program included nine technical visits taken by automobile from the Houghton Club, according to individual preference. These consisted of a geological expedition through the country, trips to the Champion mine, at Painesdale, the Calumet & Hecla mine, the Mohawk mine, the Michigan and Quincy smelters, the Quincy and Calumet & Hecla surface plants, the Calumet & Hecla smelter and electrolytic refinery, the Calumet & Hecla mills and reclamation plant and a general tour of the copper country. This last was arranged for all ladies, members, and guests who were not particularly interested in the mining or metallurgy of the district.

Visit to Ahmeek Mine

The geological trip included a visit to the Ahmeek mine. This was well attended and was chaperoned by the several distinguished geologists that are at present identified with the copper country, including Messrs. Seaman, Graton, Butler, Palache, and Locke. The chief interest was in the steeply dipping cross-fissures of the sixteenth level of this Calumet & Hecla subsidiary. One of the fissures is characterized by native copper, and another by arsenides of copper, and both cut across the main bedded lode without being displaced, and with only slight displacement of the bedded lode by the cross-fissures. A similar cross-fissure vein was inspected at the old Phoenix mine. The early miners first discovered these fissure veins and mined the native copper (mass copper) from them before the discovery of the bedded lodes.

At the Champion mine the visitors were taken to the tenth level, where the methods of drifting and ore removal were explained. The lode at this mine is removed for the entire width, overhand stoping is practised, and the waste rock used in dry walling. A system of selective stoping is used, and by this method it is possible to secure a high grade of copper rock. Where the amygdaloidal rock is rich in copper and there is a little barren rock remaining for dry walling it has been the practice to use stamp sand for filling the stopes above the drifts. The stamp sand is brought into the stopes under pressure through 4-in. pipes. The chutes from main levels through which the copper rock (the copper country miner does not use the term "ore") is dropped are dry walled and are circular in shape.

At the Champion a bell signal system is installed which insures perfect safety and obviates all possibility of error in the transmission of signals to the engineer from any station in the mine. This system was explained in detail in an article by R. H. Bacon which appeared in the *Engineering and Mining Journal* of Aug. 21.

Unique Tempering Furnace

On the surface the machine and tool sharpening shop was inspected. A tempering furnace and conveyor which is in use here embodies some unusual features, including a pyrometer-control forge. It was unfortunate that time did not permit an inspection of the regenerating heating plant. A paper on this subject was read by W. H. Schacht, general manager of the Copper Range Co., at the technical session held that evening.

At the smelters, the straight line and Walker casting machines which are used in connection with large melting and refining furnaces were seen. At the Calumet & Hecla mills at Lake Linden there was much of interest to the mill man: The use of Woodbury classifiers in connection with Wilfley tables, the tailings reclamation and regrinding plant, including leaching and flotation, the 7,500-kw. mixed pressure steam turbines, and the large tailing sand wheels.

To Eagle Harbor for Recreation

Toward noon the visitors headed for Eagle Harbor, where lunch and an elaborate program had been arranged. The first actual copper mining in the Lake Superior district was in 1844, and the first product was secured at Copper Harbor. The trip to Eagle Harbor was through a country rich in the history of the early copper mining of the district, and many of the old mines, now abandoned, were seen. Everyone in the Copper Country swears by the Calumet & Hecla band, and certainly those good people have reason to be proud of their musical organization. During and immediately following lunch the band played several selections that were greatly appreciated by the visitors. The *piece de resistance* of the excellent lunch was Cornish pasties. In the afternoon the visitors were treated to some real Cornish wrestling.

In the evening there were two sessions, one of which was technical and held at the mining building of the Michigan College of Mines, and the other a meeting of the ladies' auxiliary at which Mrs. Dwight presided.

This was held at the college gymnasium. At the session on mine practice, Dr. F. W. McNair presided. The papers "Mechanical Ventilation at the Lake Mine," the "Athens System of Mining," and "Building Reinforced-Concrete Shaft Houses" were all read and discussed by Lucien Eaton. Following the presentation of the last named, William Kelly drew the distinction between shaft houses and headframes. T. L. Condron, a structural engineer of Chicago, discussed the physical structure of concrete in connection with such buildings and pointed out the necessity of taking into account the shrinkage and temperature stresses. H. T. Mercer discussed his paper, "Handling and Treatment of Rock-drill Steel at the Copper Range Mines," and stated that by the adoption of the methods now in use the personal element is entirely obviated. A. C. Paulson, co-author of this paper, explained the pyrometric feature as it is used in the Champion shop. W. H. Schacht, discussed his paper, "Steam Regenerators Reduce Coal Consumption." O. P. Hood stated that the original installation at the Champion mine represented a remarkable achivement at the time, and that recent developments had accomplished a higher percentage of efficiency. He also outlined the coal-saving steps which were adopted by the Government during the war. At the close of the session Dr. McNair introduced President Herbert Hoover.

Mr. Hoover spoke briefly on recent developments in Russia and made a distinction between the Soviet and the Bolsheviki. The situation, said Mr. Hoover, is one which merits the attention of engineers. In closing, Mr. Hoover paid tribute to the people of the Copper Country, the Alumni Association of the Michigan College of Mines, and other local committees which had done so much to make the stay of the engineers a pleasant one. Following this session an informal dance was held at the gymnasium of the Michigan College of Mines. The special trains, one going to the Marquette Range and the other to Iron Mountain, left at 1:30.

Across the Michigan Iron Ranges

THE excursion on the Menominee iron range of Michigan on Wednesday, Aug. 25, was marked by royal weather and a precision of organization and carrying out of plans. The printed schedule which was placed in the hands of the engineers in the morning was followed throughout the day without hitch; and the sun set again at Iron Mountain for them as they returned to their trains at the close of a perfect day. O. C. Davidson, William Kelly, and C. E. Lawrence, prominent Menominee Range mining men, arranged the program, which in the morning included visits to several shafts of the Chapin mine, where the surface installations and underground were inspected, as were the hydro-electric plants in the vicinity, which offer not only engineering attractions, but scenic qualities as well. Luncheon was taken under the trees at the golf grounds, and a busy afternoon was spent visiting the Brier Hill mine and the various shafts of the Vulcan mine of the Midvale Steel Co. Great interest was shown in the various devices for economy and safety and in improved modern styles of change houses, especially that at the East Vulcan, with the overhead system of hanging and drying mine clothes. The electro-hydraulic steam shovel at the Curry shaft of the Vulcan mine, operated by a single man, received a great deal of attention. It is the invention of Frank Armstrong, the mechanical engineer at the Vulcan.

Pioneer Furnace and Chemical Plant Inspected

Engineers who elected to take the Marquette Range trip found much of interest. Arriving at Marquette about 8 in the morning, the visitors were met by automobiles and were taken to the Pioneer furnace and chemical plant of the Cleveland-Cliffs Iron Co. The furnace and also the chemical plant are thoroughly modern; the furnace is equipped with a self-dumping device for the charcoal, has steel ore bins, motor-driven scale cars, skip hoist, and revolving top. In addition to the basic products (wood alcohol, methyl acetone, acetate of lime), the chemical plant produces c. p. acetone, acetic acid, formaldehyde, flotation oils, insulating pitch, sodium acetate, sulphuric acid, iron liquor, methyl acetate, special solvents, hexamethylenamine, and pure creosote. During the visit a pouring of pig iron was made at the furnace for the entertainment of the engineers.

Athens and Negaunee Model Mines

At noon lunch was served at the Wawonowin Golf Club and, following this, many of the visitors indulged in a game of golf. The Athens and the Negaunee mines were visited, and those who wished to do so were permitted to inspect the underground pump room of the former. Both of these mines are models in equipment and the clean and orderly appearance which they present was the subject of much favorable comment.

At the Athens mine the water is raised 2,400 ft. in a single lift by two Prescott horizontal duplex plunger pumps, each having a capacity of 500 gal. per minute. As far as known this is the deepest direct lift installation in the world. At the Negaunee mine a steel stocking trestle was noted. This is supported by circular reinforced-concrete columns placed at intervals of 114 ft. These columns are 6 ft. in diameter at the base and 4 ft. at the top. They are attached to pyramid-shape reinforced-concrete bases 12 ft. x 26 ft. x 6 ft. deep. The reinforcing was made with $\frac{3}{4}$-in. rods, which extend up into the columns for a distance of 20 ft. The length of the trestle is 2,329 ft., with 2,090 ft. available for stocking ore.

On Wednesday evening the two groups, from the Marquette and the Menominee ranges, were reunited at Iron Mountain. Through the courtesy of the Midvale Steel Co., a moving picture film, showing iron ore from mine to finished product, was shown at a local theatre. The various stages of operation were explained by Mr. Richardson, of that company. Following this, William Kelly spoke with respect to an earlier visit of the Institute to the Menominee Range some thirty years ago. Mr. Kelly then introduced Mr. Hoover, who spoke briefly on the engineer's connection with reconstruction problems.

At Minneapolis and St. Paul

UPON the arrival at Minneapolis, many of the members went to the Curtis Hotel, the temporary headquarters in that city. At 10 o'clock the technical sessions at the University of Minnesota commenced, and were as follows:

Session on Mine Practice, Herbert Hoover presiding; session on Geology and Resources, W. H. Emmons, presiding; session on Oil and Gas and on Non-Ferrous Metallography, C. E. Julihn presiding. At the session on mine practice, A. J. Strane presented his paper on "Modern Commercial Explosives and Their Uses." Robert Linton in presenting a discussion of his paper, "Standardizing of North Butte Mining Co.," used a number of stereopticon as well as cinema views, thereby adding greatly to the interest of his paper. The plan now in force at the North Butte has been most successful in securing efficient results, and the methods employed have the full confidence and approval of the men.

The paper, "Mining Methods and Costs at the United Verde Mine," by H. De Witt Smith and W. H. Sirdevan, was read by Mr. Smith and was illustrated by stereopticon views. F. A. Wildes, State Superintendent of Mines, outlined the work of his department in keeping in touch with the work done by operators on state properties. This department maintains a full corps of mining engineers and assistants.

Oil and Gas To Be Discussed at St. Louis

The other papers included in the session were omitted owing to lack of time. There being no discussion at the session on Oil and Gas, this was postponed until the St. Louis meeting, when it is expected that matters pertaining to those subjects will be fully considered.

At the geological section, over which W. H. Emmons presided, the first paper, "The Dip Needle in Stratigraphy," was presented by the author, H. R. Aldrich, and attracted considerable discussion. The possibility of the further use of the dip needle, even outside of the iron regions, in detecting and following formations beneath a moderate thickness of overburden, was discussed by the author and by W. O. Hotchkiss, and the necessity for caution was emphasized by Carl apffe. The paper on "Exploration Methods on the Gogebic Range," given by Mr. Hotchkiss, was concise and convincing in its delineations of the various factors controlling ore deposition on the Gogebic and the most economical and efficient methods of exploration by diamond drilling and crosscutting. In debate, Mr. Hotchkiss was praised for the spirit he had shown in making public these valuable criteria, which had resulted in substantial saving at various properties.

The paper on "Application of Ball Mills in Southeastern Missouri," by Lewis A. Delano and Harold Rabling, was read by title, the authors not being present, but Mr. Greenfield presented a carefully prepared comment, touching in turn the various features of the original paper. The paper on the "Geology and Ore Deposits of the Jerome District, in Arizona," was presented briefly in abstract by Mr. Harper for the author, Louis E. Reber, Jr., who was absent. This is the geology of the United Verde and neighboring mines, and so is of great interest. The ore deposits are pre-Cambrian, and presumably genetically connected with a batholithic intrusion which outcrops in a neighboring area.

While at the University of Minnesota, many of the engineers visited the Mines Experiment Station, on the college campus, where a magnetic concentration test was in progress throughout the day. The test included magnetic cobbing at coarse sizes, followed by fine closed-circuit grinding in a ball mill, with concentration in a magnetic log washer, dewatering in a continuous filter, and sintering.

For the purpose of organizing a chapter in the Twin Cities, Mrs. Arthur S. Dwight, president of the Woman's Auxiliary of the A. I. M. E., met the ladies who are members, and those who are interested, at the home of Mr. and Mrs. H. V. Winchell at 10 o'clock on Thursday morning. Mrs. Dwight explained the activities of the auxiliary, but no steps were taken for the formation of a definite chapter, although Mrs. Winchell was appointed temporary chairman.

Senator Kellogg Speaks

The noon lunch was held at the St. Paul Hotel, St. Paul. U. S. Senator Frank Kellogg was introduced, and gave a short talk on the visit of the engineers to northern Minnesota. Following Mr. Kellogg, the Rev. Mr. Ferguson, who represented the Mayor of St. Paul and who is a member of the City Commission, bade the engineers welcome and paid a splendid compliment to Herbert Hoover for his work during the war. Mr. Hoover spoke briefly on industrial relations and expressed the appreciation of the engineers for the reception that had been tendered them. After the luncheon, automobile parties were formed and the visitors were taken to various points of interest in the Twin Cities. Several of the members played golf at the Interlaken and the Town and Country clubs. Among points of interest visited were the various flour mills and the plant of the Minneapolis Steel & Machinery Co. This company has constructed some of the largest mills and smelters in this country, and is now building the magnetic separation plant at Babbitt, on the eastern Mesabi Range. Some of the members visited the display rooms of the W. H. Ziegler Co., where an exhibit of mine railway equipment and supplies was shown.

The banquet, held Thursday evening at the Curtis Hotel, was preceded by an informal reception in the parlors. Immediately after being seated the guests were surprised to have all the lights extinguished, and a blaze of light at one end of the hall made it evident that several miners, dressed in slickers and wearing the regulation iron-country underground hats, had entered the room. The "miners" burst into song, and following that distributed a number of unique ash trays bearing the seal of the A. I. M. E. These were made and presented by the F. C. Orn Iron Co.

In introducing William C. Edgar, former editor of *The Bellman*, and now editor of the *Northwestern Miller*, Phillip N. Moore, past president of the Institute, announced his function as that of "introducer of introducers." Mr. Edgar acted as toastmaster in a most able manner and soon demonstrated his ability to ap-

pear at home in any company even though he is not an engineer. Fred B. Snyder, president of the Board of Regents, University of Minnesota, was the first speaker, and he outlined the history of the state, calling special attention to the importance of Minnesota as a flour center and as an iron producer. He mentioned the subject of the tonnage tax and spoke of this as being one of the factors that might hamper development of Minnesota's iron-ore resources, unless steps were taken to keep this tax within reasonable limits. He also spoke of the beneficiation work that is being done at the experimental school and elsewhere.

Mr. Edgar then introduced J. E. Spurr, Editor of *Engineering and Mining Journal*, who responded in a light vein. Mr. Spurr said that he was called in as a substitute for Mr. Winchell at the last minute, having been advised of his departure for Alaska only a few days before. Mr. Spurr told of some of his early experiences on the Mesabi Range and outlined the difficulties under which the pioneers worked. John E. Hodge, local committee chairman, then read a telegram from Horace V. Winchell to Mr. Hoover, in which Mr. Winchell congratulated him on his accomplishments and stated that the Institute might indeed be proud to have Herbert Hoover as its president.

In introducing Mr. Hoover as the next speaker, Mr. Edgar referred to him as "the greatest living American." Mr. Hoover chose as his subject the establishment of a Department of Public Works and said that such a step is necessary to a broad-visioned national guidance. Engineers must, said Mr. Hoover, exert themselves in engineering policies, and so bring about the proper co-ordination and co-operation of the various engineering functions of the Government.

The engineers' special train left the Union Depot at Minneapolis for the Mesabi Range at 11:30 p.m.

Mr. Snyder's Address

In his opening address, Fred B. Snyder spoke in part as follows:

Minnesota lies in the heart of the continent. The early voyageur could pass by water and short portages from the Gulf of Mexico by way of the Mississippi, Minnesota and Red rivers to the Arctic Ocean and by way of the Mississippi, St. Louis and St. Lawrence rivers to the Atlantic Ocean. The New England States could be laid upon her surface, and there would be enough of Minnesota left over to cover half of Pennsylvania. If the waters of her inland lakes could be gathered together, Delaware and Rhode Island could be submerged and leave to view only islands marking the high spots.

Doubtless the industry of Minnesota which most interests you as mining engineers and metallurgists is that of iron. There are, as you know, three iron-bearing ranges in Minnesota, the Vermilion, the Mesabi and the Cuyuna. Of these the greatest is the Mesabi. I would not if I could, burden you with a discussion of its geology. It is a flat, not vertical, formation covered by a shallow surface of glacial drift, susceptible by test pitting and drilling, of very accurate determination as to tonnage, metallic content, and structure, in advance of opening up. One-half of the ore in the Mesabi Range is subject to open-pit steam shovel mining at very low cost. Today approximately 70 per cent of the ore produced is won by open-pit methods and the remainder from underground operations where ore is cleanly mined with less than 5 per cent loss.

Work of Winchell and Spurr Praised

The first published scientific data about the Mesabi was issued under the State Geological Survey conducted by the University. N. H. Winchell was at the head of the survey, and he was ably assisted by his son, Horace V. Winchell, who was president of this organization last year, and J. E. Spurr, both of whom have achieved distinction in geological work.

The Mesabi Range has been the controlling raw material factor in the iron markets of the world since the true values of its ores became known. It made possible the organization of the United States Steel Corporation and the entrance of the United States into the steel markets of the world. Many furnaces in the valley districts have been remodeled or built to use exclusively Mesabi ores.

The extent of this influence may be gathered from the following data furnished by O. B. Warren, whose reputation as an authority on all questions relating to the iron ore resources of Minnesota entitles him to full credit. During the three-year period ending with 1917 the United States produced an annual average of 35,000,000 tons of pig iron, which required 70,000,000 tons of iron ore, and was one-half of all the pig iron produced in that period in the world. The increase in production of pig iron in the United States has been far greater than in other countries. This result can be traced largely to the influence of the Mesabi Range.

Mesabi Range Production

The first ore from the Mesabi Range (4,245 tons) was shipped in 1892. The annual average for the three years ending 1907 was 24,000,000 tons and for the three-year period ending 1917, 38,000,000 tons, out of a total of 70,000,000 tons, the yearly average consumed during the same period in the United States from all sources. The United States will annually need from all sources on the average for the three years ending 1927, 101,000,000 tons; for the three-year period ending 1937, 124,000,000 tons and for the three-year period ending 1947, 129,000,000 tons. To produce her proportion of this ore the Mesabi must annually yield on the average for the three-year period ending 1927, 60,000,000 tons; for the three-year period ending 1937, 74,000,000 tons. Then, gentlemen, witness the astonishing result: The Mesabi will have passed the peak of her load and during the last three-year period ending 1947 she will be able to produce only annually 55,000,000 tons. In other words, making allowance for all known ore reserves on the Mesabi and adding thereto 500,000,000 tons for new discoveries, the maximum burden on the Mesabi Range will be reached in less than twenty years. When that day comes, indeed in anticipation of it, the supremacy of Minnesota as an iron-

producing state will have passed unless something is done to change the situation, because furnace men in anticipation will seek supplies in the old ranges in Wisconsin and Michigan and in Sweden, Spain, Chile, Cuba, Brazil or elsewhere, and docks, plants and equipment will be permitted to wear out without new replacements.

And now a word about the ad valorem system of taxing iron properties in vogue in this state. Under the Minnesota law all real estate is valued at its true value, and then for the purpose of taxation is placed upon the tax books at 50 per cent of such value in the case of iron ore, 40 per cent in the case of city property, and 33⅓ per cent in the case of farm property. Doubt has been expressed about the method employed in the various taxing districts of the state for ascertaining the true value of property other than iron ore, but there can be no doubt as to the method employed to determine the value of iron ore. As to this class of property the data of all explorations, the results of test pitting and drilling, with accurate and complete blue prints, must be filed with the Minnesota Tax Commission, which submits the same to the School of Mines for a scientific determination of the tonnage and grade of the ore. The property is then assigned by the Tax Commission to a certain class, based upon the immediate or deferred availability of the ore deposit, and its value for taxation purposes ascertained by multiplying the tonnage by the rate per ton fixed for the class in which the property is placed. As a result of this system iron ore pays enormous taxes, in some cases as high as 60c. per ton on the average annual output of the mine. And yet there are those who clamor for an added or super-tax in the nature of a tonnage tax on the ore as it comes to the mouth of the mine.

I consider the present method of mineral taxation in Minnesota one of the greatest drawbacks to the maintenance of the supremacy of Minnesota as an iron producer beyond the year 1940, for the following reasons: There are many strong magnetic attractions running parallel with and lying north of the Cuyuna and Mesabi ranges and extending to the Dakotas and the Canadian border. These and unexplored available land near the known ranges should be explored, and would be were it not for the fact that the finding of an orebody is penalized by the imposition of taxes too burdensome for individuals to carry. After diligent inquiry I cannot learn of a single drill now at work by private exploration enterprise seeking iron ore in Minnesota. Individuals who now own iron-ore properties which they have developed in the past are, unless they have large outside resources, forced either to become operators, in which case the price of their ore is fixed in Cleveland, and they have no chance, without transportation and furnace facilities, to make up a loss in operation, through profits on the pig iron or finished product—or they must dispose of their property to the large Eastern corporations. Thus all individual initiative is throttled. Iron ore in Minnesota will be mined and removed as fast as possible while reserves in other states where taxes are less burdensome will be held for the future. These objections will all be made more evident if a tonnage tax is added to the present burdensome ad valorem taxes.

The Address of J. E. Spurr

The remarks of J. E. Spurr follow, in part:

Some men are born eloquent, like Mr. Bradley Stoughton; some, like Mr. Hoover, achieve eloquence; and some have eloquence thrust upon them. I do not belong to any of these groups, but of all I come nearest to the third. While we were plowing the placid waters of Lake Erie Stoughton came to me with a telegram indicating that our honored past president, Horace Winchell, had some time before set sail for Alaska, and had designated me his literary, scientific, and post-prandial executor, appointing me his proxy to represent him in and for Minneapolis. I said to Stoughton, "Why did Winchell think I should represent Minneapolis?" "Oh," he said, "It's a very good choice; you could pass for a Swede anywhere." I protested that I had not brought my dress suit. I have had a number of cards printed, addressed to myself, which I shall distribute after the exercises, and if you will put your name and address on one and send it to me I will mail you a picture of my dress suit. You can thereby assure yourself that I have a perfectly good dress suit, of the vintage of 1902, with additions of the Roosevelt period.

Anyhow I have had some very pleasant experiences since then, that have partly compensated for the mental anguish I have suffered between then and the present moment. You know it is a very pleasant thing to be distinguished and popular. I attended the picnic at Eagle Harbor the other day, for example, and I noticed a lady regarding me with the greatest of interest. Finally she spoke to me. "Would you mind," she said, "stepping a little to one side? I want my little girl to see Mr. Hoover."

Now, as a personified proxy, how shall I represent my principal, Mr. Winchell? I am convinced that he did not designate me because of any personal resemblance; but possibly because I long ago spent a year in Minnesota, saw and experienced intensively some of the rough and early days on the Mesabi Range, and was domiciled for a while in Minneapolis. He knew that I knew that Minneapolis is not a suburb of St. Paul. He remembered that at one time we both qualified among the champion bean eaters of the North Country. You know that is one of the hardships of New York, for anyone who was born near Boston and educated in Alaska, with a prep-school course in Minnesota: there isn't a decent beanery in the whole town. They have an Engineers' Club in New York, but I blush to say that you can't get bacon and beans there. Not much like the old Palace Hotel in Tonopah, where they tried to put on style. They had a restaurant, bar-room and roulette game downstairs and six bedrooms upstairs. They had one waiter, who was a graduate of Oxford, and very punctilious. A stranger sat near me one day, and this waiter was altogether correct. "Yes sir. Dinner will be ready in a moment, sir." And then, "Dinner is served sir. Will you take beans, sir?" "No, I don't care for beans." "In that case, sir, dinner is over, sir."

I confess that it gives me a peculiar satisfaction to be able to attend a function of this distinguished asso-

ciation of mining engineers in Minneapolis, and still more to visit once again the great Mesabi iron-bearing range.

I shall not soon forget the Mesabi. And very particularly do I remember Hibbing. Three of us had made a reconnaissance as far south as Cloquet, and when we left the range the furthest place westward which had been cut out of the forest, so far as we knew, was Mountain Iron. Striking north from Cloquet late in the fall, with packsacks, we followed an Indian trail northward. About the time our grub gave out the trail ended in a little lake; and this lake was not frozen thick enough so that we could travel over it, so we started around it northward through fallen timber. It became very cold that night and we huddled around a fire most of the night to keep from freezing. Next day we unexpectedly came to a line which had been newly cut for a railroad, and following along it we discovered the town of Hibbing, which we had never heard of before.

It was a wide-open town, half the population had typhoid and the other forty danced all night in the hotel. The saw and the hammer were going on very busily here; there was already a hotel. The hotel had two rooms: a combination bar and dance-hall downstairs and a bedroom upstairs. One of our party lit out for the East and the other two of us took a bed in the bedroom and tried to sleep. There were a score of beds in the room and no doors and no lights; and as soon as we went to sleep the revelry started in the room below. There would be a dance, a round of drinks, a fight, another dance and so on indefinitely. Whenever a man got too drunk to dance he started for bed and climbed into the first bed at the head of the stairs. This happened to be ours—we kicked him out and he went to the next bed and crawled in with his boots on. Pretty soon the next man came up, and crawled into our bed, was kicked out, and came to anchor in the third bed. In the course of time the next one made the rounds of the first, second and third beds, and finally found peace in the fourth bed. It was not a quiet proceeding either, and when the dawn came the game was still going on and we had not closed an eye.

We got up and traveled down the board sidewalk that was laid on top of the stumps, and we came to a house that a man was putting up for himself. He had one room finished off, and in the corner there was a pile of the nicest, loveliest shavings you ever saw. We asked him how much he would charge to let us spread our blankets on these shavings, and he said, "Go ahead." The weather was zero, but I never saw a hotel that looked more luxurious to me. Looking at it now, however, I can say to you gentlemen from Hibbing, if there are any here tonight, that I don't like your hotel accommodations.

Mr. Hoover's Address

HERBERT HOOVER'S address at the banquet of the American Institute of Mining and Metallurgical Engineers, at the Curtis Hotel, Minneapolis, on the evening of Aug. 26, was in full as follows:

The time has arrived in our national development when we must have a definite national program in the development of our great engineering problems. Our rail and water transport, our water supplies for irrigation, our reclamation, the provision of future fuel resources, the development and distribution of electrical power, all cry out for some broad-visioned national guidance. We must create a national engineering sense of provision for the nation as a whole. If we are to develop this national sense of engineering and its relations to our great human problems it must receive the advocacy of such institutions at this.

We, together with our sister engineering societies, represent the engineers of the United States. It is our duty as citizens to give voice to those critical matters of national policy which our daily contact with this, the fundamentally constructive profession, illuminates to us. Just as our medical associations voice the necessity of safeguards to national health; as the bar associations safeguard our judiciary, so the engineers should exert themselves in our national engineering policies. We have none, but we need some, or the next generation will face a lower instead of a higher standard of living than ours.

Must Co-ordinate Development

The development of our transportation, fuel, power and water under private initiative has been one of the stimuli that have created the greatness of our people. It has been easy to compass when the problems were more local and filled with speculative profits. There, however, arises a time when this haphazard development must be co-ordinated in order to secure its best results to the nation as a whole. This system has given us a 50 per cent result; if we are to have 100 per cent we must have a national conception and national guidance. This last 50 per cent involves problems beyond individual initiative alone.

Not only is individual initiative insufficient because the problems involve political, financial, interstate matters beyond corporate ability, but we have, with practically unanimous consent of the country, adopted a policy of the limitation of profits in the operation of public transportation and power and some other utilities, and through the pressure of public opinion we are rapidly coming to a limitation of profit in the development of other large sections of national resources which tend to become natural monopolies. While the limitations of these profits makes for public good, on the other hand they also militate against individualistic development of national resources and necessitate the co-operation of the community as a whole to secure initiative for wider development in the national sense.

Conservation Is National Concern

Certain of our national resources have always been in national ownership, such as waterways. Certain others, such as reclamation, irrigation, distribution of water for power, are rapidly coming under Government control. In others, such as timber, coal, and oil, the possible exhaustion brings their conservation or provision for the nation's future into national concern. In our railway

problem national action has until recently been directed wholly to limitation of profits. Latterly it has undertaken to regulate wages and give some small recognition to the necessity of equipment. But microscopic attention has been given to the greater problem of how to get more transportation, to get it so organized as to secure real economic operation in its broad sense.

We have a long list of such problems. Some of these have been discussed before the Institute on previous occasions. I may refer to our discussion of eastern bituminous coal. During the past year the Institute undertook to look into the economic situation of this industry as a national whole. It was demonstrated to be the worst functioning industry in the country. Owing to seasonal and other irregularities of demand, the average term of employment in the bituminous industry is less than 190 days per annum. If this industry could be operated a normal work year 125,000 men could be turned to other production. It is an industry in which 30 per cent more capital is invested than would otherwise be necessary. The cost of coal to the consumer and the risks to the operator are greatly increased, and, above all, it presents a great human problem fraught with all the terrible misery and strikes and justified discontent that flow from intermittent employment.

Solution Beyond Individuals

I am not proposing nationalization of the coal mines; far from it. What is required is that we should realize that with our necessary social view of prohibition of combination there remains a national problem beyond the solution of any individual coal operator or any group of operators. It must have national guidance and national plan for its solution, a co-operation of great consumers, railways, operators and miners—but what individual operator can do this?

In respect to our coal supplies again, if we would look forward to the next generation, we have a problem of conservation of immense importance. In this connection, it has been ably proposed by our members that the national government should co-operate in investigating the possibilities of the establishment of a great electrical trunk line throughout the great power consuming districts of the northeast, and that we should feed into this great power road power generated at the mines and available water sources, drawing from it at every town and city. The consummation of this project means cheaper power to all consumers. It means a great economy in consumption of coal. It means more regularity in output. It thus means greater ability to compete in world manufacture. It means great relief to the railways from expansion. It means an increased standard of living and a decreased cost of living to a very large section of our population. We have again much such a problem in providing adequate power resources upon the Pacific Coast, where today hundreds of thousands of acres of fertile land are practically non-producing for lack of pumping power.

Mountain Water Storage Problems

Of other problems akin to this, we are confronted throughout the west with the fact that a large portion of our average low water supply is already under engagement for irrigation and power. The time has come when that expansion of the land available for cultivation, or into more intensive cultivation, is a factor of mountain storage of water to increase our stream flows in the low season. We have thus a storage problem on a scale we have not hitherto dreamed of, and, again, it is a problem involving co-operation in financial, economic, distribution, navigation—interstate questions, in which individual initiative must have the assistance of the community.

Another series of such problems lies in our oil supplies. If we are to have a mercantile marine and to maintain our navy on a basis of equivalent efficiency with foreign navies, if we are to maintain the development of the gas engine—the greatest lift in our standard of living and saving of labor in fifty years—we are confronted with the necessity of securing additional oil supplies from outside our own boundaries. Our own supplies, so far as now known, do not represent twenty-five years at our present rate of consumption. The Institute many months ago was the first to give warning to the Federal Government of the gradual absorption of all of the oil sources of the world by other great powers, and that within a short time we should be dependent upon the good will of those powers for our necessary oil supplies. No private individual can compete with foreign governments in the measures that they are adopting to hog the resources of the world. This problem again is an engineering problem that requires more than private initiative.

Transportation Tax Heavy

A problem of even more pressing importance than these is the whole question of transportation. Our inability to move the commodities which we create is stifling production. It is increasing the cost of distribution and has placed a tax on the American people in decreased production and increased cost of distribution greater than all the taxes imposed by the war.

We have today in Minneapolis ample proof of the frightful cost imposed on the farmer, consumer and public. There is a premium over freight cost from 10 to 20c. a bushel for wheat at the mill door compared to wheat in the elevator a few hundred miles away, solely because cars are not available. Either the farmer is losing the amount or the consumer is paying it. Furthermore, to carry the picture further, the railways, in endeavoring to remedy this, are diverting cars from the lumber industry. Already certain mills are partially closed; men are thrown out of employment in the mills and in the building trades. Is this not a price in human misery and national efficiency that warrants some national concern? It is a problem that does not lie alone in expansion of railway facilities. It lies also in the proper expansion of waterways and their co-ordination with the railway transportation of the country.

Congressional Waste

We have been dabbling in the improvement of water transportation of the United States for 100 years, and so far as I know never yet have we considered it as a problem requiring complete co-ordination of the entire transport problem for the whole country. We have spent enough money improving useless creeks to have made several competent waterways. Every Congressional district in the United States has looked for appropriations for carrying mud from one hole to another as their proper participation in the national plunder. They have never considered that the taxes taken from the people as a whole should be devoted to those points that will benefit the people as a whole.

One result of the policy pursued has been that our waterways have been so badly handled that they have not been able even to compete with the railways, and today, with an enormous increase in railway rates, we find ourselves utterly unable to handle the great bulk commodities of the country at the possible lower charge over our waterways. The opening of the St. Lawrence to ocean-going vessels means 5c. a bushel to every farmer in ten states. Likewise, of no less importance to the people of the entire country are our internal waterways.

These projects have a simple result in the engineer's mind: they make greater production possible with less human effort; they increase the standard of life; they provide for our children. All these problems are much akin, and the time has come when they need some illumination, guidance, and co-operation in their solution from the Federal Government. Nor do I mean a vast extension of Federal bureaucracy in Federal ownership. If, in the first instance, through an agency of the central government, we could have an adequate study and preparation of plan and method made of these problems of engineering development over the next fifty years, viewed solely in their national aspects, we would have taken the first step toward the adequate provision of an increasing standard of living and a lower cost of living for our descendants.

The second step is to determine that our government will be a government of co-operation, limiting profits surely, but holding to individual initiative as the single hope of human development. In order that we shall have some central point in the Federal government where these problems may be adequately considered, from which they can be ventilated for the verdict of public opinion, where the business brains of the country can be called into conference and co-operation with the government, and therefore with the people, the engineers of the United States have proposed time and again that a Cabinet department should be established in Washington, either new or to replace the Interior Department, to which should be assigned the whole question of public works.

You are familiar enough with the advantages of such a department from an everyday administration point of view, and enormous saving to the government from the duplication or competition of the six or seven departments now engaged in engineering construction work of this character, but on this occasion I wish to call your attention to the fact that such a department has become an essential from the point of view of proper consideration and presentation to the American people of these broader national engineering problems, upon which the next generation must depend if our country is to march forward.

Duluth and the Mesabi Range

THE special train arrived at the Leonidas mine at 8 and the visitors were met by members of the Engineers' Club of Northern Minnesota, under whose auspices the entire trip of the Mesabi Range was made. A. Tancig, president of the club, was in general charge of the arrangements, and the various committees were headed by members. The carrying out of all the details was characteristic of the way Minnesota people have of doing things, and the entertainment arranged was complete in every particular.

The Leonidas Concentrator

At Leonidas the party was joined by a number of the officials of the Oliver Iron Mining Co., who made the trip from Duluth by special train. Among these were J. H. Hearding, George D. Swift, and also E. E. Hunner, of the M. A. Hanna Co. As soon as the crowd was assembled parties were made up and the visitors were taken through the Leonidas concentrator. This plant has a capacity of 2,500 tons per ten-hour shift and has a total rated motor capacity of 992 h.p. The water is supplied from Manganika Lake, one mile from the plant, through 12-in. spiral riveted pipe by two 8-in. two-stage centrifugal pumps. The pumps have a capacity of 1,600 gal. per minute each, and are driven by 150-hp. motors. The washing is accomplished by means of a 35-ft., Hutch type, Allis-Chalmers log washer operated by a 50-hp. motor. From the washing plant the visitors were taken by automobiles to Virginia, where an inspection of the Virginia & Rainy Lake Lumber Co.'s mill was made. This mill boasts of being the largest white-pine mill in the world, and has a capacity of one million feet per day.

Before returning to the special train, which was temporarily parked near the headquarters of the Oliver Iron Mining Co. at Virginia, several of the members of the party visited the neighboring mines. At the Missabe Mountain mine, one of the 350-ton steam shovels was seen in operation. Dump cars which are operated by compressed air and have a capacity of 20 cu.yd. are used here on stripping operations. At the Alpena mine the visitors had an opportunity to see an open pit in its last stages, for here all of the steam-shovel work has been completed and the little ore remaining is being removed through the shaft.

Some of the members motored east to Babbitt, where the Mesabi Iron Co. is erecting a mill for concentrating and treating low-grade iron ores on the Eastern Mesabi Range. The initial unit of the plant under construction will have a capacity of 3,000 tons of ore per day, and it is estimated that about three million dollars will be spent in the erection of the plant and the establishment of the town site. The work is in charge of W. G. Swart, and the construction is being done by the Minneapolis Steel & Machinery Co.

The greater number of the visitors were taken to the western portion of the Mesabi Range. The first stop was made at the Wabigon mine, where a 300-ton electrically-operated shovel was in operation. At the Sherango mine the visitors were treated to a little excitement in the form of blasting. A number of blasts were shot off, which demonstrated the methods generally used in open-pit practice. It was impossible to include in the itinerary a trip to the Buffalo pit, as originally planned, owing to some of the delays which had been incurred en route.

Upon reaching the Oliver headquarters at Hibbing the visitors boarded flat cars and were taken through the Hull-Rust, Mahoning, and Sellers mines. During this trip the engineers had ample opportunity to view the up-to-date methods which are used in open-pit practice. All-steel air-dump stripping cars of 20- and 30-cu.yd. capacity are used; and 91-ton steam shovels, having 4½ to 5-cu.yd. dippers, which have a capacity of 9,000 tons per ten hours, as well as 350-ton shovels, having 8 cu.yd. dippers, which can move 10,400 tons per ten hours, were seen in operation. The tracks are laid in 30-ft. sections by a wrecker, the ballasting is done by means of a clam-shell, and the ties are tamped into place by gasoline-driven air tampers. On the stripping dumps the tracks are shifted by means of wreckers and track-lifters, and the dumps are leveled by spreaders.

Returning from the pit, members of the party were driven to Bennett Park, where an elaborate lunch had been prepared, and this was followed by a band concert. Afterward, the ladies of the party were taken to the Public Library and there inspected the building which embodies features seldom seen in mining communities. In addition to an excellent library there is a complete stage equipment; a model flat, completely furnished, is on exhibition, and other features which encourage a community spirit are in evidence.

The Technical Session

The technical session, which was held at the Lincoln High School, was presided over by W. G. Swart. The first paper, "Utilization of Titaniferous Iron Ores," by J. A. Heskett, was presented by title only, and no discussion followed. "Casting and Molding Steel Ingots" was read by the author, Emil Gathmann. There was a little discussion following this, but it was largely on the use of castings. Secretary Stoughton stated that the presentation of the papers of the evening was perhaps out of order, considering the fact that there was little of interest to the iron-ore miner, but there had been, he said, no papers offered from that section for this year. He expressed his appreciation of the excellent arrangements which had been made by the Engineers' Club of Northern Minnesota for the reception of the A. I. M. E. Following the presentation of the paper, "The Acid Bessemer Process," by Richard S. McCaffery, there was some discussion by Mr. Stoughton and Prof. Joseph W. Richards. The last paper, "A New Occurrence of Proeutectoid Ferrite," was commented on briefly by the author, Charles Y. Clayton, and was discussed at some length by E. E. Thum, of *Chemical and Metallurgical Engineering*. Following this session an athletic program was held at the armory.

During the small hours the special was moved from Hibbing to Coleraine, and immediately after breakfast the visitors were taken on flat cars to the Canisteo pit, where part of the ore now being treated at the Trout Lake concentrator is being mined. They were then taken to the concentrator. The Trout Lake concentrator has a capacity of about 20,000 tons per day, with all units operating. The machinery is arranged in five units, each complete and capable of independent operation. Each unit consists of the following:

One crude ore bin and one bar grizzly.

One 20-ft. conical revolving trommel with 2-in. openings.

One picking-belt, to receive and convey the trommel oversize to the concentrate bin. (The taconite chunks are picked off the belt by hand and dropped into a rock bin.)

Two 25-ft. log washers, one on either side of the trommel to treat the trommel "throughs," discharging a product into the concentrate bin.

Two chip-screens, one for either "log," receiving "log" overflow.

Two settling tanks receiving chip-screen "throughs."

Two 18-ft. "turbos" (small log washers to treat fines), receiving the tank settlings, discharging a concentrate directly into the concentrate bin.

Four settling tanks receiving the overflow from turbo and first settling tanks.

Twenty Overstrom tables, arranged in two rows of ten each, to treat the settlings from the four settling tanks just mentioned.

Eight Frenier spiral sand pumps (four primary and four relay), to pump the table concentrates to dewatering tanks from which they discharge directly into the concentrate bin.

At 10 a.m. the party took the special train which had been switched to the tracks at the lower end of the concentrator, and at 1 o'clock Duluth was reached. Immediately upon the arrival of the train representatives of the Engineers' Club of Duluth assigned various parties to several optional trips, all of which were well attended.

At 5 all the parties were on the steamer "Rotarian" for an excursion through the beauties of Duluth Harbor, with its various industrial monuments. This trip took till nearly 9 o'clock, and was the occasion for a general final fraternizing in the spirit which marked the whole meet. A choice of box luncheons was served, a "Mining Lunch" and a "Metallurgical Lunch." The former was the more substantial, though the latter was more delicate and with a couple of extra frills. The State Geologist of Wisconsin, who disappeared with eight "Metallurgical Lunches," established the further formula that eight metallurgical lunches equal one geologist's lunch.

On landing the party split, some to return to Chicago at 9 p.m. by special train, on which the same perfection of arrangements was observed, and part to return to Buffalo by the Lake steamers.

The smoothness of the arrangements and the conduct of the whole trip of the Institute in the Lake Superior country was evidently largely due to the energy of the able Secretary of the Institute, Bradley Stoughton, and his well-chosen aide, J. T. Breunich.

The "Hand Book of Mining"

A write-up of the A. I. M. E. trip would be incomplete unless some mention were made of the various programs which were prepared by the local committees at each point. These were, in every case, most elaborate and represented painstaking preparation on the part of those who had the work in charge. Of intense interest was the "Handbook of Mining," which was prepared jointly by Alexander N. Winchell, the Engineers' Club of Northern Minnesota and the Duluth Engineers' Club. The book consists of 260 pages, is well illustrated with photographs and maps, and contains a wealth of data concerning the districts visited. These were distributed at Buffalo as the party were starting on the Lake trip. Covering every phase of mining, milling, and metallurgy in the Lake Superior district, in addition to other facts, the book proved to be a veritable Bedaeker and was in constant use as a reference.

Mining Methods and Costs at the United Verde Mine

By H. DeWitt Smith, E. M., Jerome, Ariz., and W. H. Sirdevan*

THE mine operated by the United Verde Copper Co. is situated near Jerome, Ariz., at an elevation of approximately 5,500 ft. above sea level. From the time of its location, in 1876, until its purchase by Senator W. A. Clark, of Montana, in 1889, the United Verde mine was worked on a small scale, and shipments of high-grade gold-silver ore were made from the surface workings. The approximate total amount of ore mined up to the end of 1918 is 8,200,000 tons. The production of the five years, from 1914 to 1918 inclusive, represents 40 per cent of the total mine ore production.

For the convenience of smelter operation, the ores mined are divided into four classes, each of which must be handled separately in all mining operations. In addition to these ores, a small amount of precipitate is recovered from the copper-bearing mine waters and shipped directly to the smelter. All present exploration and development work, stoping methods, tramming, hoisting, and ventilation systems, are planned with the definite purpose of providing and maintaining an underground production of 3,000 tons of ore per day, with the possibility of a further increase to 4,500 tons per day, if mine and market conditions should warrant this additional output.

To maintain an underground production of 3,000 tons of ore per day, it is necessary to develop 100 ft. in depth every year, and to drive 25,000 ft. of drifts and raises for exploration and development work. During the last few years, an average of thirty-four tons of ore has been developed per foot of development work. This high figure has been due to the character of the ore-bodies, which are large, persistent, and concentrated within a relatively small area. This advantage is partly offset by a high average cost for all exploration and development.

Working Three Shifts, But a Fourth Now Being Concreted

At present there are three working shafts at the United Verde mine. These are called No. 3, No. 4, and No. 5. A fourth shaft, No. 6, is being concreted and should be in operation by December, 1920.

The most economical interval between levels has been found to be 150 ft. A closer spacing increases proportionately the cost of level development per ton of ore mined. In mining under a filled stope, it is necessary to extract three or four floors directly beneath the level by the use of square sets, a more expensive mining method than the horizontal cut-and-fill method generally used for the remainder of the stope. With a level interval of 100 ft., approximately 20 per cent of the total ore must be mined by the square-set method, whereas the corresponding ratio is only 15 per cent when the level interval is 150 ft.

A 200-ft. level interval (1,000 ft. to 1,200 ft.) was found unsatisfactory. The increased cost for raise development, the high cost for maintenance of the ore chutes in the stopes, and the necessity of providing a sublevel for development halfway between the two levels, more than offset any advantage gained by using the longer lift.

On account of the difficult drilling ground at this mine, it has proved economical to place all drilling operations under the supervision of one engineer. His duties may be enumerated briefly as follows: (1) To keep a detailed record of all drills underground and to see that they are kept in the best working condition; (2) to test new types of drills as they are received from the manufacturers; (3) to record and analyze the work accomplished by the drill bits; (4) to see that the type of round best adapted to the class of ground being drilled is used in all development work; and (5) to carry on experimental work relative to air pressures, hose, hose connections, valve designs, and other operating factors.

Formerly the bottom cut was used exclusively, whereas in the present practice the pyramid cut is standard for all drift rounds from a clean set-up. The bottom cut is still used whenever it is necessary to set up a crossbar before the drift has been cleaned out, as it requires the drilling of only two or three holes from the lower set-up.

Diamond Drilling

Diamond drilling at the United Verde mine serves two purposes: long holes are drilled to determine the different geological formations, and massive sulphide areas are developed and blocked out by numerous short holes. It has been found that the diamond-drill cores from schist areas cannot be relied on for accurate data on the mineralization. Consequently, the drill is used to locate and determine the size of schist areas, and the actual development is performed by drifts and crosscuts. The assays of cores from the massive sulphide areas have been found to check closely with subsequent drift development work. For this reason, and because of the high cost of drifting in such areas, exploration of the massive sulphide areas and the delimitation of the boundaries of large sulphide orebodies are usually done by diamond drilling.

Stoping

The stoping methods and their relative importance are given in the accompanying table. The relative importance of these methods is rapidly changing at this time (December, 1919).

STOPING TONNAGE AT UNITED VERDE MINE, 1918

Method of stoping	Dry Tonnage Mined	Per Cent of Total
Horizontal cut-and-fill	468,000	58.5
Incline cut-and-fill	11,200	1.4
Square-set and fill	68,000	8.5
Shrinkage and fill	117,000	14.6
Glory hole	136,000	17.0
Totals	800,200	100.0

Glory-hole mining will be abandoned in favor of open-cut steam-shovel mining early in 1920. No ground has been developed recently on the lower levels that will permit the use of shrinkage methods. Consequently, in future work, horizontal cut-and-fill and square-set will be the chief methods employed in under-

*Abstract of a paper presented at the Lake Superior meeting of the A. I. M. E., Aug. 23-28, 1920.

ground mining, with subordinate use of the incline cut-and-fill method where applicable. A system of shrinkage stoping with pillar caving will be used for a converter orebody in quartz porphyry.

Shrinkage stopes are used only in hard ground in massive sulphide areas. The shrinkage method shows a lower cost for timbering and waste filling than any other method used, and, in addition, permits the accumulation of a large reserve of broken ore.

The incline cut-and-fill method has been used on a few narrow orebodies, where one wall was too weak for the application of the shrinkage method and where there were no diorite dikes cutting through the orebody.

STEAM-SHOVEL MINING

Most of the orebodies above the 500-ft. level are at present bulkheaded and inaccessible on account of mine fires. As the ground in this area was generally badly fractured, square-set methods were necessarily used. By the use of the plenum system of forcing air under pressure into the fire stopes, it was found possible to mine this ore, but only at an extremely high cost. The present plan, now under way, is to strip a total of 14,000,000 cu.yd. overburden and complete the mining of all the orebodies of the mine to the 500-ft. level by open-pit steam-shovel methods. It is estimated that approximately 5,000,000 tons of direct-smelting ore will be recovered to this depth. This is equivalent to one ton of ore recovered for each 2.8 cu.yd. of overburden removed.

Modern Commercial Explosives And Their Uses

BY A. J. STRANE, E. M.*
Tamaqua, Pa.

EXPLOSIVES may be classified as those that burn and those that detonate. Explosives of the first class include black, blasting, and smokeless powder, and are broadly known as low explosives, or propellants, because they merely burn and do that comparatively slowly. Their action is as if some power behind the projectile or other material were exerting a shoving or pushing action. The high, or detonating explosives produce a smashing or shattering effect upon the material.

In using military explosives of the propellant class, the breach of the gun, or cannon, is proportioned to hold the pressure, so that the projectile will be blown out. Exactly the reverse is true in commercial work; then it is the "breach" or the hole that is to be broken. Therefore, the projectile and the explosive that will rupture the largest "breach" possible are chosen. With the high explosives, it is easy to break out the breach, but with some of the low explosives it is necessary to plug up the muzzle very carefully before shooting.

Doubtless the use of incendiary mixtures of oxidizing and combustible materials led, in the thirteenth century, to the perfection of the mixture which is practically the same as our commercial black blasting powder of today. About 600 years later, nitroglycerine was discovered, but for years its great potential energy could not be used, because, in its liquid state, it could not be safely handled or transported. The accidental discovery that kieselguhr would absorb, and hold fairly well, three times its own weight of nitroglycerine, however, made it available.

"Guhr dynamite," as the combination nitroglycerine and kieselguhr was termed, was soon displaced by dynamites having an active base, such as wood pulp and other carbonaceous combustible materials. These do all that kieselguhr will do, and, in addition, increase the chemical reaction and add materially to the effectiveness of the blast.

An accident is said to have led to the discovery that guncotton will cause the solidifying or gelatinization of nitroglycerine under certain conditions. This discovery gave us "blasting gelatine," which is taken as the standard for *100 per cent explosive*, as its composition is practically 92 parts nitroglycerine and 8 parts guncotton, with a small amount of antacid.

The commercial explosives of today are: Nitroglycerine; blasting gelatine; straight nitroglycerine dynamites of various strengths; straight nitroglycerine gelatines of various strengths; extra or ammonia dynamites and gelatines of various strengths; low-freezing explosives of the above grades; permissible explosives, or coal-mine powders, of various strengths and physical properties; miscellaneous explosives, having special advantages for special work; non-freezing or non-nitroglycerine explosives; and black blasting powder of various sizes.

*Abstract of a paper presented at Lake Superior meeting of the A. I. M. E., Aug. 23-28, 1920.

Hoisting Equipment at Utah Apex Mining Co.

BY J. A. NORDEN AND A. R. WILLSON*
Bingham Canyon, Utah

THE hoisting equipment of the Utah Apex Mining Co. is capable of handling about 1,200 tons per day. It has not been worked to capacity, but 600 to 700 tons, together with men and materials, have been handled in two shifts without great effort.

A Nordberg engine of the double-drum, geared type, designed for a 10-ton load, including rope, at a speed of 1,500 ft. per min., is used. The drums are 7 ft. in diameter, with a 54-in. face, and have a capacity of 3,000 ft. of 1¼-in. rope. The hoist is operated by a 500-hp. 16-pole, round rotor, 450-r.p.m. motor, which drives through a single reduction of 129 to 19. Speed is regulated by the variable resistance of a rheostat of the liquid, weir-control type. A sodium-carbonate solution is used as a conductor.

The current supply is three-phase, 60-cycle, 44,000-volts, which is stepped down to 2,300 volts by a set of three 250-kva., outdoor-type transformers. From the transformers, the 2,300-v. lines are carried to a bus and switchboard in the hoist room. The average load for starting a loaded skip is about 300 amp. for a few seconds; afterward, the full-speed running current is 75 to 125 amp. The hoist is controlled by three levers on the operating platform.

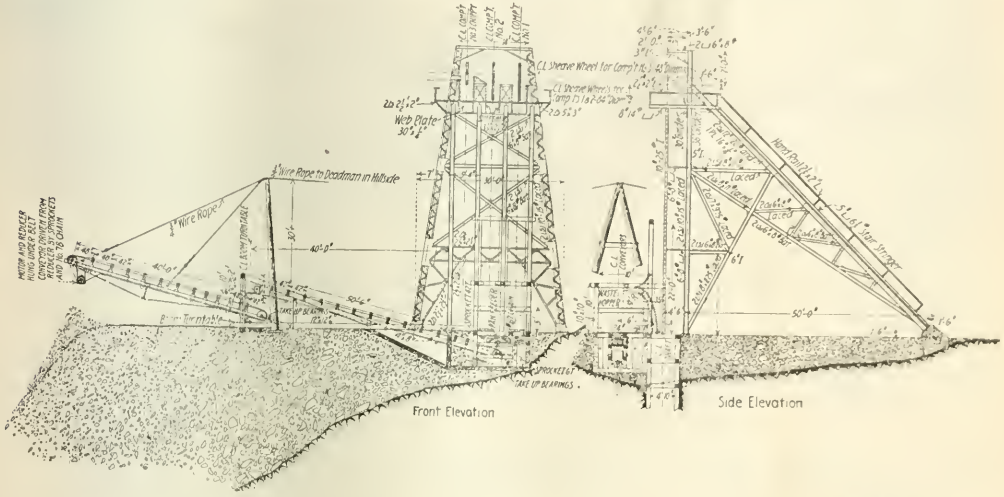
At the present time mining operations are in progress on the 100-, 1,150-, 1,300-, 1,500-, and 1,800-ft. levels. Three classes of material are produced on most of the levels: First-class or direct-smelting ore, second-class or milling ore, and waste. Hence, it was necessary to provide for handling at least two kinds of material simultaneously at the shaft. The 100-ft. level, being as adit, has its own waste dump, but some waste is hoisted to the surface from all of the other levels.

The ore pocket cut on the lower levels is divided into

*Abstract of a paper presented at Lake Superior meeting of the A. I. M. E., Aug. 23-28, 1920.

two parts by a reinforced-concrete wall. The ground is hard, requiring no timber, and a small pillar was left between the main storage pocket and the shaft. Below the storage pockets are measuring pockets which hold one skip load. The top of the storage pocket is covered by an 8-in. grizzly made of 30-lb. rail. On the 100-ft. level, owing to soft ground, it was necessary to build the entire pocket in direct connection with the shaft.

directly over the skip box, leaving only enough room for the latter to work freely. This arrangement would interfere with loading; therefore the floor was made in four sections, hinged so that it can be folded back when rock is being hoisted. The floor is of 4-in. plate and is supported by 4 x 4-in. angles, which are bolted to the bail and braces. When men are being hoisted or lowered, doors are used.



STEEL HEADFRAME, SKIP DUMP, HOPPER AND CONVEYORS FOR WASTE DISPOSAL AT PARVENU SHAFT

All ore is dumped at what is known as the 900-ft. level dumps. From here it goes through chutes to the large receiving pockets of the 100-ft. level. Reinforced concrete was used, as the ground would not stand without support.

A belt conveyor transports the waste from the hopper at the skip dump to the edge of the waste pile. Because of the steep slope of the hillside at the shaft collar, the waste dump is inclined to creep, especially during the spring thaw. Therefore, a continuous stationary conveyor would be impracticable, and two conveyors were used. The first, which takes its feed from a pan feeder under the skip-dump hopper, is of the stationary type and was extended as far from the shaft as was deemed safe, about 40 ft. The main members of the framework for this conveyor are anchored to the concrete walls of the pit, making it practically self-supporting. The second conveyor is of the swinging-boom type, and has steel framework, which is suspended from a bipod. The lower end is hinged on especially designed bearings on a turntable under the head pulley of the first conveyor. This construction not only makes the conveyors independent of the sliding dump, but, as the boom may swing in an arc of about 90 deg., the total capacity of the piling system is greatly increased. The conveyors are operated with 5-hp., 440-volt, 3-phase, 60-cycle, induction motors, rated at 1,700 r.p.m.

The headframe contains no particularly new features. It is a sturdy well-built affair, but is not high enough for present purposes. An additional 10 or 15 ft. clearance over the skip when it is in dumping position would be desirable.

The skip and cage are combined. On account of the low headframe, it is necessary to put the cage floor

The capacity of the skip box is about 70 cu.ft., or 4½ tons of ore. The total weight of the skip and cage is about 5,000 lb.

Standardizing at North Butte Mining Co.

BY ROBERT LINTON*

This paper deals with the work that has been carried on for over three years by the management and staff of the North Butte Mining Co. in an effort to standardize mining methods, to eliminate lost motion in the operating organization and to improve the efficiency of the individual workman.

Such items as the selection of machine drills and equipment, the proper type of drill, steel, ventilating equipment, ore handling, drill rounds and timbering were given special attention in order to ascertain the correct method of work and use of equipment. All sorts of experimental efforts were expended in the desire to determine the best method of performing any particular task. The studies developed some features which it is believed are new.

The paper is replete with tables and illustrations showing the basis of the results obtained and the application of the principle of standardization to some special problem. The human factor is given its share of importance, and time studies were made of drilling, timbering and other operations so as to form an intelligent basis for rating a day's work.

Regular instruction in promoting efficiency in underground work is carried on and shift bosses are trained "from the ranks."

*Abstract of a paper presented at the Lake Superior meeting of the A. I. M. E., Aug. 23-28, 1920.

HEADFRAME AT CONCRETE LINED SHAFT OF CHIEF CONSOLIDATED MINING CO.

Concreting the Chief Consolidated Shaft At Eureka, Utah

Work of Lining Carried on Simultaneously With Sinking and Was Done in Stages of 50 to 60 Ft., According to the Nature of the Ground—Average Advance, 61 Ft. Per Month—Precast Dividers Used

By R. D. Gardner
Foreman, Walter Fitch, Jr., Co.
Written for *Engineering and Mining Journal*

THE use of concrete in the construction of mine shafts has become more and more extensive during the last decade. The apparent permanency and safety from fire, together with the low upkeep, have done much to stimulate such shaft construction throughout the mining districts of the world.

At the Chief Consolidated mine in Eureka, Utah, 2,000 ft. of shaft was to be constructed through a soft monzonite porphyry, so the main problem was to use material and construction capable of holding the heavy swelling ground. The shaft has three compartments, 4 ft. 2 in., 4 ft. 2 in., and 6 ft. 1 in., respectively, in width. It was decided to concrete and carry the concreting and sinking along, as far as possible, at the same time.

Villadsen Brothers, engineers and contractors of Salt Lake City, worked out the concrete plans and specifications and did the precasting and mixing. The Walter Fitch, Jr., Co., shaft and tunnel contractors, performed the sinking and concrete construction.

Through the first 50 ft. the shaft sets were replaced by inside forms and a solid wall of concrete was poured. This was necessary because for that distance the porphyry was very loose and so affected by surface conditions that any other construction would hardly have sufficed to hold the ground. For the remaining distance a wall of reinforced concrete 8 in. thick was constructed. This wall was braced every 10 ft. by allowing the concrete to extend to the ground for a thickness of 5 ft. from the sides and ends. It was supported by a solid bearer, or support collar, constructed at intervals of 100 ft. The bearer consists of a heavily reinforced panel of concrete completely surrounding the shaft and running out for 5 ft. into special hitches cut in the country rock on each side of the shaft. It is designed to hold about three times the weight of the concrete resting on it; thus providing for any local disturbance of the country rock itself.

As sinking progressed, 6 by 6-in. wall plates, centers and end pieces, with 4 by 6-in. posts, were hung every 2½ ft. and blocked in the usual manner. These were tightly lagged and served as the outside forms for the concrete. The work was done in stages averaging from 50 to 60 ft., according to the nature of the ground and dependent entirely on the length of time the outside forms would hold the ground without being pushed out of alignment. As soon as stress was detected sinking was discontinued, inside forms were placed, and concreting was begun. Thirty-five feet was the shortest stage and 75 ft. the longest, although about 50 ft. was the usual distance.

Before concreting was begun the cross timbers from which hang the pump and bulkhead were lowered so as to rest upon the third set from the bottom. They were then below the lowest point concreted during that stage. As the weight of the first four or five pourings bears directly upon this point, it was necessary to brace and bulkhead it exceptionally well. The permanent dividers were then lowered to replace the 6 by 6-in. centers. They consist of precast concrete beams 2½ ft. high and 5½ ft. wide, of hollow web construction and designed to withstand a diagonal thrust as well as ordinary lateral pressure. They are heavily reinforced and so constructed as to make a bond with the wall of concrete over their entire height.

Near the collar of the shaft a concrete mixing tower was constructed, at the top of which were four bins large enough to hold sand and gravel for making 40

cu.yd. of concrete. Each bin was lined with steam pipes to prevent the material from freezing. The sand and gravel were hoisted to these bins by means of a bucket elevator. Measuring hoppers were placed directly under the bins, and from these the material was emptied into the mixer. Center-trip buckets, on trucks, transferred the concrete from the mixer to the shaft and were lowered through two compartments by separate hoists, discharging their contents directly into the forms.

I-beams and timber from the force of the blast, also served as a shelf on which a bulkhead of lagging could be placed. In this way any or all of the compartments could be bulkheaded tightly and thus afford excellent protection for the men below. The bulkhead was swung from cross timbers resting on the wall plates of the form sets by means of one-ton chain blocks over each end compartment. Before hanging a set the bulkhead was lowered by means of the chain blocks for the required distance and the timber let down upon it. The

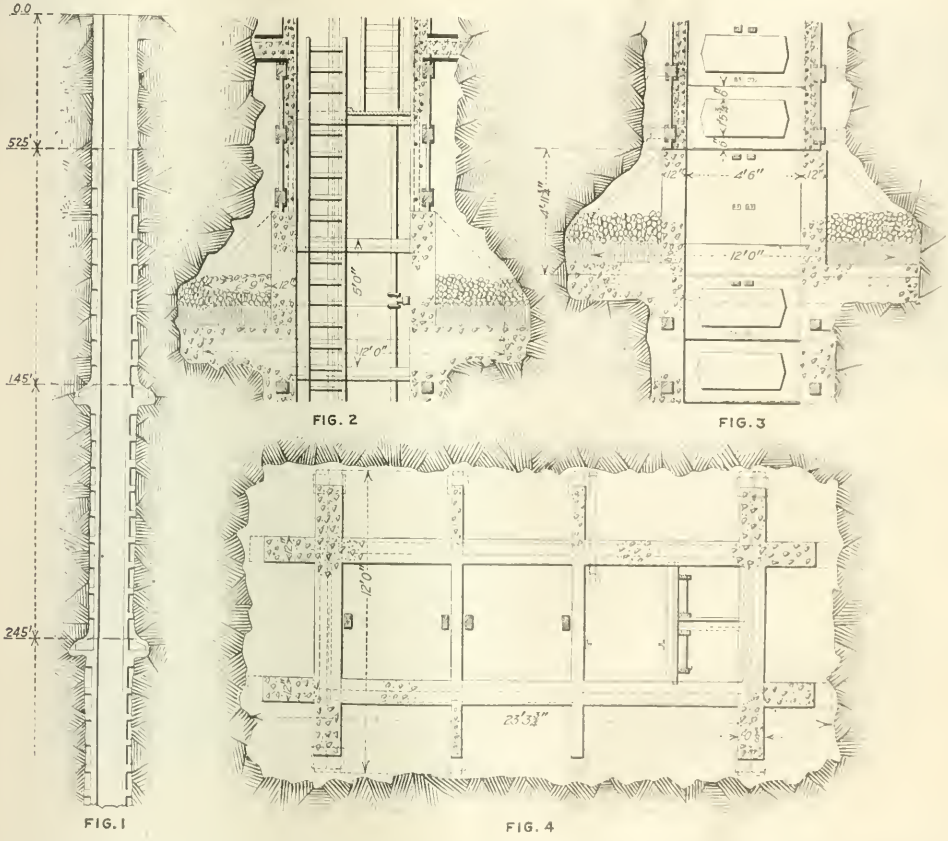


FIG. 1. SKETCH SHOWING FIRST 245 FT. OF LINING OF CHIEF CONSOLIDATED SHAFT. FIG. 2. VERTICAL SECTION THROUGH END OF SUPPORT COLLAR. FIG. 3. VERTICAL SECTION THROUGH MIDDLE COMPARTMENT, SHOWING PRECAST DIVIDERS. FIG. 4. HORIZONTAL SECTION AT SUPPORT COLLAR

A steel bulkhead was used below the bottom set, which allowed the placing of the timber or outside forms without delaying the drilling or mucking. The bulkhead was made of 8-inch standard I-beams and measured 17 ft. 6 in. long by 6 ft. 2 in. wide. The main or side beams were tied together with cross beams, one on each end, and two cross beams or dividers, 4 ft. 7½ in. and 11 ft. 2 in. respectively, formed the south end. The cross beams were placed so as to come directly under the end-form timber and the false, or temporary, dividers of the form sets. Bolted on this frame were sheets of steel ⅜ in. thick and wide enough to cover the I-beams and overlap 10 in. on the inside of the beam. This overlapping, besides protecting the timbermen working on top of the bulkhead then proceeded to install the set.

The work of sinking was made somewhat difficult by a flow of water of from 60 to 150 gal. per min. This water was raised from the bottom to a pump station by means of an air-driven sinker. On the pump station was installed an electrically driven plunger pump, which lifted the water to the station above. These stations were constructed at intervals of 300 ft., the maximum lift of the sinker. The crew consisted of four or five shaftmen and a shift boss, in the bottom; a pumpman, topman, and two hoistmen on each shift.

The best progress was made by drilling one-half of the shaft at a time. In this way mucking continued

up to the time the round was finished. A round of fourteen holes was sufficient to break half of the shaft for a depth of 5 ft., or an average of two rounds a day made a 5-ft. advance. The holes varied in depth from 7-ft. cut holes to 5½-ft. end holes. Forty to fifty pounds of 50 per cent gelatin powder was used to break the round. Ordinary water proof fuse, well crimped into a cap and dipped in P. & B. paint, gave good service, and little trouble was experienced with missed holes. When the shaft passed the 1,100-ft. mark, however, it was considered safer to use delayed action exploders.

LOOKING DOWN CONCRETE LINED SHAFT AT CHIEF CONSOLIDATED MINE

An average advance per month of 61 ft. of finished shaft, including pump stations, was maintained. Actual sinking operations consumed 70 per cent of the total time, and concrete construction 30 per cent.

The Future of the Swedish Iron Industry

Sweden is compelled to import large quantities of iron products, although possessing immense iron deposits, according to *Commerce Reports*, and this is owing to the fact that Sweden has practically no coal mines, and being unable to obtain coal from Germany, prices on this article are so high as to be almost prohibitive. It is well known that many finished articles imported into Sweden are made from Swedish steel.

Another factor is the chemical quality of the ore, which in many instances requires mixing with imported ores to produce desired properties in the steel.

In this connection it is of interest to refer to an article by a well-known Swedish mining engineer regarding the future of the Swedish iron industry:

> The answer to the question why the iron industry seeks the coal industry is simply this: It is cheaper to transport the ore to the coal than vice versa. A simple calculation will tell us that for each ton of finished iron is required about 2 tons of coal and 1.6 tons of ore (for rich ore). These relations are not, however, permanent. About thirty and forty years ago it was 3 and 4 tons, and it is not impossible that in a not very distant future the relations may be 2 tons of ore to 1.5 tons of coal per ton of finished iron.
>
> Then the conditions shall have moved in favor of the countries rich in ore. In the beginning of 1870 Sweden was compelled to turn over its quantitative superiority on the iron market to countries richer in coal. Regarding the quality production of the malleable iron, however, our iron industry retained its place. Our good raw material and inherited trade skill enabled us to back up our position.
>
> That we have succeeded in holding our place so far has its root in the ever-increasing demand for quality products and our endeavoring to meet the new requirements through technical improvements. The burning question for Sweden's iron industry will be whether or not electro-steel will, in greater degree than other cast iron, be able to replace the Swedish quality iron and place a weapon in the hands of our foreign competitors to reduce the importance of the quality inherited from our charcoal pig iron.
>
> Another technical factor is the production of excellent steel by adding metals such as nickel, chrome, and other hardening and toughening elements to foreign raw material, thus becoming independent of Swedish iron.

Italy's Sulphur Production

The war has imposed a serious check on the development of the Italian sulphur industry, according to Attaché Alfred Dennis. Italian production has been cut from 330,000 tons in 1914 to 180,000 tons in 1919. The reasons adduced for this decline are lack of labor and the difficulty of keeping up the mechanical equipment of the mines.

The cost of production has increased tremendously. Before the war, sulphur was mined at from 80 to 85 lire per ton (all sulphur figures are given in short tons). Since the last advance in wages (May, 1920), production costs are estimated at from 420 to 430 lire per ton. Pre-war prices f. o. b. Sicilian ports ranged from 110 to 115 lire per ton; the last price advance (May 1) brought the quotation up to 650 lire.

Whereas in former times Italian sulphur found a wide market throughout the European countries, its sale is now practically limited to the Mediterranean Basin, the consuming countries being identical with the wine-producing regions of southern Europe. Sulphur is an indispensable adjunct to the cultivation of the vine as an antidote for the mildew which attacks the flower of the grape. Sulphate of copper is also employed to spray the vines as a protection against parasites. On account of the scarcity and high prices of fuel in Sicily, a wasteful process for the recovery of sulphur has to be employed.

It is not strictly correct to imply that Italy's sources of sulphur supply are limited to the Island of Sicily. There is a district on the Adriatic near the cities of Rimini and Pesaro where sulphur is mined. One small mine is in operation on the east coast of southern Calabria. The amount of sulphur produced on the mainland, however, amounts to only about 10 per cent of the total for all Italy.

Chinese Antimony

Since 1908 over 50 per cent of the world's total antimony production has come from China. In 1913 the output was estimated to be the equivalent of 10,800 tons of metallic antimony, that of the whole world being about 20,000 tons.

The Wah Chang Mining & Smelting Co. virtually controls the production of antimony ore, regulus, and crude in the Province of Hunan. This company operates smelters in Changsha and owns low-grade mines. It possesses a complete monopoly, granted by the Peking government, for the manufacture of regulus in Hunan, and owns the patent rights in China for the Herrenschmidt furnace, the most successful means of reducing low-grade antimony ores. The mines themselves are mostly native owned, and worked in a small way.*

*H. G. Ferguson and D. A. Hall in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Through Villa Territory

A Mining Engineer Journeys From Juarez to Santa Barbara, Chihuahua, Before the Bandit's Surrender — No Casualties Reported en Route but Many Inconveniences — Rags, Ruins, and Native Fear of Bandits Chief Features of Trip

Written for *Engineering and Mining Journal**

BEFORE one can cross the border today between Mexico and the United States a passport must be obtained. This necessitates some special photos—*specially* bad, that is, since the State Department is not interested in our good looks, but wants them natural, unretouched, of ourselves alone.

With these in hand, then, we went to the United States Immigration Office at the International Bridge between El Paso and Juarez, where a special border permit was issued and one of our artistic photos mounted on it. A duplicate is kept in the office. With this border permit we proceeded to the Mexican consul in El Paso, who viséd it, charged $2.50, and filed a couple more of our photos. We then took a taxi and crossed the bridge into Juarez and called on U. S. Consul Dow, who also viséd our passport and wrote thereon a special permit for one trip to Santa Barbara.

Next we went to the Mexican Customs, where an official of the latest government affixed a revenue stamp —50 *centavos*. We now had an emergency passport, good for one trip to our destination, but had to have a regular passport if we intended to stay in the country. Hence we proceeded to the clerk of the Federal Court in El Paso and made application, fee $2, which had to be accompanied by birth certificate, and photos, and affidavit of some person knowing the applicant two years or more. This was forwarded to Washington and in due time a permanent or six-months passport may be expected.

We then set out to our destination, which we were to reach, God and Villa willing. Hold on! I overlooked a few yards of tape. After crossing the bridge into Mexico and calling on Consul Dow, one cannot re-enter the United States without passing inspection for vaccination. If he can show a recent scar, or lie strongly enough about the one he has, he may get by. Otherwise, he gets a shot in the arm. I lied ten years about mine, but did not go strongly enough, so the doctor gave me the shot.

SANTA BARBARA, CHIHUAHUA, A TYPICAL MEXICAN 'DOBE TOWN

Of course, there is the regular customs inspection of both governments. The United States inspectors search outgoing passengers for firearms, which are not permitted to be taken across the border. The Mexican customs look for dutiable goods and other things.

We went to Juarez the evening before our train left, so as to get used to the local color, which is here laid on with a bold brush. Juarez is a typical 'dobe town of the northern Mexican states. The buildings along the principal streets present a solid 'dobe front, one-story high, flat topped and broken with doors and windows, the latter, however, not very numerous. Light can be had without building houses to let it in. Some of the better houses have courtyards after the Spanish style,

*Written before Villa's surrender.

and even some of the poorest and most squalid tenements open on a common court. There are a number of more imposing buildings housing government offices, including the Custom House and a school. Then there is the Bull Ring, and a couple of brick- or stone-front business blocks.

The population appears to be made up of very poor Mexicans, Chinamen, American sightseers, American saloon-keepers, gamblers, and all sorts of border riff-raff; a sprinkling of people who, like myself, were going somewhere, and the better Mexican class, officials and business men, who fill in the background.

Two Hundred Ragged Guards per Train

Our train left Juarez at 7 a.m. There were a dozen freight cars, a second-class coach, one first-class coach (in name only), and two steel "gondola" cars, one ahead of the coaches and one behind. In these steel

TRAIN GUARDS IN STEEL "GONDOLA" CAR

cars rode our guard, federal soldiers who guard every train. There were about two hundred men on this train. Every one has read of the barefoot army and the tatterdemalion soldiers of Mexico. I want to say to your imagination, Go as far as you can. Imagine everything grotesque, unkept, undisciplined, underfed, and unfit. You can hardly match the truth. I did not see a pair of shoes in the outfit except those worn by officers. Some wore a rough sandal, home made, of old leather or whatever came to hand; worn-out auto tires, belting, rubber, or fabric of any kind. Some were bare of foot except for the coating freely supplied by Mother Earth. Ragged breeches or overalls, and shirts in various stages of fragmentation, generally constituted the sole clothing. All wore the grotesque, large straw hats of Mexico, in every degree of decrepitude. Some had a ragged dirty blanket or *serape* thrown loosely over the shoulder or worn like a shawl.

Their weapons were as grotesque as their clothing, a varied assortment of rifles, Winchesters, Springfields, Spanish Mausers, German Mausers, and others, all looking as though they had been taken from a museum. A tin canteen, a small coarse provision bag, and one or two cartridge belts completed the accoutrement.

Our train had hardly got away from the station when we began to see evidence of the battles that have taken place during the many revolutions and counter revolutions that have torn Mexico during the last ten years. There were 'dobe houses shot full of bullet holes, or blown up; small circular forts of 'dobe three to five feet high; barbed wire entanglements; trenches and holes in the desert large enough for only one man. We passed the cemetery where victims of battle are buried like rats in trenches.

South of the border, for forty or fifty miles, the country is mostly uninhabited desert, sparsely strewn with grease wood, mesquite, and other desert shrubs, and many varieties of cacti. There is some grass, however, and at this season of the year cattle can still find fairly good grazing. We saw only a few isolated head, however. As we went further south, the land improved rapidly, so that when the train stopped for lunch at a small station, we were in a splendid agricultural and stock-raising region. We saw some small irrigation ditches, with cottonwood trees growing along them, and green fields adjacent, green with weeds for the most part. The village where the train stopped for lunch bore the scars of battle—water tanks blown up, a small circular 'dobe fort, houses abandoned and crumbling, a recently made graveyard beside the track, and dead horses rotting where they fell.

Mexican Troops Sans Commissary

A swarm of natives met the train with baskets of food to sell to the soldiers and passengers. These vendors do a lively business, as there does not appear to be any commissary in the Mexican army, and the train guards are obliged to feed themselves by buying stuff from the natives along the line. The offering consisted of *tortillas* and *frijoles*, the two great national dishes of the poorer Mexicans. There were also *enchiladas*, pancake-like cheeses, bread, cakes, fruit, and bottles of milk.

The first-class passengers went to a Chinese restaurant (the Chinaman is the national caterer in Mexico), and had a dinner consisting of much the same dishes; *enchiladas*, *frijoles*, stuffed peppers and rice with chili sauce. There was pie, but let that pass. The business of supplying food to the passing troops seems to be the only occupation of the handful of wretched people living in these shattered 'dobe villages.

During the afternoon, the train was running continuously through fat, green land, hundreds of thousands of acres, where formerly great herds of cattle grazed but which now lie deserted. It is said that the cattle were raided and run across the border into Texas, where they were sold to American stockmen or to the market, such as were not consumed by the raiders themselves. Villa and his followers have the credit for the job.

We passed over about forty miles of track, which had been rebuilt after having been destroyed with explosives. The old rails lay alongside of the track, warped and twisted into useless shapes. Everywhere bridges had been burned or dynamited, and rebuilt. Late in the afternoon we saw the *hacienda* where the Terrazas family, renowned for their wealth, formerly lived. This

family owned all the valley from the border to Chihuahua City and ranged great herds of cattle. It is said that they branded three hundred thousand calves yearly, and their herds totaled over a million head. Now all is deserted save for a few ragged peons living in crumbling 'dobes along the railway.

Stopovers Allowed on All Tickets

Our train arrived at Chihuahua City at 7 o'clock in the evening, and as the trains do not run at night, we unloaded ourselves and baggage, and had a bus convey us to the Hotel Palacio, a fine, large building in the Spanish style, three stories high, with big rooms opening on a court.

Beside myself there were two other guests, Americans, whom I had met on the train, and who were connected with the same company as myself, but going to different destinations. We were the sole occupants of a hostelry capable of accommodating several hundred persons. There were a number of other hotels, all seemingly in the same condition of vacancy. After dinner, we, the three guests, took a car and drove around the city. Stone-front business blocks gave evidence of former activity, but we did not see a single American. Away from the heart of the city, the streets were lined with the common 'dobes, outside of which the peons sat or reclined on the ground. The number of ragged and nearly naked children was astonishing, but evidently in harmony with biological law.

After covering the town, our driver, who had been instructed to show us everything, stopping in a particularly narrow and ill-appearing street, informed us that this was *"La Calle de Muchachas."* We all thought that there was no particular fascination for us in *"La Calle de Muchachas"* and told the driver to *"vamos."* We remarked the extraordinary number of plazas in the city, and some one found the explanation in the fact that the Mexicans were a plaza-loving people.

In the morning, while waiting for breakfast, I walked across the plaza and looked into the cathedral. Mass was being said, and many women were on their knees in devout attitudes. But the music—what was it that the organist was playing? Ah! I have it—the *"Barcarolle"* from the "Tales of Hoffman." I could not draw my face into as solemn an aspect as the occasion demanded, as I passed out and slipped a coin into the palm of a beggar at the church door.

As we drove to the station in the early morning to resume our journey, we saw more activity than one would think possible, judging from the inertia of the evening before. Donkeys laden with milk cans, and the milk man were coming to market. Other donkeys with fruit and vegetables made up a colorful caravan. Along the streets, the sidewalk merchants had spread their wares; bottles of milk, *tortillas* patted out in the hand and cooked on a piece of sheet iron or tin over a few coals in the street, while you wait; *frijoles*, *enchiladas*, coffee, cakes, and fruit—a variety of stuff to alleviate hunger, but hardly appealing to an appetite cultivated above the Rio Grande.

Better Halves (?) Have Makeshift Quarters

The scene at the railway station was colorful and fascinating. There were several troop trains in the yards, and the guards on our train and the one going in the opposite direction added to the flux of life. The regular troop trains carried swarms of camp followers, degenerate females—one hesitates to call them more—who served the men. They had numerous children, naked little savages, and carried their household goods, reduced to the primitive minimum, with them. These women camp followers lived in box cars, cattle cars, flat cars, underneath, on top, anywhere—while the decrepit train was in motion. While in the yards on sidings, they lived underneath, on the ground. They prepared the *tortillas* and *frijoles* for the soldiers, thus serving as a commissary. Squalid, filthy, ragged, diseased, they gave the lie to Fiske's "Ascent of Man."

Peddlers and street merchants were hawking their wares, a babel of voices constantly chattering; engine bells were ringing, donkeys braying and strident bugles blowing. In response to a bugle blown by a Yaqui boy, bare-footed, ragged, and rifled, of the color of oxidized copper, a squad of the most villainous looking men, Yaqui Indians, drew up for inspection—a screaming farce—and then mounted a box car for special guard duty.

It appeared that the reason for the Yaqui guards lay in the fact that an officer rode in our car with a large amount of metallic money which was destined to pay the soldiers at the stations south of Chihuahua, where thousands of federal troops were moving north in an attempt to put an end to the depredations of Villa. These Yaquis are said to be the best fighters in Mexico. They do not know what fear is, while the soldiers of the regular—or irregular—armies are inclined to the policy of "Safety First." Yaqui soldiers have been known to turn and shoot their fleeing comrades.

Air Hose and Grease Classed With Jewels

Our train finally got away from the hubbub of the station about half an hour behind schedule. We were delayed somewhat while waiting for the brakeman to bring the connecting air hose from the safe in the depot and attach it to the coaches. Then he went back and got a can of grease-soaked waste, to fill the stuffing boxes on the wheel axles. The humor of these proceedings can hardly be appreciated without seeing them.

The day's run through idle grazing lands in the valley of the Rio Conchos brought us to the town of Jimenez. We passed through only one town on the way to Santa Rosalie. Here the station was filled with troop trains and our aforesaid paymaster detrained with his precious bags. The scene of the morning at Chihuahua was re-enacted here, with the added objectionable features of more filth and stench, and myriads of flies.

Along a cliff under the edge of the town we saw a number of caves inhabited by modern troglodytes. At Jimenez we encountered more troop trains. There were thousands of soldiers here. The railroad yards and streets were filled with them and the ubiquitous *mujeres* patting out their *tortillas* beside a few embers. As our train was to camp again for the night, we had *cargadores* carry our baggage to a hotel, where our company maintained a number of rooms for the convenience of its men traveling back and forth.

This hotel was owned and operated by one Doña Luisa, a woman having something of American pluck and initiative. Doña Luisa had come down here with her husband during the Civil War, to buy hay for Confederate horses. In the meantime, the Confederacy surrendered and Doña Luisa and her husband, not approving of the proceeding, refused to go back. Her husband has since gone further West. Doña Luisa is over eighty, but still manages her hotel. She is said to be the only one in the place who does not fear Villa,

and to have run off a bunch of his bandits with two revolvers, when they tried to raid her stock of liquors. Salud! Doña Luisa.

One other member of the party and myself were to leave the main line here and proceed on a branch line via Parral to Santa Barbara, a mining camp in the Sierras. It was at Parral that Villa was last heard from, when he made an attack on the town in the morning hours of June 2. Our train had the usual guards and also acted as escort for an unmixed freight train behind. If our train got out of sight or around a bend from the freight, it stopped while the latter caught up, and several times we were forced to stop for engine repairs.

Train Does a Serpentine

Near Parral, a railroad bridge across a small stream had been burned by Villa in his recent attack. A temporary track had been laid on the river bar, crossing the channel on an improvised trestle. Looking out of the coach, I saw the cars ahead dropping down a tremendous grade, 20 or 25 per cent. It was a perilous-looking performance, but the train stayed on the rails, crossed the stream and climbed the opposite bank, warping itself to the contour of the earth like a thick-bodied, giant snake.

Just at noon our protesting train came to a stop at Parral. We saw evidence of the recent fight, in breast-works of boulders on the outskirts of the town, and bullet-marked walls, and some recently-erected crosses. The water tank lay a twisted mass of ruins from earlier raids.

The town of Parral had been a prosperous and busy mining camp before the era of revolutions, but continued depredations of bandits have so harrowed the American companies operating there that these have, for the most part, ceased operations. Only one company, and that because of its superior financial strength, diplomacy, and political power, operates in the district today.

After an interminable wait, our train resumed its meandering way toward Santa Barbara, eighteen miles up the valley. Toward evening, it came to a stop in a terrific thunder storm, a mile short of the station, due to an engine derailed ahead. Fortunately, however, we were opposite the mine which was my destination, and a messenger came to meet us with a couple of *mozos*, who carried our baggage to the quarters assigned us in the American Club. Here at dinner we learned that, before attacking Parral, Villa's men had paid their respects to Santa Barbara, looting the principal store in the town and generously giving the mining company a receipt for all of its horses.

Abandoned Mines a Refuge

It is said that the town people were very inconspicuous during the stay of the Villistas in Santa Barbara, many taking to the hills and abandoned mines during the night. One official incumbent is known to have availed himself of the hospitality of some of the company employees and lain hidden in a closet for a night and a day. Previous to the visit, some of the natives employed by the company had twitted the Americans about Villa. "Just wait until Villa comes! You *gringos* will be very scarce." As a matter of fact, when Villa did come, these same individuals lay hidden in an abandoned mine, while the Americans entertained the Villistas at dinner.

But perhaps the greatest fear of Villa was in the hearts of the Chinamen. Mindful of the treatment accorded their countrymen in previous raids, they hid until it became apparent that there was to be no hanging or shooting. The peaceable behavior of the Villistas was, in all likelihood, owing to the fact that they met no opposition. Had they been shot at, they would have made reprisals by organizing a necktie party, or a firing squad; the former probably, as they were short of bullets and in such emergency are wont to resort to the rope.

After being beaten off in his attack on Parral, where he lost ten men, Villa headed in an easterly direction and was last heard of at La Reforma, on the main line, where he burned a small bridge and continued easterly,

SOLDIERS THREE

supposedly to meet a pack train from Eagle Pass, which was carrying ammunition that had been smuggled across the border.

The movement of troops into the district continues, until now there are reported to be over twenty thousand federals hunting for Villistas along the main line from Juarez to Jimenez.

Before Villa Surrendered

The present administration is evidently making a strong effort to bring Villa's career of outlawry to a close. But the federals are handicapped in hunting Villa on his own ground. Better men than Mexican soldiers fell down on the job once. And, too, Villa is better equipped than the federals, with the exception of ammunition, which defect may have been remedied ere now. His men are mounted, and exceedingly mobile. They are fearless fighters under a renowned guerilla leader. The only advantage the federals possess lies in superiority of numbers and control of lines of communication and transportation. The latter Villa may nullify at any time. On the outcome of the hunt for the outlaw, it is believed, rests the immediate fate of Mexico.

Dominant Features Controlling Ore Deposits Of Washington

Formations Genetically Related to Batholithic Intrusions of Granitic Rocks Associated With Dikes in Stevens and Northern Pend Oreille Counties Near Marginal Contacts At Some Other Points Ores of Republic District Excepted

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Written for *Engineering and Mining Journal*

UPON examining the various mining districts of the State of Washington, dominant characteristics of the deposits are noted that continue to develop as field evidence is accumulated. Thus, a generalized perspective is permitted which simplifies the solution of the problems of the individual mines.

First in importance is the fact that practically all the deposits show evidence of direct association with batholithic intrusions of granitic rocks These batholiths related. The intrusions of northeastern Washington have been provisionally assigned to the Mesozoic.[1]

I shall not here attempt to correlate the mining districts of Washington with those of the surrounding, and often better known, districts in the adjoining states and in British Columbia. It is believed, however, that the Washington deposits are a link in the chain of an extensive metalliferous area which will later submit to a broader correlation based on accumulated field observa-

CAMP OF ELECTRIC POINT MINE, TWENTY MILES EAST OF NORTHPORT, WASH., AT AN EARLIER STAGE OF OPERATION. TOPOGRAPHY SHOWN IS TYPICAL OF THAT OF SURROUNDING COUNTRY

form the parent source of practically the entire metal resources of the state. The ore deposits occur in the northern tier of counties bordering the international boundary. This entire section, from the Selkirk range along the Idaho boundary westward across the state to the Cascades, is underlain by a series of batholithic intrusions apparently closely related. These continue northward into British Columbia and eastward into Idaho, where they are found genetically related to the ore deposits of important mining districts. Granodiorite forms the core of the Blue Mountains of northeastern Oregon, and the striking similarity of field evidence observed both in northeastern Oregon and Washington suggests that the two batholiths may be directly

tions. I have not yet undertaken field work in the Cascade Range of western Washington and the generalizations of this report do not include that section. The gold veins of the quite well-known Republic district in Ferry County represent a distinct period of mineralization younger than the surrounding districts and they are not considered in this article.

Topography of Northern Washington Distinctive

In northern Washington, from the Idaho line westward to the Cascade Range, the topography uniformly consists of a series of mountain ranges trending north and south, the forested ranges being separated by broad

*Published by permission of Henry Landes, State Geologist of Washington.

[1]Weaver, C. E.: "The Mineral Resources of Stevens County, Wash." Geological Survey Bulletin 20.

glacial trenches. The floors of these trenches, often one to two miles across, are occupied by streams so small as to be totally out of proportion to the giant troughs. These valleys are at elevations of 1,500 to 2,000 ft. above the sea, and the average elevations of the associated ranges vary between 4,000 and 5,000 ft., with ridges occasionally culminating in peaks attaining maximum elevations of 7,000 ft. This characteristic topography is noted on entering the state from British Columbia and continues southward approximately 100 miles to a latitude a few miles north of Spokane, where the ranges rapidly lose their prominence and disappear beneath the northern extension of the Columbia River basalt plateau.

Dikes Associated with Orebodies in Northeast

Northern Pend Oreille County, in the northeastern corner of the state, and Stevens County, adjoining on the west, are covered with an extensive series of metamorphosed Paleozoic sediments tilted to a steep angle and overlying, for the most part, the intrusive granitic rocks. The ore deposits here occur as irregular replacement bodies in the metamorphosed series. With more extensive development, some of the larger deposits may be found to extend down into the underlying granites. Closely associated with all these deposits are found igneous dikes which mostly approach lamprophyres and granite porphyries in character. In some cases, the ore is found in contact with these dikes, but more often the dike is 10 to 150 ft. from the ore. This association has led to a confusion of ideas and in some cases resulted in exploration work being improperly directed. I believe these dikes, as a general rule, to be feeders from the underlying batholith which forced their way up through the overlying sediments.

The dikes naturally sought out the shattered zones for their entrance into the metamorphosed sedimentary beds; the intrusive force of the dikes further shattered the brittle sediments. The total result was that the shattered ground adjacent to the dikes offered inviting conduits for the mineralized hydrothermal solutions and the gases, which were exhaled from the magma a little later than the dikes. In the United Silver-Copper mine concrete evidence is offered to prove that the dikes are earlier than the ore, for on the 1,200-ft. level a considerable portion of the vein is found filling a shrinkage crack in the dike.

Invaded Formations Have Influenced Ore Deposition

The shape and often the extent and richness of the ore deposits were effected by the character of the formation into which the mineralized solutions were injected. The highly folded and tilted position of the sediments often placed them in a favorable position to receive the mineralized solutions and gases through fractures opened along the bedding and schistosity planes of the formations. The zones of weakness in such formations would naturally be along these planes. However, should the beds be so favorably oriented that the components of shattering forces were applied at certain angles to the planes, then the fractures would tend to cut the formations at angles to the bedding or schistosity planes. These two types of deposits are common to argillites and schistose rocks in Stevens County and are well represented by the Loon Lake deposit, the United Silver-Copper, and by smaller deposits such as the Frisco-Standard and the Bonanza.

Brittle formations, when ruptured, often develop irregular undulating fractures. If such a fissure should later be subjected to faulting along the plane of fracture, some of the walls would be brought into such juxtaposition that pinches and swells would be developed. These conditions are strikingly represented by the Reardon Copper deposit and, to a lesser degree, in the United Silver-Copper vein.

Planes of contact between two formations, such as argillite and quartzite, are in some cases planes of rupture. The quartzite is not as favorable for ore deposition as the argillite, as the argillite yields more readily to metasomatic replacement than does the refractory quartzite; and, further, the organic matter in the argillite has acted as a precipitating agent on ore-bearing solutions.

Limestone, under favorable conditions, is readily susceptible to replacement by mineral-laden solutions and gases. A belt of limestone that has been stressed by folding and then intruded by igneous dikes will ordinarily develop irregular fracture patterns which ore solutions may later use as a conduit. The intersection

KAABA VEIN ON 200-FT. LEVEL OF KAABA MINE, WASHINGTON. TRUE WIDTH NOT SHOWN ON ACCOUNT OF RIB OF WASTE ON FOOT-WALL SIDE

of two or more fractures affords an inviting locus about which heated solutions may work to replace the limestone and deposit ore in irregular pots and chimneys. The Electric Point deposit and the deposits in the Metaline district of Pend Oreille County are striking examples of this phenomenon.

Deposits Occur in Igneous Rocks

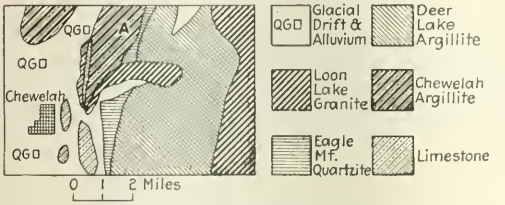
In southern Pend Oreille County and westward in Ferry and Okanogan counties, the metamorphosed roof rocks are less conspicuous, and large areas of granitic rocks, varying in composition from true granite to diorite, are exposed. Here the ore deposits are more often found inclosed in the granitic rocks. It is particularly pertinent, however, that some of the most promising deposits occur near the marginal contact of the granitic rocks and the older intruded formations as marginal veins. In the Newport, Nespelem, Concunully, and Oroville-Nighthawk districts and near Danville there are veins near the roof of the batholith adjacent to its contact with the older intruded rocks. Near the Nespelem deposits the roof rocks have been completely removed by erosion, but, judging from the surrounding horizons, the present granite outcroppings on Mineral Hill repre-

sent the upper limits of the batholith near this particular locality.

As the laws governing the formation of veins and other types of metalliferous deposits are better understood, it seems safe to predict, the occurrence of ore deposits near the margins of the intrusive rocks will be more readily appreciated. It is logical that, following the invasion of a batholitic mass, the margins of the magma in contact with the older rocks would be the first to crystallize. Crustal tensions developed by shrinkage and recurrent heavings originating deeper in the partially cooled magma would develop fissures in the granitic rocks and even across the contact into the intruded formations. Such fissures would offer excellent conduits for mineralized solutions and gases which might be exhaled by the cooling interior of the magma.

Localizing Influences Discussed

If the protective roof rocks overlying a batholith could be suddenly stripped off, the underlying granites would probably be found not with flat relief, but with an uneven undulating surface and with cupolas or dome-like projections above the general level, this irregular relief originating from a series of complex conditions



AREAL GEOLOGY OF CHEWELAH DISTRICT, WASHINGTON, SHOWING OCCURRENCE OF PRINCIPAL ORE DEPOSITS AROUND A GRANITE STOCK

which caused the distribution of the intrusive forces unequally over the marginal surfaces of the mass. The idea is not new; the phenomenon has been recognized and described by numerous observers. These so-called cupolas are admirably exposed in Stevens County, where erosion has stripped off part of the old roof rocks and bared small sections of the underlying batholith. An excellent example is the Chewelah district, where the ore deposits occur principally in the argillites, but around the periphery of a granite stock or cupola.

When plunging contacts, rather than those approaching the horizontal, appear, pendants or blocks of the old roof rocks are suspended down into a batholith 2,000 feet or more, and often of such horizontal extent as to measure two or three miles in diameter, all boundaries of the pendant except the upper being surrounded by the intrusive rocks. In northern Okanogan County one of these pendants was observed to be continuously connected with the roof rocks of the area, which proves that it is not a detached block immersed in the batholith but a roof pendant projecting downward into the mass, and which represents a lower portion of the roof rocks. This phenomenon of roof pendants as occurring in the Okanogan Highlands was first interpreted by Daly.[2]

Along the marginal contact of such a pendant it would seem that favorable conditions could exist for the development of fissures which might later become channels for mineralized hydrothermal solutions and gases. Complementary to the pendant there could ordinarily exist the margin of a granitic stock. The function of the stock or cupola would be to collect and concentrate the ore-bearing solutions and gases from the remainder of the batholith. The function of the pendant would be to encourage the development of fissures by chilling the margins of the batholith. I advance this hypothesis as a possible influencing factor on certain Western ore deposits.

The mechanics of fissure development is none too well understood, and there is generally a tendency to pass it by with a vague sentence or two about regional compressive or tensional strains. There is little doubt that these offer the best fitting explanation for many districts, but I feel that, at least in certain districts, the factors governing the development of fissures can be traced to local causes. Particularly in the Oroville-Nighthawk district of Washington there are found several large marginal veins which satisfactorily bear out this conclusion. In fact, it was while I was engaged in field work in this area that this theory first suggested itself.

At the Kaaba and Four Metals mines field evidence favors such conclusions. Large quartz veins occur at the margin of the quartz batholith. The contact between a roof pendant and the granite stands nearly vertical. The veins trend across the contact and into the pendant a distance of several hundred feet, then gradually "tail" out. They gain their maximum width (up to 15 ft.) on the granite side of the contact several hundred feet from the margin. As these veins are traced further away from the contact and into the granite, they are found to grow more narrow gradually until one of them was found to be only one foot wide at a point half a mile from where the contact was crossed. All of the oreshoots so far developed have been found within a few hundred feet of this margin.

Post-mineral faulting is quite prevalent in the vicinity of the deposits, but the vein displacement is usually not over 10 ft.. and more often it is 2 or 3 ft. The operator who finds his vein cut off by a fault should not be too readily discouraged. The United Silver-Copper vein exhibits a series of lateral step-faults with displacements averaging about 2 or 3 ft. Of larger faults, the Morgan fault, in the Loon Lake Copper deposit, with a throw of 50 ft. to the north, and the fault which displaces the east segment of the Bead Lake vein 135 ft. to the north, were the largest observed. There are many unmeasurable faults along the plane of the veins, as evidenced by slickensided wall rocks and streaks of gouge painting the walls of many of the deposits.

Few Bonanza Deposits in Washington

Washington has produced few ore deposits of the bonanza type. The Electric Point mine, discovered in 1914, is one of the really spectacular mines. There are several disseminated low-grade deposits of gold and copper ore in northern Okanogan County which show some promise of developing extensive tonnages of low-grade ore, but at present not enough systematic sampling or development work has been done to prove the properties. There exist, however, a number of small to medium-sized veins and other types of deposits, which, with the proper application of brains and capital, could be made to pay good returns. Barring a few isolated examples, the grade of ore in deposits throughout the

[2]Daly, R. A.: C. G. S. Memoir No. 38, p. 429.

state is not sufficiently high to be steadily and economically worked without concentration.

As a general statement, it can be said that the veins are capable of an average length that is good for veins of their width. Many of them have already been proved to extend to a good depth. The United Silver-Copper vein has been followed to a depth of 1,140 ft. below the outcrop, without decrease in size or metallic contents. Several of the other properties have attained depths of 500 to 800 ft. with no signs of the ore bottoming. Many of the smaller mines are worked intermittently and with limited capital, which condition has served to confine the developments to shallow workings.

Necessity of Concentrating Better Recognized

So far as can be foretold, Washington will not lose ground as a producer of metals during the next decade. The production can be expected to come largely from concentrated ore. The state as a whole has been backward in employing efficient methods of concentration, but decided improvement has been made in the last two years, and several well-designed, small mills are now under construction. A number of worthy properties are now idle because of lack of capital to permit work on an efficient scale and the need of skillful management. A number of such properties should develop into paying mines.

The promising ore deposits of the Northwestern States have not been combed over so thoroughly by capable mining organizations as is generally believed. The haphazard methods of development, often of the "shoe-string" kind, now in vogue, do not achieve satisfactory results. The gap between the promising prospect or semi-developed mine and a producing mine can best be bridged by well-organized and well-financed mining development companies with a staff of competent engineers. When there is a more dependable market, prospecting will be accelerated and new finds made.

Summary

In summarizing it may be said that:

1. The metalliferous ore deposits of Washington are genetically related to batholithic intrusions of granitic rocks.

2. In Stevens County and northern Pend Oreille County the ore deposits are found inclosed in Paleozoic metamorphosed sediments and closely associated with dikes genetically related to underlying granite. The dike intrusions are believed to have preceded the veins and assisted in opening channels in the roof rocks for the hydrothermal ore-bearing solutions and gases which soon followed the dikes.

3. In Ferry, Okanogan and southern Pend Oreille counties the vein deposits for the most part are inclosed in granitic rocks but near marginal contacts.

4. The character of the invaded formations plays an important rôle in determining the size, shape, and character of the orebodies.

5. Favorable local conditions for the formation of veins are found around the periphery of granitic cupolas and near marginal contacts of granitic and intruded rocks. For example, several commercial deposits are found near the margins of a plunging contact between granite and a roof pendant of the intruded rocks.

6. The gold-silver ores of the Republic district represent a distinctly separate period of mineralization, and for that reason are not included in these generalizations. Field work has not been attempted in the western part of the Cascades, and no effort has been made to include that area in this report.

7. Most of the deposits are believed to have been formed at intermediate depths below the surface.

8. Active erosion has prevented the formation of extensive zones of secondary enrichment.

9. No mammoth, low-grade deposits have so far been developed, and as a general rule the deposits are not of the bonanza type. There are a number of medium-sized, worth-while deposits that contain considerable tonnages of commercial ore of milling grade.

10. There are promising properties, now semi-dormant, which should yield returns if operated by well-financed and well organized mining-development companies.

Manganese in India

In India, on the east coast in the Vizagapatam and Ganjam districts, Madras, is a unique group of rocks known as the Kodurite series, containing manganese garnet, manganese pyroxene, potash feldspar, apatite, and quartz. These rocks, supposed to be of igneous origin, have been deeply weathered and the manganese concentrated as oxides in the surface zone.

The manganese-bearing districts form a belt that extends from Baroda, on the west coast, across northern India nearly to Calcutta on the east, a distance of 700 miles. In these districts, beds of manganese oxides, with manganese, garnet, and rhodonite, form a rock type known as gondite, which is interlayered with quartzite and mica schist.

The orebodies are lenses and layers. The largest single deposit, Balaghat, has the form of a shallow trough, is 1¾ miles long and 45 to 50 feet thick, and yielded from 1901 to 1913 a total of 725,248 tons of ore. In 1913, thirteen distinct deposits had yielded more than 100,000 tons each, the range being from 101,721 to 725,248 tons.

The annual production of manganese ore in India rose steadily from 1892, when the first shipments were made, to 1907, when 899,055 tons was shipped; and since then has ranged from 450,000 to 815,000 tons. The total production, up to and including 1916, was 8,748,000 tons.*

Cost of Building the Alaskan Railroad

Colonel Frederick Mears, chairman of the Alaskan Engineering Commission, has recently submitted the cost of several sections of the Alaskan Government Railroad. The most expensive section is an 11-mile stretch from Riley Creek to the foot of Nenana Canyon, which it is estimated will cost about $157,000 per mile upon completion. The northernmost section of fifty-six miles along the north bank of the Tanana River to Fairbanks is the cheapest part, at $43,700 per mile. Most of the first 260 miles has now been completed, as well as the last 100 miles. The total length is 468 miles.

Early Use of Copper Coins

Coins made from copper mined on the Island of Cyprus by the Phœnicians were used as medium of exchange by the early Meediterranean traders.

*D. S. Hewett in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Leaching and Concentrating Mixed Copper Ores

Method Used at Experimental Plant of Arizona Copper Co., Ltd., at Clifton, on Old Tailings, Consists in Regrinding, Dissolution of Oxidized Copper in Weak Sulphuric Acid, and Flotation of the Sulphide Slimes

By Arthur Crowfoot and Kenneth H. Donaldson
Superintendent of Concentrators and General Foreman of No. 4 Concentrator
Written for *Engineering and Mining Journal*

EARLY in 1917, experiments made by the metallurgical staff of the concentrating division of the Arizona Copper Co. on mixed ores showed that 75 per cent of the acid-soluble copper was readily soluble in a dilute sulphuric-acid solution, if the ore were crushed to pass 35 mesh. Finer grinding was recommended to hasten the results and to increase the extraction. Coincident tests made upon old tailing material from the Clifton ponds indicated that these tailing deposits could be worked successfully by a combined leaching and flotation process. A continuation of the experiments during 1917 and 1918 on a larger scale resulted in the presentation of several proposed flow sheets for a combined leaching and flotation plant, using a counter-current decantation tank system for the recovery of the copper-bearing solution from the pulp, precipitating launders containing scrap iron for the precipitation of the copper from solution, and flotation cells for the recovery of the sulphide copper. Also, a ten-ton experimental leaching and decantation plant was erected at the Clifton concentrator, to treat current tailing product from the mill for the recovery of the contained acid-soluble copper.

Experiments were made on the current mill tailings from concentrator No. 4 for the recovery of its acid-soluble copper content during the period September to November inclusive, 1918. These were discontinued because the acid-soluble copper of the ore treated in the mill dropped to a point which made consideration of its recovery by a leaching process inadvisable. In this process the acid-soluble copper content of the mill tailings was concentrated in the slime portion of the tailings by a de-sanding operation performed by an Allen cone which preceded leaching and decanting operations.

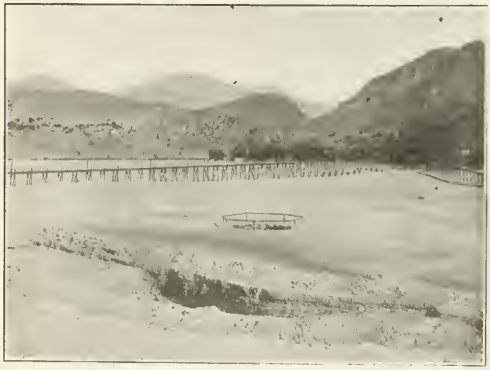
THE SLIME TAILING PONDS IN SOUTH CLIFTON

The treatment of the old Clifton tailings in the experimental leaching plant had been considered, and it was decided during November, 1918, to make the necessary changes in the plant for the treatment of this material. These consisted chiefly in the addition of a pebble tube mill to reduce to the required size any coarse sand which might be encountered and also to act as a disintegrator for lumps of slime; and in the addition of a flotation unit so that the sulphide copper might be recovered from the underflow of the last decanting tank. The required changes were started in December, 1918, and finished in January, 1919.

The plant was put into operation on the treatment of the old tailing material on Jan. 25, 1919, and operated under the conditions of flow sheet No. 1 until May 13, 1919, when flow sheet No. 2 was put into operation. The plant operated under the conditions of flow sheet No. 2 until July 10, 1919.

Material in Old Tailing Ponds Utilized

The material upon which the test work was performed consisted of representative samples of the tailing slime contained in the old tailing ponds in South Clifton. The banks of these tailing ponds are constructed of tailing sand having a maximum size of grain of between 1.5 and 2 mm.; and 93 per cent of the material in the ponds is fine enough to pass through a 200-mesh sieve which has openings .074 mm. square. The sandy material forming the banks of the ponds constitutes only a small



SOUTH CLIFTON SLIME TAILING POND, SHOWING PRELIMINARY SAMPLE CUT IN FOREGROUND AND TEST PIT IMMEDIATELY BEYOND

percentage of the total deposit, and this material was not included in the feed to the test plant. The copper in this sandy material will, however, be readily amenable to recovery by the same flow sheet proposed for the treatment of the slime.

The deposit consists of a mixture of practically untreated "oxide" slime and the slime tailings from a sulphide mill. The "oxide" slime originated in a concentrating plant which preceded the old leaching plant at Clifton, the oxide ore being treated in a Hancock jig for the removal of a coarse concentrate before leaching. The slime was then removed from the jig middling and sent direct to the ponds without further treatment. The deslimed jig middling was sent to the leaching plant. (See Greenawalt's "Hydro-metallurgy of Copper," p. 183.) The tailings from the sulphide mill were desanded by the use of a special form of elevator, the slime joining the "oxide" slime in the ponds, and the sand being hauled away in railroad cars to form the banks of the ponds and for other purposes.

The slime mixture as it occurs in the ponds has the appearance of a stiff clay and contains 20 per cent by weight of moisture. The material settles slowly, average results showing that about 30 sq.ft. of settling area is required per dry ton of material to obtain a Dorr tank underflow with a density of 50 per cent solids, as was required. Large tank areas are therefore necessary. For instance, to settle 100 tons of the slime from a density of about 25 per cent solids (the density leaving flotation cells) to a density of 50 per cent solids, a tank 60 ft. in diameter is required.

The thorough sampling of the slime deposit progressed with the experimental leaching and flotation work. In all, thirty test pits were sunk, these being regularly at the corners of rectangles. These pits were 8 ft. square and were continued to the bottom of the deposit, varying from 9 to 16 ft. in depth. A hole about 2 ft. square was dug 2 ft. deep in the center of the bottom of each test pit to prove the bottom. A total sample of about 1,200 dry tons was obtained, which assayed as follows:

	Total Cu	Acid-Sol. Cu	Water-Sol. Cu	Sul. Cu
Assay, per cent	1.39	0.85	0.06	0.48
Per cent of total Cu	100.00	61.20	4.30	34.50

Small- and large-scale laboratory tests indicated that at least 75 per cent of the total copper in the slime was readily recoverable by subjecting the slime to a comparatively short dilute sulphuric-acid leach for obtaining the acid-soluble copper, and to treatment by flotation for the sulphide copper.

On account of the finely divided character of the material, and its cohesive nature when moist, the percolation method was not practicable. Therefore, the leaching solution had to be applied after the slime had been brought into the form of a pulp by the aid of additional water.

The density of the pulp had to be kept as high as was consistent with the necessity of obtaining thorough agitation with the leaching solution, so that the required degree of acidity in the leaching solution might be maintained without excessive use of acid.

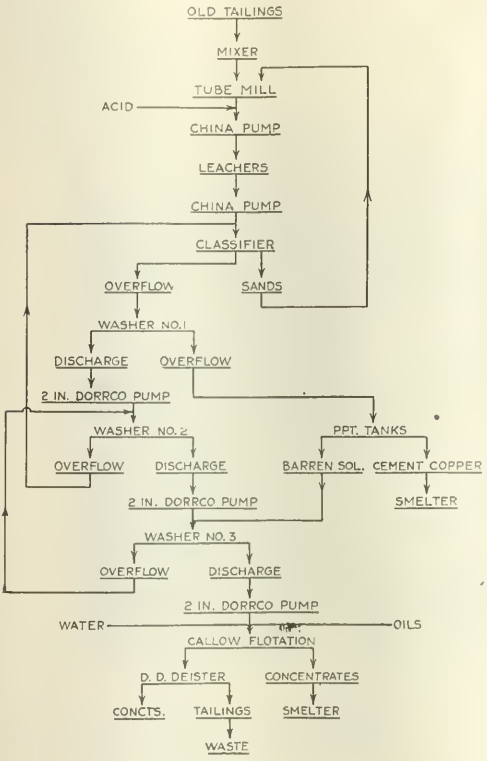
For the separation of the copper-bearing solution from the leached pulp, counter-current washing and decantation was employed, the conditions being analogous to those existing in cyanide plants working on finely divided gold. Flow sheet No. 1 shows the arrangement. The slime lumps were first broken in a mixer somewhat similar to a small-scale log washer, water being added to bring the density of the discharge to 50 per cent solids. The mixer put the slime in condition to be picked up by the scoop feeder of the tube mill which immediately followed it. The tube mill used was 5 ft. in diameter by 12 ft. long, direct-connected to a motor, and lined with Danish pebbles set in cement. Danish pebbles were also used for a grinding medium. Sulphuric acid was added at the discharge of the mill, the pulp then being delivered to the leaching tanks. Nos. 1, 2, and 3 were wood-stave tanks 9 ft. 6 in. in diameter and 10 ft. deep, these tanks being in place and available for use for this purpose.

Pulp was transferred from one tank to the next by the use of air lifts. These consisted of a square wooden pipe of 2 in. inside cross-section, made up of two pieces of 2 x 2 and two pieces of 2 x 6 nailed together with copper nails. The air pipe was a ¾-in. rubber hose which discharged directly into the pulp, no footpiece being used. Although this type of lift was not efficient in the use of air, it worked satisfactorily for test purposes, and with a pulp containing 50 per cent solids the submergence was frequently as low as 25 per cent.

The air used for regular operation was that supplied by a No. 3 Root blower, which also supplied the air for flotation and the air lifts for the washing tanks. The discharge launders from the air lifts were arranged so that any proportion of the material lifted could be returned to the same tank. The return gave an excellent mixture of the pulp as well as simplifying the regula-

tion of the advance. These air lifts have since been replaced with Dorrco pumps, as it was desired to test this type of pump. They will probably be more economical in the use of power.

The leached pulp from the tanks was delivered to a drag-belt classifier, which returned the sands to the tube mill for regrinding and a slime product to the washing



FLOW SHEET NO. 1

and decanting tanks. The necessary dilution of the leaching tank discharge preceding classification was accomplished by the use of return solution from the overflow of the second decanting tank in the three-tank system.

Air Lifts Replaced by Dorrco Pumps

The washing and decanting tanks used in flow sheet No. 1 were 16 ft. square, and were in place, having been used in a previous test on current mill tailings. They were equipped with air lifts for the transfer of the settled solids, similar to those already described. These lifts were not satisfactory, owing to difficulty in controlling the amount of thickened pulp raised. They were therefore replaced with 2-in. Dorrco pumps, which gave good service, requiring a minimum of repairs and operating attention.

The pulp discharge from the third washer in the series was sent to a standard Callow 8-ft. flotation cell, which produced a rough concentrate and a tailing product. No cleaner cell was installed, but periodical tests showed that a high-grade sulphide concentrate could be produced.

The tailings from the flotation cell were at first retreated on a Deister table, but this operation was later discontinued as unnecessary.

The results obtained with flow sheet No. 1 were as follows:

	Assay, per Cent			
	Total Cu	A.-S. Cu	Sul. Cu	W.-S. Cu
Feed to plant	1.41	0.87	0.51	0.03
Leaching-tank discharge	1.14	0.22	0.43	0.49
Washing-tank discharge	0.73	0.21	0.42	0.10
Flotation tailings	0.31	0.13	0.11	0.07

Acid Consumption (Lb. 60 Deg. Bé.)

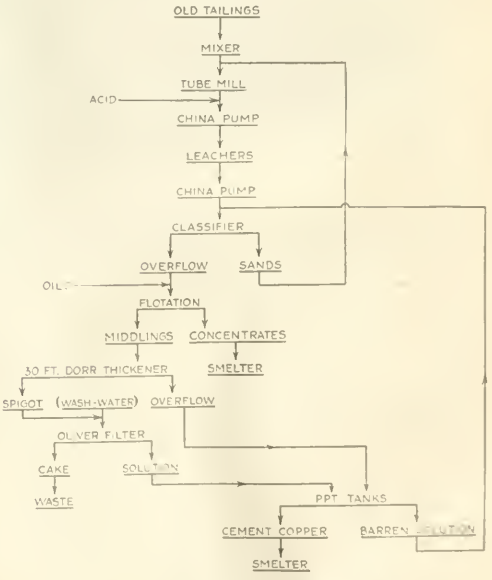
Per dry ton of material treated	51.14
Per lb. of total copper in feed	1.81
Per lb. of A.-S. copper in feed	2.94
Per lb. of A.-S. copper recovered	3.71

Over-All Extraction or Recovery

Per cent of total copper	79.57
Per cent of acid-soluble copper	79.35
Per cent of sulphide copper	79.96
Per cent of water-soluble copper	86.72

The recovery of water-soluble copper would have been increased had not some difficulty been encountered in holding the discharge of the washing tanks at the correct density.

Because of the slow settling of the suspended matter, already mentioned, it was decided to try out a combined decanting tank and vacuum filter flow sheet, limiting the decantation to one tank followed by a continuous vacuum filter. The flow sheet was, therefore, rearranged as shown in flow sheet No. 2. Both flow sheets are identical up to the point where the discharge from the leaching tanks is sent to the classifier. Following this



FLOW SHEET NO. 2

point, in flow sheet No. 2, the copper-bearing solution is recovered partly by tank decantation and partly by filter decantation; also, there is a notable difference in the location of the flotation system in the flow sheet. In No. 1 flotation is the final operation, the table which followed having been discarded as unnecessary, the

sulphide copper being floated from a pulp containing practically barren solution.

In flow sheet No. 2 flotation precedes the decanting and filtering system and receives its feed from the overflow of the classifier which immediately follows the leaching tanks. The sulphide copper is, therefore, floated from the solids contained in a lean copper-sulphate solution. The flotation tailings are sent to the decanting and filtering system, and the final waste tailings of the process form the filter cake. Laboratory tests had proved that sulphides can be floated as readily in lean copper-sulphate solutions as in barren solutions, and this has been checked and confirmed in test-plant operations.

Arranging the flotation system as in flow sheet No. 2 eliminates the necessity of re-pulping the filter cake for flotation treatment, and the problem of disposing of the tailings is simplified.

That the results obtained under No. 2 conditions were more satisfactory than under those in flow sheet No. 1 was due largely to a higher recovery of water-soluble copper. Also, the flotation tailings produced were 0.04 per cent lower in sulphide copper, and it was considered that the presence of a slight amount of free acid was beneficial to the flotation process.

A summary of the principal results obtained under flow sheet No. 2 conditions is given below:

	Assay, per Cent			
	Total Cu	A.-S. Cu	Sul. Cu	W.-S Cu
Feed to plant	1 36	0 79	0 44	0 13
Leaching-tank discharge	1 12	0 22	0 35	0 55
Flotation feed	1 43	0 23	0 47	0 73
Flotation tailings	0 90	0 12	0 09	0 69
Washing-tank discharge	0 33	0 09	0 08	0 16
Filter-cake tailings	0 22	0 10	0 07	0 05

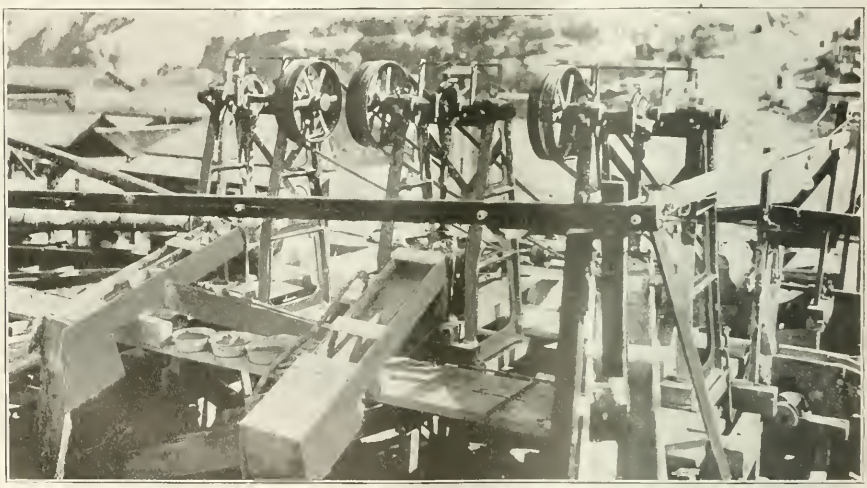
Acid Consumption	Lb., 60 Deg. Bé.
Per dry ton of material treated	59 08
Per lb. of total copper in feed	2 17
Per lb. of A.-S. copper in feed	3 74
Per lb. of A.-S. copper recovered	4 40

Over-All Extraction or Recovery	
Per cent of total copper	84 57
Per cent of acid-soluble copper	84 93
Per cent of sulphide copper	82 70
Per cent of water-soluble copper	91 18

The sands from the classifier being returned to the tube mill, the total copper is lower in the leaching tank discharge than in the feed to the plant, in both flow sheets Nos. 1 and 2. The tube mill, leaching tanks, and classifier operate in a closed circuit. The flotation feed is higher in total copper than the feed to the plant, because the return solution used for diluting the classifier feed contained a small amount of copper in solution, which material was included in the flotation-feed assays.

Flow sheet No. 2 gave satisfactory results if the copper was to be precipitated by the use of scrap iron or sponge iron, and for the slime deposit this method of depositing the copper no doubt will prove to be the most economical.

Recovering all copper-bearing solution by the use of continuous vacuum filters is now proposed, in which operation the leaching-tank discharge will be sent directly to a filter equipped to produce possibly three grades of solution. Recovery of the sulphide copper will not then be attempted until after the copper-bearing solution has been removed from the pulp. The filter cake will be repulped and sent to the flotation system, the flotation rougher cell tailings again forming the general tailings of the system.



DORRCO PUMPS TRANSFERRING PULP FROM ONE LEACHING TANK TO ANOTHER

If it is found possible to construct tailing dams from this dilute tailing pulp of very finely divided solids, so that clear water may be recovered, the use of tanks for the reclamation of solution or of water will be entirely superseded. However, employing of tanks to reclaim the tailing water may be found economical if used in conjunction with the tailing dams as water reclaimers. The main benefit to be derived from the use of the tanks will probably be a better control of the dilution of the copper solution and the production of a higher grade of copper solution.

Crusher, screen, roll, and primary table equipment have been added to the plant to make possible the handling of mixed run-of-mine ores. A roasting furnace and SO_2-leaching drum are also being installed at the plant, so that the cheaper sulphur dioxide may be tried on ores which contain a high percentage of acid-soluble gangue.

Mine Operators of Note

James MacNaughton

VISITING Institute members in the Michigan Copper country were impressed by several interesting facts, and among them was the realization that of all the influences which have directly affected the upbuilding of that section perhaps the greatest is the Calumet & Hecla Mining Co.—the largest operating company in the district. The mines, mills and smelter operated by the C. & H. (no one ever speaks of the company by its full title) all show the influence of a guiding spirit; the effect is that of a well-balanced piece of machinery, each unit working with precision under the touch of a master engineer. Large-scale operations require big-thinking, able men who are learned in the school of experience and who combine with their acquired knowledge of affairs a keen understanding of human nature. Such a man is James MacNaughton, vice-president and general manager of the Calumet & Hecla Mining Co., and, in addition, general manager of all the subsidiary companies of the parent organization. Born in Canada in 1864, of Scotch parents, young MacNaughton, after attending high school, entered the University of Michigan, where he studied civil engineering. There were no frills in those days, and his education was obtained by dint of hard work which brought out those admirable qualities that Mr. MacNaughton so well displays in his management of affairs today. He played football, and, as with everything else, successfully. It is the remembrance of those early days that has produced the enthusiasm and interest which he shows in the sports of the copper district and in the excellent school system that stands second to none in the country. It is quite probable that Mr. MacNaughton would have attended the Michigan School of Mines had that institution been established at the time he entered college, but it was not until 1885 that this excellent college—now the Michigan College of Mines—was founded. However, Mr. MacNaughton has always displayed a keen interest in the school at Houghton, and much of the prestige enjoyed by its graduates and the school itself is due to his advice and counsel. Many of the able members of his staff are "M. C. M." men, and frequently he consents to address the student body on matters concerning their chosen profession. As with many others, Mr. MacNaughton's course in civil engineering was merely the stepping stone to mining, and upon entering the employ of the Calumet & Hecla company his advance was rapid. He was, and is, big, generous, intelligent and resourceful, and above all has that deep insight into human nature which has come to be recognized as prerequisite in the modern administrator and which is the biggest asset of the successful man. One has only to study the record of the Calumet & Hecla to note what that organization has accomplished in the development of a community spirit in the copper country, its methods of handling men, the bonus and pension systems, free insurance for its workmen, and other examples of welfare work, to realize that such undertakings must require the supervisory services of a man of broad mental measurement. Certainly the copper country and the Calumet & Hecla are to be congratulated on "Jim" MacNaughton. He is a member of the American Institute of Mining and Metallurgical Engineers, of the Lake Superior Mining Institute and of the Institution of Mining and Metallurgy (London). He was, and is, keenly interested in politics, having been a delegate to the Republican National Convention at St. Louis in 1896, and also a delegate-at-large from Michigan to the Republican National Convention in 1908. From this we may assume that politics, contrary to the opinions expressed by many engineers, was considered by James MacNaughton to be a good game, for if it were not he would have had little to do with it. His devotion to the welfare of the industrial communities of Michigan should prove an inspiration to the engineering profession.

JAMES MacNAUGHTON

Despite Mr. MacNaughton's many interests he finds time to give consideration to good roads and to the programs for other public improvements which his section of northern Michigan has so well put into practice. He is a member of the University Club of Chicago, the Tennis and Racquet Club of Boston and the Links Club of New York.

The Railroad Situation

By R. S. McBride
Engineering Representative, Washington, D. C.

NEVER within any similar short period have three such far-reaching steps been taken in the American railroad industry as have been made during the last few weeks. The railroad wage award has doubtless affected more workers and influenced wages in a larger total sum than any other similar award in history. Certainly at no time has a regulating authority ever before in one single order created rate increases amounting to a billion and a half dollars per year.

The discharge of nearly 10 per cent of its workers by one of the large eastern railway systems is almost correspondingly drastic in its significance. Apparently labor as well as the rest of the community understands this last event to mean that slothful service in return for reasonable wage is no longer going to be tolerated. Persistent report of appreciable unemployment throughout the country indicates that the railway labor situation is not alone affected thus. The limited ability of the transportation systems to move materials needed for construction and industrial-plant operation accounts in part for the appreciable shortage of employment, but there seems to be at present a general feeling that a decision on the part of management officials is even more potent an influence to this end.

Almost without exception those who have commented upon the railway labor situation believe that increasing efficiency in performance of labor will certainly result from recent events. The increase in wage will render willing workers more content and better disposed toward their employment; the executive policy referred to will mean the elimination of the unwilling employee. It is, therefore, not too much to expect an increase in operating efficiency during the coming months which will perhaps amount to as much as $100,000,000 per year in benefit to the railway systems.

The Accounting Significance

The Interstate Commerce Commission is specifically instructed by Congress in the transportation act of 1920 to regard 5½ per cent as a fair return upon railway values plus an allowance of not to exceed one-half of 1 per cent, this to be fixed in the judgment of the Commission as an allowance for improvements, betterments, or equipment which are chargeable to capital account. The recent decision, therefore, is based upon these terms and is intended to provide a net operating income to the utilities of 6 per cent upon a value of approximately ninteen billion dollars.

There has been very general favorable comment upon this finding. By some it is regarded purely as a reasonable return for current operation of these public corporations. Others, however, believe that the Interstate Commerce Commission took an even more advanced view. Those who hold this latter opinion say that the Commission, realizing that earlier returns had been wholly inadequate, intended to fix the returns at a point which would permit the utilities to catch up on their deferred maintenance work. Of course, if this is the fact it makes little difference whether it is considered to be a recognition of need for adjustment of past returns, which were too low, or it be assumed that these items were deferred from earlier periods, when they were properly chargeable to operating expense, and now, therefore, are properly included in the coming years' operating expenses. The economic significance is the same, though the accounting and legal meanings may be quite different. No matter which one of the several views mentioned is held, it is almost always found that railway students regard the rate increase and the present situation most encouraging to industries as a whole. Great improvement in transportation facilities and service are generally anticipated. If they are realized, all industrial activity will quickly profit.

The effect of the railway situation upon cost of living by and large to the community is too complicated to forecast for the immediate future. However, even though the ultimate user finds the whole increase passed on to him in the prices of commodities which he buys, he can feel some degree of reassurance in the fact that facilities are being provided whereby *future* transportation of *similar* commodities can be more effectively accomplished. Taking the present coal situation as a striking example of the benefit of this, it is evident that the user of this commodity will ultimately profit greatly by paying the higher transportation charges. The coal situation is as follows:

Factors Affecting Coal Prices

The high prices of coal, both bituminous and anthracite, have been in large measure, if not wholly, the result of two factors: (1) a slight under-supply, and (2) an excessive panic with respect to shortage. It is well known that even a very small percentage of demand above supply creates large percentage increase in prices. This has been all too evident in the coal situation recently. Spot coal prices have been extremely high, and wholesalers handling coal on contract from the mines for current sales not under contract naturally have taken advantage of the current spot market. The margin between the spot market and the contract market has thus been very great, and hence the temptation to break contracts has been most unusual. Doubtless the violation of contracts by producers of coal has, therefore, been unprecedented in amount recently; and what should have been contract coal became spot coal subject to all the fluctuations and competitive demand. As a result almost everyone who had to buy during recent months has been compelled to pay a high price.

The fundamental cause of the entire coal shortage has, however, been the inability to provide cars for the prompt movement of coal, which coal could be produced in quantity far in excess of current demand were cars available. Let us assume that a reasonable policy of improved coal-handling facilities is adopted and that part of the billion dollars per year increase in railway net income is expended for this needed equipment. In a single year the purchasers of coal should be relieved of all fear of coal shortages and excessive prices similar to those now confronting them.

Krupps After Russian Iron Ore

A Berlin correspondent of *The Iron Age* reports that Krupp prospectors are investigating the large fields of magnetic iron ore located by the late Professor Leydt at Kursk, in South Central Russia. These so-far unworked ore fields, according to Leydt and two Swedish engineers who have checked his observations, extend in parallel bands for a distance of 180 kilometers, and are among the greatest deposits of magnetic ore in the world.

BY THE WAY

More Points on Technical Writing

During the course of a dinner at which the members of the Bureau of Mines staff gathered recently, John L. Cochrane, the director of the Bureau's publicity division, was asked to discuss the following topic: "If you had the power to develop a writer of technical matter, what course would you adopt?" A portion of Mr. Cochrane's reply is as follows:

First of all I would catch him young and feed him on alphabetical crackers to insure that he became a man of letters. Then I would give him a careful diet of raw bull to strengthen his nerve—the one most essential thing to technical writing.

I would teach him that the other man in the same line of work is always wrong: can't possibly ever be right. (You could prove that through the fact that he indulges in technical writing.) I would attempt to teach him that clearness is fatal to any technical writer. I would drill into him daily, "Kid, obscure your meaning, and you will become famous." Then it will give you a convenient loophole to escape if you ever have to. If anyone attacks you then you can very easily call him "another," because in reality you, yourself, if honest with yourself, as you sometimes should be, do not quite know what you mean yourself. In that way, you'll have it on him, even though he won't know. Anyway, a conscience is sometimes convenient, even to a technical man.

If you want to throw a few additional smoke screens into the article, which is always desirable, puncture it with stars, asterisks, crosses and other mysterious marks, the harder to understand the better. Then have a number of footnotes that correspond, but mean nothing. Be sure that you refer as authority to some society that you defy him to find out anything about, such as "Flannigan in the May, 1852, proceedings of Erin-go-Bragh." Make it as difficult as possible for your reader to follow; that's genius.

And here is some advice that ought to be italicized: If you disagree with another author and want to pillorize him before your technical disciple (you really care about nobody else), put in an extra footnote and refer to him as the authority for something you know is wrong. If done naively, it has the effect of T.N.T. The ordinary effort of the layman in such matters is childish in comparison.

Always quarrel with your scientific brother in a dignified manner. Begin with, "May I have the honor to explain." The beauty about such open, gentlemanly controversy is that you may quite as often be as near right or as near wrong as the other fellow. I stress this, because I feel it is an important accomplishment in technical writing. How fully equipped is a technical writer who can tell a man he is a damn fool in language that leaves him flattered!

Then by all means, if you are a Government technical employee, have at least three or four other technical employees read critically your manuscript before it is ready for the printed page. The beauty here lies in the fact that when they get through with it all such annoying superfluities as personality of the author have disappeared. Don't bother about the lack of capabilities of those who read the manuscript. The chances are that unconsciously they may improve it, as in the case of the hitherto homely person who developed into a handsome man after a horse had stepped on his face. And during this process of critique, if you ever wince when they put the hot iron into your soul, you will never make a technical writer, and therefore there may be some hope for you.

And please remember as a technical writer that nothing is ever perfect. If you are in a great art gallery and the simple-minded folk are admiring the Venus de Milo in their crude, enthusiastic way, remember your training and take issue with the work. Suggest that it is not true to nature because it does not have one or two warts on the feet. Point out that there are no varicose veins on the leg.

I almost forgot to say that brevity, being the soul of wit, has no place in a technical article.

If the dream child that I have instructed (and he is no synthetic kid) can follow me, it may be said of him with apologies to Kipling "Then you'll be a man, my son; you'll be a man."

Typewritten in the Clouds

P. R. Coldren, editor in charge of editorials and mining for the *Joplin Globe*, believes he is the first newspaper man in the country to write an editorial in an aeroplane. He made his first flight on Friday, Aug. 13, just to show his scorn of superstition, and in order to feel perfectly at home, took along a small portable typewriter, tied securely to his knees. The editorial he wrote he admits was not literature, but he is going to claim that it is the first written on a typewriter in an aeroplane, until he learns differently. Mr. Coldren is an honorary member of the American Zinc Institute and had a place on the program at the recent annual meeting in Chicago.

Engineer and Inventor

Pedro Zamora, the Mexican bandit, recently captured Charles Hoyle, of Esperanza, Ltd., as recounted in the daily press, whereupon a certain New York paper stated, "Hoyle is a nephew of the American inventor, John Hays Hammond." What's the use of being an engineer, after all, and famous (so we think) at that?

Rolling Stones

That mining need not be an ephemeral occupation is indicated by the records of a few old-timers in the Globe district in Arizona. Sam Richmond, who worked the first silver claim in Richmond Basin about forty years ago, is still working a claim there at the age of seventy-seven and recently received $200 from a single sackful of silver ore shipped by him. Fred Ilefty, also seventy-seven years old, has lived at McMillen for forty-three years, and Charles Newton, caretaker at the old McMillen mine, has been in the camp for over forty years, though it has long been practically deserted.

A Classic Allusion

"On one occasion in 1849, for instance," says Hittel in his "History of California," "when William B. Almond was trying a trivial case in San Francisco, the attorney for the plaintiff, in what he considered a sudden burst of inspiration, called his opponent an oscillating Tarquin. 'A what?' exclaimed the judge in a stentorian voice. 'An oscillating Tarquin, Your Honor.' At this the judge, who was entirely unacquainted with Tarquin and had probably never before heard the word 'oscillating,' removed his feet from the table in front of him; and, leaning forward and pointing his index finger toward the offending disciple of Blackstone, he ejaculated in a voice of thunder, 'If this Honorable Court knows herself, and she thinks she do, that remark is an insult to this Honorable Court. You are fined two ounces and stand committed till you down with the dust.' 'But, Your Honor—' remonstrated the attorney. 'Silence, sir,' roared the judge, 'this Honorable Court won't tolerate 'cussing' and never goes back on her decisions.' It is almost needless to add that the fine was paid and the attorney more careful of classical allusions for the future."

CONSULTATION

The Future of Barytes

"In your Aug. 7 issue of the *Engineering and Mining Journal*, first article, the statement is made that the demand for barytes is increasing and its future is excellent. I would be glad to know why."

The demand for barytes is dependent upon its useful properties. There are three major uses for this material, which, in order of importance, are, in the manufacture of lithopone, as ground barytes (a white pigment, or base for paints), and in the manufacture of barium chemicals. Barytes has a wide variety of important applications that are continually being expanded. The greatest consumption is absorbed by the growing lithopone industry in the United States, whereby barytes and zinc are chemically and physically treated to form a valuable pigment (see July 17 issue of *Engineering and Mining Journal*.) It is the great demand for paint in the United States in connection with building and other construction which accounts for the present pressure to produce as much barytes as possible. The demand for barytes at the present time is larger than the supply, a condition that shows no indication of being mitigated for some time unless unexpected shipments of crude barytes from abroad should occur. It is essentially a producers' market.

The critical shortage of barytes is directly the result of the almost complete curtailment of imports of this material from Germany, where most of the foreign barytes formerly coming to the United States was produced. In previous years 25,000 to 30,000 short tons was imported annually. In 1916, 1917, and 1918 the imports totaled only twenty-three tons. Under these circumstances the domestic resources of barytes were called upon to fill the void left by decreased imports, with the result that the price of the product gradually increased. In previous years $3.50 per ton was considered a fair price for crude barytes. Present prices for the same class of material are between $10 and $12 per ton, an advance of about 250 per cent.

The attempt to replace the shortage of foreign ore by greater activities in the domestic barytes fields was handicapped by the smallness and frequently the isolation of the deposits. Ready accessibility is so lacking in some barytes mines that only with a high price of barytes —such as is ruling at the present time—can these operations continue. However, inaccessibility today may be accessibility tomorrow. The chief source—also the chief market—for barytes is in the East, and those mines in the Appalachians conveniently located as to markets are in for a prosperous period. The only dark outlook on the barytes horizon is the probability of the resumption of imports from Germany. There is little doubt but what Germany will be anxious to ship this material to the United States and furnish competition along the Atlantic seaboard which it will be difficult to meet under existing tariff regulations. The large deposits of Germany can be mined cheaply and the ad valorem duty of 15 per cent is a small protection to the industry. However, the possibility of Germany resuming the export trade quickly is not as probable as it may seem. Many difficulties will have to be surmounted before the readily available shipping facilities which that nation was accustomed to have before the war are again at its disposal. Furthermore, labor and political troubles have not been entirely eliminated. The importation of German barytes is still an uncertain element in the situation. Then there is the possibility, which ought not to be overlooked, that higher tariffs may be imposed to protect the American industry.

How long the present period of prosperity may continue no one can prophesy, but it seems certain that it will be for some time—until heavy importations from abroad are made. A much larger production than the present one could be easily absorbed, and search is being continually made for other deposits. A great part of the country's output is in the hands of the lithopone and other manufacturers, but these interests have been unable to fill their own requirements and are constantly in the market for the crude material. It is unlikely that the demand for this useful mineral will decrease in the next few years.

The following table summarizes the development of the industry in the ten years previous to 1919.

BARYTES PRODUCTION IN THE UNITED STATES, IMPORTS, AND AVERAGE PRICE 1910-1918

	Produced and Marketed in U. S.	Imports	Average Price
1910-1914 Average	43,389	28,800	$3.31
1915	108,547	2,504	3.51
1916	221,952	17	4.56
1917	206,888	6	5.66
1918	155,368	0	6.73

Cobalt-Nickel Smelters

"I would appreciate it very much if you would give me the names of some smelting companies that treat cobalt-nickel ores. There are some, I believe, in Eastern Canada and a few in England."

The following comprises a list of companies producing cobalt in North America:

	Location of Works	Post Office Address
Deloro Smelting & Refining Co., Ltd.	Deloro	Deloro, Ont.
Coniagas Reduction Co., Ltd.	Thorold	St. Catharines, Ont.
*Metals Chemical, Ltd.	Welland	Welland, Ont.
Standard Smelting & Refining Co., Ltd.	Chippawa	Niagara Falls, Ont.

In the United States, the Haynes Stellite Co. has a plant at Kokomo, Ind., in which it reduces cobalt ores mined at its property in Idaho. A former cobalt-nickel refinery at Fredericktown, Mo., was shut down in 1909. and to the best of our knowledge is not operating at the present time.

The domestic resources of nickel and cobalt are small. The nickel smelters and refineries in the United States, such as the International Nickel Co., work wholly on imported ore and matte coming from Canada or New Caledonia. The United States is not self-supporting in nickel requirements.

*Not operating.

THE PETROLEUM INDUSTRY

A Numerical Expression for Production-Decline Curves of Oil Wells

By Means of Mathematical Interpretation and Records of Formulæ Which Express Well Production It Is Possible To Avoid Bulky Data, and Curves May Be Conveniently Constructed as Desired

BY J. O. LEWIS* AND W. W. CUTLER, JR.†
Written for *Engineering and Mining Journal*‡

EXPERIENCE has shown that the production-decline curve follows an exponential equation of the type formula $y - a = k\ (x - b)^{-n}$. These curves have usually been recorded graphically on rectilinear or logarithmic co-ordinate paper. The recording of such curves by numerical rather than graphical expressions has certain features which are useful, particularly as thereby much data may be presented in condensed form. The method of deriving and recording numerical expressions for production-decline curves will be briefly outlined.

The production-decline curve shows the production of a well, tract, or field for successive periods, in terms of production. Thus for a well which produced during successive years 8,200, 4,900, 3,800, 2,450, 2,300, and 1,850 bbl., the production-decline curve would at successive equal horizontal intervals pass through points 8,200, 4,900, 3,800, 2,450, 2,300, and 1,850, respectively, on the vertical scale.

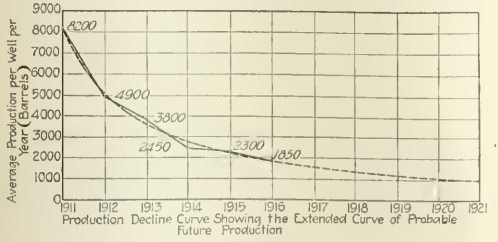


FIG. 1. PRODUCTION-DECLINE CURVE

Fig. 1, which illustrates a production-decline curve, is taken from p. 70 of the "Manual for the Oil & Gas Industry," for 1918, published by the Treasury Department. Such curves may be used to read past production and to estimate production in the future. Curves can be made by various methods for different fields or properties which usually reduce to hyperbolas when "ironed out." A collection of plotted curves is bulky and inconvenient to carry, whereas a simple numerical expression for each curve may easily be formed which will permit the reproduction of the curve when desired, and thus the curves for many fields may be carried on a single sheet of a notebook. The use of this method is confined to curves which closely follow a true hyperbola.

The method is as follows: Transfer the production-decline curve to logarithmic paper. Shift all points of the logarithmic curve the same number of units to the right or left until the curve approximates a straight line. To straighten always move the curve in the direction of its convex side. It may require several trials to determine the proper position of the curve.

In the accompanying illustration (Fig. 2) curves 1, 2, and 3 represent the same curve in different positions

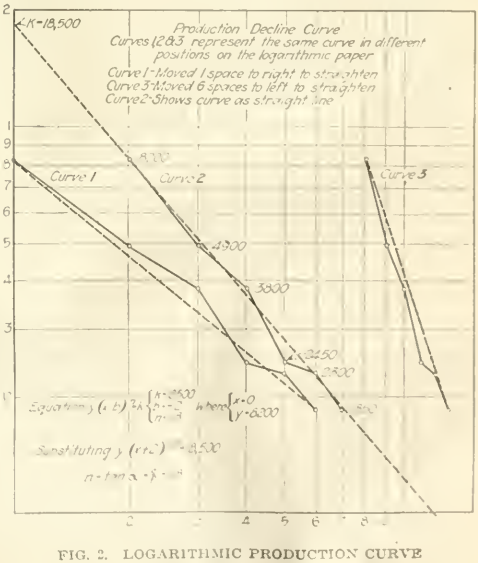


FIG. 2. LOGARITHMIC PRODUCTION CURVE

on logarithmic paper. Curve 1 was moved one unit to the right until it approached a straight line, as shown by Curve 2. Curve 3 was moved six units to the left until it occupied the position of Curve 2. A straight line can be drawn through Curve 2 so that it passes through or lies between all points of the curve and

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‡Published by permission of the Director, Bureau of Mines.

represents the mean average of the curve. This straight line represents the "ironed-out" curve and may be extended downward to read estimated future production, or may be extended upward in case the past production is not known.

Two points of a straight line on logarithmic paper establish a curve, and thus by recording the co-ordinates of two points on the "ironed-out," straightened, logarithmic curve a numerical expression for the production-decline curve is obtained.

To show which part of the curve represents the actual productive life of the wells choose the two points on the "ironed-out" curve where it crosses the beginning and the end of the period of production.

Thus in the accompanying illustration the record of these two points establishes that part of the curve representing the period of actual production:

$Y = 8200$ $\quad Y = 1850$
$X = 2$ $\quad X = 7$

(y = production in barrels, x = relative time in years; thus 2 = 1 actual time and 7 = 6 actual time).

These two points may be plotted on logarithmic paper and joined by a straight line when it is desired to reproduce the curve.

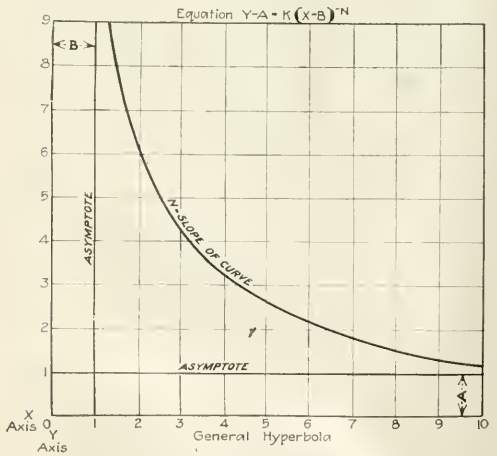

FIG. 3. HYPERBOLIC PRODUCTION CURVE

Fig. 3 shows the type of hyperbola which the production-decline curve approaches. The type equation for this curve is $Y - a = K\ (x - b)^{-n}$ where a and b are the distances of the asymptotes from the X and Y axes respectively, n the slope of the curve, and K, a constant.

It is to be noted that this type of hyperbolic curve is the curve for expanding gases. The production of an oil well generally represents the work accomplished by the expansion of the compressed natural gas associated with the oil in the sands. The production of oil in fields where recovery is caused mainly by expanding gases is essentially a problem in thermodynamics.

A production-decline curve begins theoretically at infinity production and zero time, but actually at some definite production, and the Y axis may be moved to pass through this point, thus throwing the asymptote to the left of the Y axis and making b a minus quantity. All points to the left of the Y axis thus become minus quantities, and hence imaginary so far as the well or wells are concerned. Time for the particular curve begins in the Y axis; thus in Curve 2, Fig. 2, 2 on the time scale becomes the first year, 3 the second year, and 7 the sixth year.

The production curve may be theoretically considered as ending at zero production and at infinity time. Thus a becomes zero and the asymptote coincides with the X axis. Actually the curve terminates where production ceases for whatever reason—usually where it has reached, or is estimated will reach, the economic minimum of production. n, the slope of the curve, may be determined by plotting the production decline curve as a stright line on logarithmic paper and then scaling the tangent of the slope as in Fig. 2, where tan

$$\alpha = \frac{e}{f} = 1.18.$$

K is a constant and may be determined graphically from the straightened logarithmic curve, as it is the value of Y where the curve crosses the left side of the logarithmic paper at one on the abscissa from the asymptote. In Fig. 2, $K = 18{,}500$. K may be determined mathematically by substituting the already determined values of n, b, and x and y for any point in the equation:

$$y - a = k\ (x - b)^{-n} \text{ where } a = o,\ y = \frac{k}{(x - b)^n} \text{ or}$$

$$y(x - b)^n = k.$$

In Fig. 2 n was recorded as 1.18. The highest recorded production was 8,200, which lies on the straightened logarithmic curve where the abscissa equals 2. b, therefore, for this curve, is —2. K, which equals value of y where curve lies at abscissa 1, equals 18,500.

The formula for this curve thus becomes

$$y(x - b)^n = K, \text{ or } Y(x + 2)^{1.18} = 18{,}500.$$

Where $x = o$, $Y = 8{,}200$.

When the value of n is high, and it sometimes approaches 20, the determination of n must be very exact, and is difficult to obtain. A small error in the value of n introduces a large error in the calculation.

It is, therefore, preferable to record the co-ordinates of two points of the curve instead of the equation.

New Oil Area in Colombia

Colombian engineers and geologists are investigating a reported new oil area in the southeastern part of Colombia and about thirty-five miles from a navigable affluent of the Amazon. Some drilling has already been done, and good results are claimed. So far, no foreign interests are in the field.

The attention of the American and British operators has recently been directed to the Pacific littoral south of Buena Ventura, where excellent oil indications and structure are reported. This formation is supposed to be a continuation of the horizons yielding high-grade oil, exploited in northwestern Peru and developed by shallow native operations at Santa Elena, in Ecuador.

The Union Oil Co. of California has reported that its first well in Mexico proves to be a 42,000-bbl. gusher, according to word received by the local office from Mexico. The well in a twelve-hour day is said to have delivered 20,891 bbl. through a pipe line for three miles and kept the pressure at 350 lb. in the line. Oil men on the ground, according to the report, estimated that if the oil was flowing into tanks that were closer the well would run as high as 80,000 bbl. a day.

NEWS FROM THE OIL FIELDS

Lost Soldier Field, in Wyoming, Shows Promise at Depth

From Our Special Correspondent

The Blair Oil Co. has completed its No. 22 well in the Lost Soldier field, flowing 600 bbl. daily from the fifth sand at 1,375 ft. Four other sands above this fifth sand were penetrated, each showing oil in commercial quantity. After being cased and deepened the flow increased to 1,500 bbl. This hole is of considerable importance, as it shows that the Lost Soldier field is of much greater importance at depth than was formerly believed.

Several wells have been brought in near Casper recently. The Iowa-Wyoming Oil Co. completed its No. 3 well in the Bolton Creek field, producing several hundred barrels of oil daily. The other wells are being drilled, and the location for a fourth has been made. The Chappell Oil Co. is also spudding in on land of the Victor-Wyoming Oil Co. In the Osage field a gusher was brought in at 1,320 ft. on land in which the Casper-Osage Oil Co. holds a one-half lease interest.

Considerable work is under way on the Mahoney dome, north of Rawlins. The Utah Refining Co. has struck a good oil showing at 2,100 ft. This has been cased off and the well deepened to the lower sand at about 2,400 ft.

The Midwest Refining Co. is drilling its first well in the Elk Basin field on Section 19-58-99. This well will be drilled to 2,500 ft. at least. Wells producing 50 bbl. daily have been brought in at 1,600 ft. in this field.

The Anglo-United Oil Co., Ltd., has a well 130 ft. deep to the top of a 50-ft. sand in the Dallas field, Lander County, producing about 50 bbl. of heavy oil daily. This is one of the shallowest wells in Wyoming. In contrast to this well oil has been struck in the General Petroleum Co.'s well on Sect. 17, Ferris field, 4,400 ft. deep. Two sands were passed through, but these gave no indication of being oil-bearing until drilling was stopped to permit casing to be set when the hole started to cave at the bottom.

Considerable drilling is being done on wildcat wells in the Muskrat field, thirty miles south of Shoshoni. It is stated that the Midwest Refining Co. has found a good showing of oil and gas at 1,380 ft. in this section.

Deep drilling in the Alkali Butte field, near Riverton, is being done by the Inland Oil & Refining Co. Its No. 2 well is over 2,780 ft. deep, and the first Wall Creek sand, it is expected, will be struck soon. The Cheno-Myrin-Midwest Companies' well in the northern part of the field is down 900 ft. This will also be a deep test. The Myrin Oil Co. will drill twenty wells to the proved shallow sand of this field. These wells will be on property of the Cheno Oil Co. recently taken over on a working basis by the Myrin Co. There are already eight producing wells on this land. The Carter Oil Co. will extract casinghead gas from its gas well, which came in making 35,000,000 ft. of wet gas.

High-Grade Well Rekindles Oil Interest in Montana

From Our Special Correspondent

Cleaning of a shale cave-in at the Frantz No. 2 well in the Cat Creek field, in Fergus County, in the central part of Montana, resulted in the well blowing itself in with a production of 1,200 bbl. of high-grade oil daily. This output at one time showed a flush of 1,800 bbl. The oil runs as high as 50 per cent gasoline, and, for the volume of high-grade flow, the well, it is claimed, will stand alone in the country. Up to the time the well had been cleaned it had an output of about 350 bbl. A pipe line has been constructed from the well to Winnet, about fourteen miles distant, on a branch line of the Chicago, Milwaukee & St. Paul Ry., capable of carrying about 1,200 bbl. daily. This well has kindled anew the oil excitement in Montana, and about 100 drilling rigs are in operation throughout the state.

Oil Struck Within Arctic Circle

From Our Special Correspondent

The Imperial Oil Co. makes the announcement that after two years' exploration and drilling, oil has been struck at Fort Norman, just within the Arctic Circle, north of Great Slave Lake and close to the Mackenzie River. Oil was found at a depth of 480 ft. with a flow of 10 bbl. per day. The company has eleven rigs operating at various points in Western Canada, carrying out the program as announced at the annual meeting last February, comprising the exploration of all prospective oil areas in the country.

Few people appreciate the immensity of this undertaking. Fort Norman is 1,000 miles north of the nearest railway, and the complete drilling outfit had to be taken by water down the Peace and Slave Rivers, through Great Slave Lake and down the Mackenzie River. Fur traders in those far posts receive mail only once a year. The crew and outfit started down the river early in the summer of 1919, but on account of low water had to winter at Great Slave Lake, the journey being completed this year.

At Czar, Alberta, where one well is already 2,000 ft. down, it is thought the prospects of striking oil between that point and 2,500 ft. are good.

1,000-bbl. Gusher in Kentucky Kills the Driller

From Our Special Correspondent

A gusher which flowed 250 bbl. the first four hours was brought in Aug. 18 on the S. A. Kelly farm near Bowling Green, Warren County, Ky. It was completed at 484 ft. and is estimated good for 1,000 bbl. a day. Fred Fulton, sixty years old, driller, was burned to death when the well came in. Other drillers succumbed temporarily to the gas fumes from the well.

A well was completed Aug. 20 on the farm of General W. L. Sibert, offsetting the Tarrants wells near Bowling Green. Oil was thrown 60 ft. into the air and a continuous stream shot skyward for forty-five minutes before it was put under control. The initial flow was 100 bbl. an hour.

The Leon Producing Co. recently brought in a 500-bbl. well on the Davenport lease in Warren County. The well was standing 700 feet in oil when it was shot. Location is being staked out for No. 2, on which work will begin as soon as No. 1 is put on the pump.

Interest in oil is growing in Cumberland County, eastern Kentucky. The Southern Oil & Refining Co. brought in what is described as a "real good well" on the Russ Gilbert farm, near Bakerton. A strong stream has been flowing from the well to the Cumberland River, a half mile distant. It is located a short distance from the "Old English" well, drilled in 1866, and which produced 1,200 bbl. daily. No. 2 of the Carter Oil Co. is reported from Menifee County on the John Powers lease, rated at 100 bbl. Oil operators report this to be a promising field. The Turtle Oil & Gas Co. is drilling south of Paintsville, Harlan County, and expects to be in the sand soon.

Colorado Wildcat Strikes Oil

From Our Special Correspondent

It is reported that the Nee-No-She Oil Co. has struck oil at 2,550 ft. in its well in Sect. 18, T.20S., R.46W. in Kiowa County, Col. The well has not yet been bailed, so it is impossible to state what its possible production will be. Naturally, the discovery of oil in a wildcat well of this character has created great excitement locally, and leases are selling at high figures.

The Producers & Refiners Corporation has secured leases on a block of 8,000 acres in Routt County. This area covers, it is believed, two possible oil bearing structures. The first well will be drilled near the center of the southeast one-quarter of Sect. 25, [illegible]. Machinery and building material are being hauled in from Hayden, the nearest railway station, about twenty miles southwest. Several years ago gas was found at shallow depth in the section.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Deister Machine Co. Patents Held Valid

U. S. Circuit Court of Appeals Rules Claim Not Void, Though Not Included in Co-pending Application

The Circuit Court of Appeals of the United States, Seventh Circuit, recently affirmed the judgment of the District Court holding the patent of the Deister Machine Co. for improvements in concentrator tables valid and infringed by the Deister Concentrator Co. In the appeal the Concentrator company attacked the decree of the District Court upholding certain claims in three patents covering improvements in concentrating tables, asserting that all the patents were invalid and that its structures do not infringe any of the claims involved. It also claimed that as to the first two patents issued there had been double patenting.

Speaking for the court, Judge Evans says that various types of concentrating tables were well known to the trade in 1912. Some were covered by patents, and certain factors in the successful operation of all concentrating tables were well recognized at that date. Among the well-known types were the Gilpin County bumping table, the Gold Coast of Africa table, the Overstrom table, and the Butchart bent-riffle table. From these types, as well as from various patents, it was found that riffles were old, resistance planes were old, and the reciprocal longitudinal movement and the tipping or tilting of the table were all well known, and had been commonly practiced for many years prior to the appearance of the Deister Machine Co.'s tables.

The inventors of this company's table were far from being pioneers in the art. However, they conceived and worked out what they claimed was an improvement over other tables. A new element was added to these older ones, which, co-operating with them, doubled, it was claimed, the capacity of the table, without increasing the loss in the tailings, secured a cleaner and greater quantity of ore values, and reduced the item of labor cost. The court found some evidence to support these assertions. That an increased capacity without loss in the tailings resulted was not seriously disputed.

The Machine company's Claim 4 of Patent 1,040,164, for concentrating table, one element of which is a plateau having its surface above, but substantially parallel with, the general surface of the table, and Claim 1 of Patent 1,040,165, having the same element, were held valid and infringed, though the plateau of the Concentrator company's table was not precisely parallel with the surface of the table.

Defining the terms "substantially parallel," the court says the patentee was seeking apparently to prevent congestion of material on the dam or incline connecting the plateau with the main surface of the table. If the plateau was approximately parallel, the material leaving the apex of the dam or incline would move more rapidly than it traveled while ascending the incline, with the result that the minerals would spread out and the wash water would remove the slime or sand that was carried up the incline by the values. Thus, "substantially parallel" as used here is a relative term, and not synonymous with exactly or precisely parallel. And defendant's plateau was sufficiently parallel, said the court, to constitute infringement of the patent.

Applications by the same person for the two above-numbered patents were co-pending in the U. S. Patent Office, and the patents were issued on the same day. The defendant contended the claim of the latter was void because it was only a broader or more generic claim and might have been joined with the claims of the first patent. The court ruled against the contention that there had been a double patenting, and said it could not be assumed that the issuance of the one with the smaller number preceded the issuance of the other.

Claims 1, 4 and 5 of the Deister patent, No. 1,088,685, for a concentrating table having a plurality of plateaus, with the front edge of the final plateau forming the mineral-discharge edge, were held valid and infringed, though defendant's final plateau was rounded near the edge. But, the patentee having specified as one element of his combination a plurality of plateaus, with the front edge of the final plateau forming the mineral-discharge edge, he was limited to a table in which the front edge of the final plateau formed the mineral-discharge edge, though such element was valueless.

Thomas Et Al Guilty of Contempt in South Butte Suit

In the contempt proceedings of the South Butte Mining Co. against Thomas B. Thomas, in which the Circuit Court of Appeals, Ninth Circuit, held Thomas and others in contempt for attempting to obtain a patent from the Land Department to the Resurrection lode claim, the Supreme Court of the United States has denied the petition of Thomas for a writ of certiorari to the Court of Appeals, making the judgment of that court conclusive in holding them in contempt.

Arizona Supreme Court Defines Private Nuisance Law

Rules as to Conditions Under Which Mines Are Liable for Noise, Smoke, and Offensive Odors

Judgment against the Arizona Hercules Copper Company, in its condemnation proceedings against the Methodist Church at Ray, and the Ray Consolidated Mining Company, has been affirmed in the Supreme Court of Arizona.

In its opinion the court says that a mine had the right to construct ore bins at the mouth of its shaft on its own property, and the fact that they were in close proximity to a church, and that in their reasonable use the noise therefrom disturbed public worship or other functions of the church, and thereby diminished the value of the church's property, gave the church no right of action for damages.

And where a mine condemns property and lays tracks for its private use, the principles applied to common carriers when acting in their private capacity should be adapted in fixing the liability of the mine owner for damages to private property.

Further, a mine which condemns a small strip of land for a track and in the general plan of construction intends to construct several other tracks on a highway, tracks being for the private use of the mine, the rule of consequential damages should be extended to all the tracks and their operation, and the land owner is entitled to damages by reason of noise, smoke, cinders, vibration, or other nuisance or injury; the improvements amounting to a private nuisance under the Arizona law.

Judgment Against Brant Independent Mining Co. Reversed

In another action arising out of the foreclosure proceedings against the Brant Independent Mining Co., the U. S. Circuit Court of Appeals has again reversed the judgment of the District Court for Colorado, which had awarded to the trustee in the mortgage a deficiency judgment in the sum of $108,373 against the mining company.

The judgment was the difference between the amount found due upon the bonds issued by the mining company, with interest and costs, less the amount received from the sale of the mortgage property. The Court of Appeals ruled that a trustee in a corporation mortgage securing bonds, on foreclosure of the mortgage, is not entitled as such trustee to recover a deficiency judgment for the amount found due on the bonds over and above the proceeds of the sale, unless such right is given him by the mortgage.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Bisbee To Remain American, If Possible, Says Dowell

Large Number of Mexicans on Sacramento Hill a Temporary Condition —Operations Must Continue

"Present Plans and Plans for the Future in Company Operation," was the subject of a recent talk at Bisbee, Ariz., by G. H. Dowell, manager of the Copper Queen branch of the Phelps Dodge Corporation. Mr. Dowell made the first authoritative remarks that have been heard there in some time, as to the views of the company on the labor situation and the prospect for the future in the matter of ore reserves. He said in part:

"The company that I represent depends largely on the income from this property for the development of other properties. As you all know, operations have been restricted during the last year or so on account of the inability of the company to market copper, but all look forward to a time when we shall be able to market all the copper we can produce.

"In addition to normal mining operations, there has been the work on Sacramento Hill. The company has invested there already about $5,000,000 and before the project is ready for operation will have invested more than $8,000,000. I remember that a speaker here some time ago remarked that Sacramento Hill is an illustration of the saying that faith will move mountains, but I have found that it takes something more than faith to move Sacramento Hill. The project is really just begun. We have moved, up to date, about 10,000,000 tons, but before the project is completed shall have to move more than 80,000,000 tons.

"The companies and the community here, as elsewhere, have the problem of labor supply. We have had and have now all the labor we need under present production conditions. I think we shall have enough when the time comes to attain our normal output of about eight millions pounds of copper a month.

"It has been the policy of the company to employ English-speaking men under ground. About 80 per cent of those now working under ground are Americans. I hope the company may be able to continue this policy. On Sacramento Hill the company has been forced to employ much Mexican labor, but you should understand that this is only a temporary condition. When the Sacramento Hill project has been completed, most of these will be laid off.

"The problem of obtaining American labor devolves on three conditions. The wage scale is the first. This camp has the reputation of paying as high or higher than other places. The company desires to maintain this reputation. To a certain extent, however, the company's hands are tied. It would be destructive to depart very far from the scale of wages paid for similar labor in other camps.

"The second point in obtaining American labor is the treatment of men on the job. We are trying to bring about a system whereby a man gets a square deal on the job. Under such conditions men become and continue contented, and will want to stay.

"The third point is community environment. There is no other locality in the Southwest that can compare with Bisbee in climate and public schools. We have done what we can in the matter of providing recreation. Men who are working hard must have recreation. We have endeavored to assist in the matter of housing. It has been the policy of the company to employ married men and to enable them to provide a home. We have encouraged home building, but in the last few years have been hampered by the war and high costs in this respect. Many employees provide their own homes through the Building and Loan Association. Married men, as a rule, are the most dependable and efficient and lose less time on the job.

"Another matter of importance is that of community spirit. Men who come into this camp must be made to feel that they are one of us. It makes no difference what occupation a man is in if he is an honest man earning an honest living.

"We hope to maintain our policy of employing Americans in this camp. It would be disastrous to have to shut down the mines in order to carry out this policy, and if the worst came to the worst we would employ what men we could get. This is a matter in which all are vitally interested. The company will carry out the policy of employing Americans to the fullest extent, but we need your assistance.

"With regard to the future of Bisbee, we have as much ore reserves now as we ever had. A large part of the earnings of this property will be put back into it."

The Société de Chrome has been having some difficulty in completing the installation on Yaté of the extensive hydro-metallurgical installations ordered from France. The local canaques, by advice of their religious leaders, are refusing to recognize the validity of sales of land regularly agreed on and ratified by current usage and decrees. The colonial government has been hesitating in face of the native opposition, writes *Le Bulletin du Commerce* of Nouméa, and work has been held up.

Stolen Platinum Recovered by Aid of Bureau of Standards

One of the noteworthy features in the industrial chemist's year of 1919-1920 has been the theft and subsequent recovery of large quantities of platinum laboratory utensils belonging to government and private laboratories. Two men were arrested last April while attempting to dispose of 280 troy ounces of platinum "sponge," the porous state of the metal. They had left small lots with two firms who, having circulars concerning various thefts, notified the authorities.

A general round-up was ordered and inventories of all Government platinum in various bureaus and in munitions manufacture were made.

Chemical analysis indicated that the seized supply had come neither from the New Jersey plant nor from the laboratory of the Bureau of Standards. The Government agents did not believe the story of one of the men that he and a friend had obtained the metal by placer mining about 100 miles north of Parry Sound, Ont., because there had never been any of the metal found there.

In its quality the captured consignment closely resembled the stocks at the War Department Plant at Nitro, W. Va., where the inventory showed there should be 5,000 ounces of sponge, and also the stock at a Government military plant at Jacksonville, Tenn. As some of the platinum at Nitro was known to contain a large percentage of palladium that in the satchel seemed to have come from Jacksonville.

One of the men, although he said that he was a Canadian, spoke with a marked Southern drawl, which suggested that he had been born not far from the Blue Ridge. He had a certain indolence of manner, which made the detectives think he would not work his imagination any more than he was compelled to do. Finally they located a Maxwell House in Nashville, Tenn. Government agents immediately were dispatched to this hotel and working from it discovered that one of the men arrested had been employed in the Old Hickory Powder Plant at Jacksonville. The investigation led from the powder plant to the Government reservation and resulted in the arrest of an assistant chemist who was implicated in a confession as the man who had abstracted the precious metal.

According to the chemical society's account, investigation disclosed that the chemist had abstracted the platinum sponge and in its place put mercury and ordinary moist dirt. The Government agents declared that the plan was to steal eighty-six cans, each containing twenty-five ounces of platinum, selling the metal for $100 an ounce.

Book Reviews

The Iron Ores of Lake Superior. By Crowell & Murray. Cloth; 6¼ x 9½; pp. 392; maps; Penton Publishing Co., Cleveland, Ohio.

This fourth edition includes revised and up-to-date information concerning the iron mines and ores of the Lake Superior district. Supplementing the data covered in the earlier editions, a chapter describing modern methods for mixing ores and figures showing average analyses and shipments since 1917 have been added. The book serves not only as a valuable reference work to the operators in that section but as a guide to the student of iron ore mining, as all of the chapters, with the exception of 9, 11, and 12, relate to some phase of mining or marketing iron ores. The arrangement of the data is such as to afford an excellent conception of the manner in which operations are carried on, and although a further elaboration on the subject of mining methods might be given, it is questionable if such is warranted in the preparation of a book that fulfils in such a complete manner the demand for information regarding operating mines.

Mining Directory of Minnesota for 1920. Compiled by the Minnesota School of Mines Experiment Station. Paper, 3⅜ x 6, pp. 153. Published by the University of Minnesota, Minneapolis, Minn.

Part I contains thirteen maps reproduced from the originals, prepared by the Mines Experiment Station. These show a general map of the iron ranges and separate maps of the Mesabi, Vermilion and Cuyuna ranges. Part II contains a list of all mines and properties that have shipped ore or are listed on the tax records as containing taxable ore. The name, location, and legal description of each are given. Part III includes a list of the various companies, together with the names of the officials, subsidiary companies and the properties with which they are associated. Part IV contains a list of the men associated with the mining industry of the state.

The compilation is issued in a most convenient form and will be found valuable to those in any way connected with the iron industry. Much of the excellent work of data collection which has been done in this section must be credited to the Experiment Station of the Minnesota School of Mines.

Earthwork and Its Cost. By Halbert Powers Gillette. Flexible binding, 4¾ x 7; illustrated; pp. 1350. McGraw-Hill Book Co., New York. Price $6.

The author of the book is too well known to need introduction to engineers, and the same thoroughness which has characterized his earlier works is noticeable in this handbook of earth excavation. In his preface and introduction, Mr. Gillette emphasizes the value to the engineer of the careful collecting and analyzing of cost data. The subsequent chapters of the book are proof sufficient that his contentions are well taken, for the data relating to each object leave little to be desired. Among the subjects covered are the following: Properties of earth; measurement, classification and cost estimating; boring and sounding; clearing and grubbing; loosening and shoveling earth; spreading, trimming, and rolling earth; haulage and earth removal and excavation, and the design and construction of embankments, earth dams, and similar works.

Technical Papers

Flotation in Australia—"Some Controlling Factors in Flotation," by Ralph D. Nevett, with subsequent discussion, occupies seventeen pages in the March *Proceedings* of the Australasian Institute of Mining and Metallurgy (Melbourne). The paper discusses the principal things which must be watched to secure satisfactory results in Australian selective flotation practice. 1. *Crushing.* The ideal feed is slime. 2 *Rate and Regularity of Feed.* It is absolutely necessary to have a regular flow of feed for the best results. A large storage tank should be provided, as an agitator or Dorr thickener. 3 *Density of Pulp* This is very important, and it is necessary to find what density will give the largest capacity and best metallurgical results; that density must be kept constant by frequent tests. 4. *Temperature.* The temperature must be watched closely, both in the SO_2 and the Palmer-Seale-Nevett processes. A difference of two or three deg. F. may have a marked effect. Some external heat is usually necessary: introduction of high-pressure steam into the pulp is the favorite method. 5. *Addition Agents.* These should be added generally as far ahead of the flotation machine as possible. 6. *Condition of Circuit Liquor.* The water must be clean. Other requirements are indefinite. A certain quantity of salts in solution seems to improve the results. The addition of elemental sulphur seems often to be beneficial in the P.-S.-N. process. Oil must be emulsified. 7. *Agitation.* "Agitation is beneficial in all methods of flotation of all classes of ore." An agitator ahead of the flotation machine is recommended. Sometimes bucket elevators provide sufficient agitation. 8. *Aëration* Air must be admitted in minute bubbles only, and under the agitating impellers. In the discussion following the reading of the paper Mr. Henderson said soluble salts could be present up to 8,000 gr. per imperial gallon. He was against the use of compressed air in any form. Mr. Nevett replied that compressed air increased capacity when treating slime. Mr. Chomley said primary slime (colloids) had a bad effect. Regularity of flow was very important, and underflow from a Dorr thickener was not as satisfactory as material from an agitating tank for this purpose. Mr. Read said he had no trouble using compressed air as long as it was properly atomized. A density of 45 per cent was found much better than one of 50 per cent in one instance. Mr. Wincey said best results were obtained on slime and that troubles from that source were probably due to dirty circuit water. Large amounts of salts in solution caused no trouble provided the SO_2 process was used.

Bolshevik Russia—Two very informative articles written in a most interesting manner are "Actualities in Industrial Russia of Today," in the August number of the *Compressed Air Magazine* (11 Broadway, New York City, 25c.) and "Bolshevism From the Inside," in the August *Atlantic Monthly* (Boston 9, Mass., 40c.). Is is plain that Russia is no place for a white man; it is a proper territory only for Reds.

Chrome—*The Colorado School of Mines Magazine* for July (Golden, Col., 25c.) publishes a seven-page article on the concentration of a Montana chrome ore, a "black sand" from Oregon, and a slag resulting from the production of ferrochromium in the electric furnace.

Chloride, Arizona—The history and prospects of the Chloride district are discussed in the August number of the *Arizona Mining Journal* (price 20c., Phœnix, Ariz.). Special mention is made of the Chloride Queen, the Dardanelles, the Molly Gibson-Chloride, and the Tuckahoe properties. The author admits that the district is dead, but thinks that modern metallurgy will solve the complex ore problem there if capable management and sane financing can be obtained.

Talc and Soapstone—In *Reports of Investigations* for July, Serial No. 2,142 (Department of the Interior, Washington, D. C.), R. B. Ladoo discusses talc and soapstone (five pages). The common physical and chemical tests which determine the grade of product are outlined and a plea is made for standardization so that definite and comparable price schedules can be formulated.

Federated Engineering Societies—Those of our readers who wish to know all about the organization and purpose of the Federated American Engineering Societies will be interested in a pamphlet entitled "Engineers Unite," which may be obtained free of charge from the McGraw-Hill Co., New York. It consists of reprints of news articles and editorials from the pages of the publications of the societies and the engineering and industrial journals.

Barite—"Barite Deposits in Upper East Tennessee" is the title of a six-page paper in Bulletin 23 of the Tennessee State Geological Survey (Nashville, Tenn.). Short references to known deposits are made.

MEN YOU SHOULD KNOW ABOUT

J. Leonard Replogle returned to the United States from Europe on Aug. 21.

W. E. Malm, of the Malm-Wolf Co., is in New York City on professional business.

J. Parke Channing, of New York, recently spent two weeks in the Michigan iron and copper fields.

M. H. Alworth, owner of several Mesabi Range operations, has completed an inspection of his properties.

Bailey Willis is working out the geology of the Washington magnesite deposits for the Northwest Magnesite Co.

Walter Harvey Weed has completed and reported on his examination of the Boston Montana Development Co. property.

Sir John Cadman, professor of mining at the University of Birmingham, England, recently resigned from that chair.

Roy J. Colony, instructor in geology in Columbia University, New York, is examining gold properties on Long Lake, Manitoba.

Eugene Dawson, mining engineer, will sail for South America on Sept. 7. He will examine mining properties in Brazil and Bolivia.

E. E. Hunter, general manager of the Hanna Ore Mining Co., has returned to Duluth, Minn., after a business trip to Cleveland, Ohio.

R. M. Overbeck, of the U. S. Geological Survey, has returned from a trip to South America where he has been on petroleum work.

A. K. Knickerbocker, superintendent for the Northern Minnesota Ore Co., is in charge of manganese operations for his company at Cushman, Ark.

F. A. Vestal, superintendent of the Bureau of Mines helium plant at Petrolia, Tex., has been paying a visit to the Washington offices of the bureau.

William H. Hubbard, Jr., of the Northport Smelting & Refining Co., is spending a few months at the affiliated works of the Pennsylvania Smelting Co., Pittsburgh, Pa.

Dwight E. Woodbridge and **George H. Rupp**, mining engineers, have completed a trip into the Hudson Bay country.

Lewis A. Levensaler, consulting mining engineer, 902 Hoge Building, Seattle, Wash., has gone to Nome and other Seward Peninsula points on examination work and will not return before October.

C. D. Young, general supervisor of stores, Pennsylvania R.R. system, Broad St. Station, Philadelphia, Pa., and vice-president of the American Society for Testing Materials, has been appointed as representative of that society on Engineering Council.

John D. Ryan, chairman of the board of directors of Anaconda Copper Mining Co., was in Butte recently inspecting the mining properties of his company and in conference with C. F. Kelley, president of the corporation.

J. Henderson, an English oil expert who was at Baku for a number of years looking after British oil interests, is in Canada on behalf of the Anglo-Persian Oil Co., which has secured oil leases in the neighborhood of Moncton, N. B.

E. J. Maney, general manager of the ore mines of the Shenango Furnace Co., has returned from a lake trip on one of the company's ore boats in company with **W. P. Snyder**, president, and **C. D. Dyer**, vice-president, of the company.

Harris & Ewing

ARTHUR E. WELLS

Arthur E. Wells, formerly assistant chief metallurgist and assistant supervisor of stations at the Salt Lake City station, has been made chief metallurgical engineer in charge of the new non-ferrous metallurgical division of the U. S. Bureau of Mines. Mr. Wells' headquarters will continue to be at Salt Lake City, Utah. He has been a member of A. I. M. E. since 1916.

D. D. Irvin, of Douglas, Ariz., has been appointed general superintendent of Moctezuma Copper Co. (the Phelps Dodge subsidiary) with headquarters at Nacozari, Sonora, Mex., where **H. T. Hamilton** continues as general manager.

Charles Camsell, who is leaving Vancouver to take up the duties of Deputy Minister of Mines at Ottawa, was given a farewell banquet on Aug. 18 by the British Columbia division of the Canadian Institute of Mining and Metallurgy.

Capt. M. L. Fay, one of the pioneer prospectors of the Lake Superior iron country, and who has for several years been on the Mesabi and Cuyuna ranges, has returned to the scenes of his earlier work on the Gogebic range to study the more recent developments of geologic interest

OBITUARY

Clyde M. Ney, a mining engineer thirty years old, employed at the Old Dominion mine, Miami, Ariz., was instantly killed on Aug. 2, last, by a blast on the mine's eighteenth level.

Jared Everett Gaylord, formerly manager of the Parrot Silver & Copper Co., a prominent copper producer of Butte, Mont., died at the age of seventy-six, in Bridgeport, Conn., on July 22 last. Mr. Gaylord was born at Liberty, Sullivan County, N. Y., Jan. 14, 1844, and went to Butte, Mont., in 1882, where he remained until his return in 1898. He took an active part in all that related to the development of Utah.

J. C. Gwillim, professor of mining in Queen's University, Kingston, Ont., from 1903 to 1919, died on Aug. 19 after a long illness in his fifty-second year. He was a graduate in mining engineering of McGill University. Professor Gwillim spent several summers exploring coal lands and oil properties of the Canadian Pacific Ry. In 1919 he explored the Peace River oil fields for the British Columbia government.

SOCIETY MEETINGS ANNOUNCED

Iron & Steel Institute, 28 Victoria St., London, S.W.1, will hold its fall meeting at Cardiff, Wales, on Sept. 21-24 next, in the rooms of the South Wales Institute of Engineers. G. C. Lloyd, secretary, is at the above address.

A First-Aid and Mine-Rescue Contest will be held Sept. 9, 10, and 11, in Denver, under the auspices of the U. S. Bureau of Mines in co-operation with the Rocky Mountain Coal Mining Institute, Colorado Metal Mining Association, and the Colorado Chapter of American Mining Congress, which will hold meetings in Denver on the dates mentioned.

The Sixth National Exposition of Chemical Industries at Grand Central Palace, New York City, Sept. 20-25, has just issued its revised official program. Among the cinema displays at 8 p.m. of particular interest to our readers are noted:

Sept. 21, (1) "The Story of Sulphuric Acid," one reel.

Sept. 23. (1) "Modern Coke and Gas Manufacture," three reels.
(2) "Story of Petroleum Oil," three reels.

Sept. 24. (2) "Building, Mining and Quarrying Machinery," two reels. (4) "Silver Mining," and (5) Gold Mining in Ontario," one reel each.

Sept 25. (1) "Manufacture of Asbestos," one reel.

THE MINING NEWS

LEADING EVENTS

WEEKLY RÉSUMÉ

Little of the spectacular has occurred recently: Calumet & Hecla has shut down three of its smaller subsidiaries. Lake ore carriers are to be allowed to raise their rates. An ore boat was sunk by collision on Lake Superior. The village of Kinney, Minn., has been awarded the decision in its case with the Cleveland-Cliffs Iron Co. In Missouri the St. Joseph Lead Co., in line with its practice in the past, has announced another stock dividend. In the Joplin district, a new boom is looked for in the section near the old Badger-Peacock camp, 12 miles away. In the Coeur d'Alenes, it has been announced that the Pine Creek railroad will be extended 6½ miles, thus benefiting several operators. The New Mexico Mining Association was recently organized.

St. Joseph Lead Co. To Resume Paying Stock Dividends

Will Cut Another Melon After Lapse of Several Years, Continuing Former Practice

After a hiatus of several years, the St. Joseph Lead Co. has decided to resume paying stock dividends. A 10-per cent stock dividend will be paid Sept. 20 on the 1,464,798 shares of outstanding stock. The authorized capital is 2,000,000 shares of $10 each, or $20,000,000 capital in gross, of which 535,202 shares are in the treasury. When the company was incorporated in 1864, the capital was $1,000,000 which was mainly issued to pay for about 900 acres of land and promotion expenses. The capital was increased in 1886 to $1,500,000 to take over the original Desloge Lead Co.'s lands at Bonne Terre in exchange for stock. The Doe Run Lead Co. was also absorbed in 1916 by an exchange of stock. Otherwise the present outstanding stock represents stock dividends that have been paid from time to time.

It was these occasional melons that for years kept the stock in the St. Louis market at such high prices that it only yielded 4 to 5 per cent on the market price and was the highest priced mining stock in the country. Up to 1912 the annual cash dividend rate for the previous twenty-seven years was only 6 per cent, whereas the stock ranged from $12 to $16 per share (par value $10) on the St. Louis market. That these stock dividends were more than justified is shown by the market putting a value of over $20,000,000 on the property, as millions have been put back into the property from earnings in past years.

A quarterly cash dividend of 50c. per share will also be paid on Sept. 9, which will bring the total cash dividends to nearly $22,000,000.

M. B. Dudley Interests Reopening Old Producers in Mohave County, Ariz.

Several Properties, Including C. O. D., I. X. L., Rural, Golden Star and Others, Equipped and Under Development — Many Features Being Worked Out for Group as Whole

BY S. FORD EATON

Activity in mining throughout Mohave County, Ariz., has evidenced a decided rejuvenation during the last few years. New operations are under way, old properties being reopened and mines forced to close down on account of wartime conditions are resuming work. Of the various projects brought into being none is more worthy of note than what is generally called the Dudley interests.

M. B. Dudley, a pioneer of Goldfield, Tonopah and Hilltop, Nev., and eastern associates are the operators and they are furnishing the capital. To Mr. Dudley, however, can rightfully be given credit for the conception, planning and general management of the various operations.

Early in 1917 Mr. Dudley's attention was first attracted to Mohave County in general and the Cerbat Range in particular. At that time he came into this section to examine the old Twins mine in the Cerbat district. With him, as consulting engineer, came W. W. Widdowson. The results of the examination were such that the Twins was purchased outright by the Dudley interests during the latter part of 1917. Since that time considerable development work has been done under the name of the Daisell Mining Co.

During 1918, under the direction of Mr. Widdowson, an extensive program of investigation and examination was carried on in the districts of Cerbat, Mineral Park and Stockton Hill. Early in 1919 four properties were purchased in the Mineral Park District. These were the Golden Star & Queen Bee, Rural & Buckeye, Toledo & Argo (now called Mineral Park Mines), and the Cherum Peak Silver.

In the Stockton Hills section, a three-months examination of the C. O. D. and I. X. L. was made. September, 1919, witnessed the purchase of the C. O. D. and early in 1920 the I. X. L. was taken over under option. Combined holdings aggregate over 100 claims. Separate corporations handle each property but with the exception of the Rural Mines, Inc., they are all more or less interlocking.

The financing of the various enterprises is said to be amply provided for. In a sense, all are closed corporations and there is no stock for sale. To date the preliminary steps represent an outlay of over half a million dollars. Present monthly expenditures are between sixty and seventy thousand.

Inasmuch as the mines are within comparatively short distances of one another and the general management is centralized, numerous features are being worked out with regard to the group as a whole. Active development is being pushed as rapidly as local conditions permit. At present work is going on at the C. O. D., I. X. L., Rural, Golden Star and the Daisell. Each of these is operated as an independent unit under a capable superintendent. F. H. Lerchen is general superintendent in charge of all underground work.

The various properties taken over are mostly mines having recorded production during the past. Practically all of them have produced ore of shipping grade. None of the workings were carried to a very great depth, the former operators having mined only the high-grade surface deposits. In most cases it is the mining and treatment of the large lower-grade bodies which constitute the basis of the present projects.

C. O. D. PROPERTY OF MOST IMPORTANCE

The C. O. D. at present occupies the most prominent position in the group and might be termed the pet of the organization. It is located in the Cerbat Range, seven miles south of Chloride in the Stockton Hill district. Though several other veins show on the property, development and interest center at present in what is known as the C. O. D. vein. This passes through the C. O. D. claim lengthwise with a general strike of N 80 deg. W. Near the middle of the claim the vein, at the surface, is split by an elliptical horse of country rock about 500 ft. long. The workings are on the north spur, which has a dip of 75 deg. N. Indications are that these two spurs converge to the west and join at depth. Croppings to the east of the split are very strong and it is probable that further and deeper development will prove the vein to be extremely wide. Schrader classifies the country rock in the main as porphyritic granite associated with chloritic schist. The gangue is quartz with some talc stringers found in the vein filling. High-grade ore lenses vary in width from 6 in. to 7 ft. with milling ore much wider. The average vein width is problematical as nowhere at a depth

of 300 ft. have the true walls been uncovered. Ore values are in gold, silver, lead and zinc. Recent tests by Mr. Widdowson have proven the existence of an unusual condition; namely, the gold is associated with the lead, the silver with the iron, the zinc being practically free.

On taking over the mine the new management unwatered the No. 2 shaft with the old steam equipment on the ground. As soon as retimbering and lining were completed this shaft was sunk to the 300 level and the long 300 drift cleaned out.

New electrical equipment has been installed. The hoist is a Denver Engineering electric, driven by a 75-hp. motor. It has a ⅝-in. cable and is capable of lifting a two-ton live load from a depth of 1,100-ft. A 15 x 9 x 12-in. Ingersoll-Rand compressor, short coupled to a 100-hp. motor, is installed in the same large concrete-floored building. There are also a commodious blacksmith shop equipped with a No. 5 Leyner drill sharpener and punch, timber sheds with crosscut and band saws for framing, change rooms, unit bunk houses, mess house, laboratory and office buildings. The laboratory is completely equipped for ore analysis and testing.

Power is obtained from the Desert Power & Water Co. at Kingman. Tramways and bins are being erected and the old mill near the shaft is being remodeled into a 100-ton pilot mill. Crushing to 1½ in. will be done at the shaft. Three products, lead, iron and zinc, will be made from the C. O. D. ores. The Colorado Iron Works is providing the milling equipment. It is hoped to have this pilot mill running within the next three or four months. There is sufficient material in the old dumps to supply the mill for three months. The mine will then be in shape to supply more ore than is required, and of an excellent milling grade. Mill runs will also be made here with ores from the other mines before any treatment plants are constructed.

Underground work is progressing steadily. The 4½ x 7-ft. development shaft has the same dip as the vein and goes down in the ledge matter. At this writing it is nearing the 400 level. From a 3-ft. lense in the bottom ore running $8 in gold, 37 oz. silver, 5 per cent lead, 6 per cent zinc and 8 per cent iron is being taken out. A hand-sorted test shipment of this ore will be made soon to the smelter. The west drift samples $45 per ton in gold and silver alone over a distance of 219 ft. Ultimate plans call for a large three-compartment shaft east of the present workings. From this shaft the ore will be conveyed by aërial tram to a large mill located on the I. X. L. property.

Geological Conditions Same at I. X. L.

One mile and a half south of the C. O. D. are the I. X. L. claims. A proposed auto road of moderate grade and easy construction will eventually connect the two properties. Geological conditions here are practically the same as at the C. O. D.; the main I. X. L. vein is apparently the southeastern continuation of the C. O. D. vein. In the I. X. L ground this ledge has a more northerly strike and dips about 80 deg. NE. The bend required to bring it into the C. O. D. claim probably has some relation to a cross ledge called the Hyson vein. This vein strikes about N 45 deg. W and was also a surface producer in the old days. It crosses the main C. O. D.-I. X. L. croppings about 1,400 ft. north of the I. X. L. shaft.

The character of the I. X. L. sulphide ores differs somewhat from those of the C. O. D. in that the lead content is much higher and zinc is practically absent. Mill tests on a combination of the two classes have been completely successful.

Early this year the Dudley Interests began work under their option. G. B. Atlee, a former operator, was engaged as superintendent, and the well appointed Wrigley camp, near by, was leased. A 15-hp. gasoline hoist and a two-drill portable gasoline-driven compressor were installed. The old shaft was cleaned out and sunk to a depth of 268 ft. At the 250-ft. level a station was cut and a 28-ft. crosscut driven through the ledge. Here the vein matter proved to be 19 ft. wide. A 200-ft. drift to the south on the vein is under way and will give access to the ground under the old stopes. When I visited the property the face of this drift was carrying a streak of high-grade 12 in. wide at the top and 24 in. wide at the bottom. This ore assayed $2 in gold, 200 oz. silver, 29 per cent lead and no zinc. Drifting north on the vein and deepening of the shaft will be started as soon as new electrical equipment has been installed. The water flow is about 15,000 gal. daily. This is handled by a jack-head plunger pump driven by a 3-hp. gasoline engine.

The possibilities of the I. X. L. ledge as regards milling ore are great. North of the shaft 350 ft. the vein shows in an enormous cropping. Surface trenching indicates a total width of 90 ft. at this point. This entire width is said to average close to $18 per ton in gold and silver. It is on this showing that the future plans for mining and milling are building. In conjunction with the prospective tonnage from the C. O. D. there is available a large amount of good milling ore. The I. X. L. basin offers a number of splendid mill sites and indications are that the two mines will supply ample water. The lower altitude of the I. X. L. ground makes the bringing of the ore from the C. O. D. a simple gravity problem.

Rural-Buckeye Another Old Producer

Less than two miles northwest from the I. X. L. on the southern slope of Cherum Peak are the Rural-Buckeye claims, operated under the name of Rural Mines Co., Inc. The location is in what is called the Mineral Park district, about four miles due southeast from Chloride.

The vein is a fissure in medium-grained granite striking nearly east and west, with a dip of 72 deg. N. Some schist is found associated with the granite. As a rule the walls are hard and require little timbering. Vein stringers shoot off at intervals into the wall rock. The gangue is quartz and has a marked tendency to "freeze" to the country rock. A short distance beyond where the vein leaves the Buckeye claim and enters the Rural (about 250 ft. west of the present main shaft) it is cut at nearly right angles by a granite porphyry dike. This has resulted in a pronounced faulting. West of this fault line there are five parallel vein croppings, so it is to be presumed that one of these is the continuation of the Rural-Buckeye vein. This vein to the east of the fault is remarkable for its persistency and varies in width from 1 to 8 ft. The ore values are in gold and silver; there is considerable arsenical iron, with very little lead and zinc.

New electrical equipment of ample capacity is housed in well constructed buildings. The hoist is a counterpart of that at the C. O. D. A 17 x 19-in. two-stage Ingersoll-Rand compressor driven by a 100-hp. motor supplies air for the jackhammers, Leyners and a No. 3 Cameron pump at the 160-level station. The blacksmith shop has a No. 5 Leyner drill sharpener and punch. The camp in general is well appointed.

A new double-compartment vertical shaft, 4½ x 8½ ft. in the clear, has been sunk in the footwall between the two old shafts. Work is being pushed in a number of faces. A north crosscut west of the fault line is expected to supply information regarding the veins on that side. The long adit is advancing east toward a point where a fourth ore shoot shows at the surface. A raise from the 160-ft. level in an unexplored portion of the Buckeye vein has broken into excellent ore 40 ft. above the level. This ore carries 1 oz. gold and 170 oz. silver.

Golden Star Ore More Refractory

Adjoining the Rural on the south but about 300 ft. lower, is the Golden Star mine, formerly called the Lone Star. The more refractory nature of the ore found in the lower levels apparently was responsible for the cessation of work about 1900. Here the country rock is mostly granite, with some chloritic and mica schist. The main fissure is from 2 to 9 ft. wide, striking about west northwest. At the surface it dips 60 deg. S, but at depth flattens to 55 deg. A pronounced tendency to assume a more vertical dip is indicated at the 230 ft. point. Two minor parallel veins come to the surface a short distance south of the main vein. The sulphide ores show considerable arsenopyrite carrying gold, silver and lead. Wire and ruby silver occur in varying quantities.

The first step of the Dudley operations was to clean out the old shaft. At the 100-ft. level a drift was driven in 40 ft. east on a vein seam traced from the old workings. Breaking into the hanging wall uncovered a 24-in. streak of ore carrying 0.8 oz. gold and 17 oz. silver.

While cleaning up and widening the old 185-ft. level to the west the hanging wall was broken into about 100 ft. from the shaft. A high-grade lens 12 in. wide was disclosed in the bottom carrying 9 oz. gold and 240 oz. silver. Both of these finds will be opened up as soon as working conditions permit. Early in 1920 new equipment was installed in concrete-floored buildings. This included a Denver Engineering Co. single-drum hoist with 3,500-lb. rope pull driven by a 75-hp. electric motor, a 12 x 10-in. Ingersoll-Rand compressor with a 150-hp. motor and a No. 5 Leyner drill sharpener. New camp buildings are complete. A vertical two-compartment shaft, 4½ x 8½ ft. in the clear, has been sunk in the hanging wall east of the old shaft. This is now down 200 ft. with a large, well-designed station and an ore pocket at the 160-ft level. Lateral development is in progress.

Daisell a Milling Proposition

Formerly known as the Twins group of five claims, the Daisell in the Cerbat district lies three miles east of the Santa Fe branch line to Chloride and about three-fourths of a mile from the Chloride-Kingman highway. An excellent road has been constructed to the mine. The deposit is essentially a milling proposition. The old incline shaft on the vein was sunk 300 ft. This vein strikes about east and west with a dip of 78 deg. N. The country rock consists of pre-Cambrian granite and schists. The intrusion of a strong trap rock dike striking practically the same as the ledge but with a nearly vertical dip has caused considerable faulting. This is most evident on the 300 level, but the old operators lost the vein at a depth of 130 ft. Recent work has shown that the dike is on the hanging wall of the vein at the 130 level but forms the foot wall at the 300.

The vein varies in width from 6 to 20 ft. The ores are secondary and exceedingly complex, carrying gold, silver, lead, zinc and copper. Three carloads of sorted ore were shipped by the Dudley interests which ran close to $50 per ton. Surface samples along the vein show from 0.75 to 2.5 oz. in gold.

During the last two years much development work has been done with gasoline equipment at the old shaft. An 8 x 10-in. compressor driven by a 40-hp. engine supplies air for the drills. The hoist is a 25-hp. Fairbanks-Morse.

With the old shaft working, a new level was started at the 130 ft. point. This was driven 90 ft. east and 530 ft. west, the latter drift leaving the faulted zone about 250 ft. west of the shaft. The old 300-ft. level to the west was cleaned out, widened and retimbered. During this operation the ore was picked up on the footwall side of the drift. Further work proved the ore to be from 13 to 20 ft. wide.

The necessity of a new working shaft and working out of the milling problems have caused work to be suspended for the time being. The management wishes to concentrate efforts on the C. O. D. mill.

Other Dudley properties include the Mineral Park Mines, Inc., holdings which embrace the old Toledo, Argo and twenty surrounding claims northwest of the Rural. Cherum Peak Silver, Inc., lies to the northeast. The latter includes seventeen claims. The high elevation of these claims on the southern slope of the Cherum Peak makes them particularly adaptable to development by adit.

Tennessee Copper Temporarily Leases School Property

Copper Pyrites Corporation Makes Tentative Agreement—Ore Now Going to T. C. Smelter

The Copper Pyrites Corporation, in the Ducktown Basin of Tennessee, has made a temporary lease to the Tennessee Copper Co. subject to two months' notice from either party, of its School Property, the "A" shaft workings of which were illustrated in the Aug. 7 issue of the *Journal*. Tennessee Copper is shipping 75 to 100 tons of ore per day at present over the Copper Pyrites Corporation's tracks and those of the Louisville & Nashville R.R. to the Tennessee company's smelter at Copperhill. The latter company has built a trestle directly from "A" shaft collar out over the Pyrites Corporation's railroad tracks below the shaft and is shipping run-of-mine ore without crushing or sizing other than to grizzly out the fines as the ore runs down the chute leading from the mine-car tipple to the railroad cars. They are thus avoiding the cost of operating the Pyrites Corporation's crushing and sizing plant which was built to prepare ore for use in acid manufacturers' roasters.

SULPHURIC ACID PLANTS NO. 1 AND NO. 2 AND COPPER SMELTER OF TENNESSEE COPPER & CHEMICAL CORPO PLANT IS SEEN ON SUMMIT OF HILL; NO. 2 PLANT IS LONG

Object to Freight Increase on Low-Grade Ores

A protest against a proposed increase in freight rates on low-grade ores is being made by the Utah chapter of the American Mining Congress to the State Public Utilities Commission. The increase has been asked by the railroads in a request for a general blanket raise in rates to conform to the rates authorized by the I. C. C.

New Mexico Mining Association Organized

Step Preliminary To Forming State Chapter of American Mining Congress

Mining men of New Mexico met in Silver City recently and organized the New Mexico Mining Association as a preliminary step to organizing a state chapter of the American Mining Congress. John M. Sully, general manager of the Chino Copper Co., was named chairman of the association and N. C. Cross, Mr. Sully's assistant, was appointed secretary. These two officers were empowered to take the steps necessary to perfect the organization of a chapter of the Mining Congress. Out of a list of fifty representative mining men thirty-three were present.

The executive committee of ten members, including the chairman of the newly formed association, was named, as follows: B. B. Hanger, Albuquerque; Powell Stackhouse, Jr., San Antonio; S. J. Kidder, Mogollon; E. M. Sawyer, Tyrone; Ira L. Wright, Silver City; C. T. Brown, Socorro; J. B. Gilchrist, Fierro; M. W. Porterfield, Silver City, and John M. Sully.

Canada's Deepest Diamond Drill Hole Completed

What is reported to be the deepest diamond drill hole in Canada was recently completed near Chelmsford, Ont., on the Soo branch of the C. P. R. The hole, which attained a depth of 2,007 ft., was put down for W. McVittie, of Sudbury, who was prospecting for coal. A small surface deposit, which certain geologists claimed was anthraxolite, was responsible for the undertaking.

New Boom Expected in Zinc Camp Near Joplin

Recent development in a new field about 12 miles northwest of Joplin, Mo., near the old Badger-Peacock camp, has encouraged mining men to look for a pronounced boom for that section in the months to come. At least two of the larger companies have taken big acreages there. Two new mills are in operation and considerable drilling is under way. One of the new plants is that of the Kanoak Mining Co., of which A. M. Gaines, Picher, Okla., is manager. After a hard fight against water, this plant is turning out a large tonnage of lead ore, which is proving exceptionally rich. The water still prevents the company from going after the zinc run deeper down. Since the successful start of this property, the Huttig Lead & Zince Co. has made contracts for approximately 880 acres one mile immediately north of the Kanoak mine, and in between the two the Chanute Metal Co., a subsidiary of the American Metal Co., has taken a lease. In addition to this, the Chanute company at the present time holds a tract comprising over 1,000 acres.

Mining men of the district believe that this field will prove equally as rich as the new one recently proved up immediately west of Baxter by the Chanute Spelter Co. The Huttig company placed a drill on its acreage in the Badger-Crestline camp on Aug. 26, and will send other drills there at once. The Kanoak company is continuing drilling. The Oakey Mining Co. has completed and placed in operation its new mill immediately east of the Kanoak plant, with highly satisfactory results.

Lake Ore Rates May Go Up

Steamship Companies Privileged To Ask 40 Cents More—Extra Charge To Come Out of Shippers' Profits

Steamship companies operating on the Great Lakes have been given the privilege of raising rates about 40c. per ton from the head of Lake Superior to Lake Erie ports, and it is almost certain that they will take advantage of the offer. New rates can be made immediately, and shippers of iron ore from the Lake Superior district believe that they will have to pay more to have their product transported from Lake Superior to the East. There will be no change in the price of iron ore to offset this extra burden, the iron prices for the year having been fixed. It simply means that the operators will be deprived of a part of their profits.

The ore is now going down the lake at a steady rate, and the August movement will be in excess of 9,000,000 tons. The Oliver Iron Mining Co. is about 2,000,000 short tons short to date, but there is some hope that this will be made up prior to the closing of navigation. Coal is now coming into the district in far greater quantities and there is little fear that the mines will experience a shortage during the winter. The boats are moving more freely and there are not the long delays at lower lake ports which held back the ore and coal movement during the early months of the 1920 season. There is no doubt that the ruling of the Government with regard to delivering coal to the Northwest relieved the anxiety of a lot of mining men of the region.

Ore cars are not so plentiful as they might be, and it is reported that some of the railroads are to add more equip-

RATION, COPPERHILL, TENN. TOTAL CAPACITY OF ACID PLANTS IS 350,000 TONS OF ACID PER YEAR. NO. 1 ACID LOW BUILDING AT LEFT. SMELTER IS IN LEFT CENTER

ment before next year. The old wooden cars are fast disappearing, and steel cars are now more numerous than the others. There is a possibility of the Lake Superior & Ishpeming road being electrified between Ishpeming and Marquette, on the Marquette Range, and engineers have already gone over the system and made estimates. The company has waterpower that can be used, and it is believed that a saving would result. There is a drop of close to 800 ft. in the fifteen-mile haul, and power could be generated and returned to the line during a part of the run. The L. S. & I. hauls most of the ore that is mined on the Marquette Range, being principally an ore road.

Calumet & Hecla Shuts Down Three Mines

The Allouez, Centennial and Superior mines have been closed down by the Calumet & Hecla Mining Co., which means a further curtailment of about 8 per cent in the company's output. The total output of the company and its subsidiaries in July was 8,312,025 lb., of which Allouez yielded 262,400, Centennial 34,600 and Superior 85,800, the output of the three being 382,800, or about 4.6 per cent of the total. It is said that the company intends to shut down the Osceola mine also shortly, the force there having already been reduced.

Cage Falls in German Mine, Killing Twenty-five

On the morning of Aug. 8 the hoisting rope broke at the Kaiserstuhl mine in Germany. The cage fell to the bottom, a distance of 360 m., and twenty-five miners were killed.

Mine Shaft on Rand Collapses

The Robinson shaft of the Randfontein Central Gold Mining Co., Johannesburg, South Africa, is reported, somewhat belatedly, to have collapsed on July 29. It is said that it cannot be repaired and that its loss will affect the tonnage hoisted until the north vertical shaft comes into commission this October. The company hopes to make a small profit in the meantime. The expense of maintaining this shaft has been heavy. It had been intended to abandon it toward the end of the year, when the new shaft should become available.

Lake Ore Carrier Sunk

The steamer "Superior City," of the fleet of the U. S. Steel Corporation, was sunk in Lake Superior in collision with the steamer "Willis L. King," of the Jones & Laughlin fleet, on the night of Aug. 20. Twenty-nine lives were lost. The first boat was bound south with ore and the "King" upbound with a light cargo of coal when the accident occurred off Keweenaw Point. It is reported that the night was clear and fogless and that the accident was due to a misunderstanding of signals. The Federal authorities are now investigating.

Wisconsin Zinc District Output Below 1919 Average

Eighteen Concentrators Active—Operating Conditions Bad

The curtailment of operations in the Wisconsin zinc district has reduced the weekly production of raw blende concentrates to 2,000 tons, which is 33 per cent below the average for 1919. Only eighteen standard concentrating mills are now active, their combined maximum daily capacity for the hours operated approximating 6,000 tons. Only six mills are being run double shift or twenty hours, the rest being run only one shift of ten hours or less. Four roasters, not including the Mineral Point Zinc Works, are running part time and part capacity. Approximate figures show only 4,500 tons of finished blende in bins and 8,000 tons stock of separator low-grade concentrates.

General operating conditions remain bad. Labor is somewhat more plentiful for those continuing to operate. At Highland the Mineral Point Zinc Co. is dismantling its remaining mill. Only one mill, the Lampe, remains intact at this old carbonate-producing camp. Linden's last active producer, the Fearless, has just closed. At Mifflin, the two Cokers of the Mineral Point Zinc Co. and the Yewdall of the Vinegar Hill Zinc Co. have kept going, and the B. M. & B. has just been reopened as the Fearless No. 2.

Platteville camp has one steady producer, the Blockhouse. Cuba City camp has the Big Dick and Connecting Link No. 2. The Connecting Link Co. has its No. 1 mill completed and ready to go. The Zinc Hill Co., owner of the Big Dick, plans to build a 100-ton mill this fall on the Tom Lee lease and to erect a roaster as soon as construction conditions improve. At Benton-New Diggins, the Mineral Point Zinc Co. continues to operate the Hoskins and Penna Benton. Here the Vinegar Hill is operating a new property, the Fields-Meloy. The Frontier Mining Co. is running the Bull Moose and Middie. The Lawrence Mines Co. operates the Indian Mound. The Wisconsin Zinc Co. has closed its string of producers, but continues prospect work and is re-milling tailings. At Hazel Green, the Vinegar Hill has just closed the Jefferson, but has taken over the Monmouth and reopened it. At Shullsburg, the Rodham and Imperial are active. At Galena, the Mineral Point Zinc Co. operates the Black Jack and the Vinegar Hill Zinc Co. the North Unity.

Lead-Silver Discovery Reported in Alberta

The discovery of lead-silver ore at Milk River, Alberta, is said to have created a little excitement in that part of Canada. It is said that the usual rush of would-be stakers has taken place and that some drilling is being done. The report has not been verified up to the present.

MONUMENT ON BOUNDARY BETWEEN ALASKA AND BRITISH COLUMBIA. THE RE-SURVEY OF WHICH LINE IS NOW UNDER WAY

Boundary Re-Survey Under Way in Portland Canal District

Both Governments Seek To Obviate Chance of Dispute as to Nationality of Mineral Ground

The work of re-defining the international boundary between Alaska and British Columbia in the Portland Canal district is under way at the present time. Parties representing the United States and Canadian governments are doing the work, erecting stone cairns and bronze monuments on the mountains, and hewing a lane twenty feet wide through the forest. This is the second time in about sixteen years that this has been done, the line having become overgrown in the meantime and difficult to recognize. The Canadian party is in charge of J. D. Craig. The chief purpose in making this resurvey is to obviate all chance of dispute as to the nationality of valuable mineral claims located or that may be located in the district. The Premier mine is the most important property of the district but there are others of promise.

To Extend Pine Creek Railroad in Coeur d'Alenes

Milwaukee Lumber Co. Reaches Agreement With O.-W. R. & N.—Will Benefit Mining Companies

Definite announcement has been made that an agreement has been reached between the Oregon-Washington Ry. & Navigation Co. and the Milwaukee Lumber Co. by which the latter will take over the Pine Creek branch and extend it to the forks of the creek, two miles and a half, and thence four miles up the west fork to a large body of timber owned by the lumber company. The track now extends up Pine Creek a little more than two miles and the right of way is cleared to the forks. The road is in the Coeur d'Alenes.

The construction of this branch will be of great benefit to the mining interests of the section. The Nabob, in particular, which has its mill near the forks of the creek, will at once be relieved of a wagon-road haul of five miles, which will mean a direct saving of at least $4 per ton on all shipments. The Highland-Surprise, which has a 100-ton mill, is preparing to ship and the railroad will reduce its wagon haul by half. Other properties, with ore available for shipment, that will be directly benefited, are the Douglas and Constitution, the latter of which has a 125-ton mill. Numerous development companies will be encouraged in the work of finding new mines.

Kinney, Minn., Wins Case Against Cleveland-Cliffs

The U. S. Circuit Court of Appeals has sustained the District Court in its findings for the Village of Kinney, Minn., in the case of the Cleveland-Cliffs Iron Co. versus the Village of Kinney. The case involved the annexation of property in and around the Wade mine by the village and has been long fought out. Starting with an injunction to stop the initial election called for the purpose of sanctioning the annexation, it was later taken to the district court in an effort to overturn the outcome of the election on the ground of illegality. Losing there, it was referred to the Court of Appeals, which court has now sustained the voters and the lower court. About 2,500,000 tons of developed ore are involved.

Fifteen-minute speeches will be made at the ceremonies to be held at the end of the Mine Rescue Meet in Denver next week. The speakers will be: Governor Oliver H. Shoup, of Colorado; Mayor Dewey C. Bailey, of Denver; W. H. Huff, of the Victor American Fuel Co.; J. F. Callbreath, secretary of the American Mining Congress, and John L. Lewis, president of the United Mine Workers of America. Dr. F. G. Cottrell, the director of the U. S. Bureau of Mines, will present two sets of prizes; namely, the Joseph A. Holmes medals and the prizes for the winning teams.

Sulphide Cut by Boras Leasing Co., at Warren, Ariz.

First To Be Found in This Section of District

The Boras Leasing Co., at Warren, Ariz., has struck sulphide ore in a drift on the 600 level in the Space claim. Although this section of the Warren district has produced considerable oxidized copper ore, the sulphide now being opened up is the first to be discovered. The new strike will therefore be watched with much interest.

Civil Service Examinations

Those interested in the following examinations should apply to the Civil Service Commission, Washington, D. C., for form 1,312, stating the title of examination desired:

Associate physicist qualified in physical metallurgy, $2,000-$2,800; assistant physicist qualified in physical metallurgy, $1,400-$1,800; both sexes. An open competitive examination; no date given. Vacancies in the Bureau of Standards, Washington, D. C., may be filled from the results of this examination.

Metallurgical laboratorian, $4.80 per day (or higher or lower salaries); both sexes. An open competitive examination; no date given. Vacancies at the Engineering Experiment Station, U. S. Naval Academy, Annapolis, Md., may be filled from results.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Bureau of Mines Analyzes Its Expenditures

Research on Metalliferous Minerals Accounts for 60 Per Cent of Money Spent on Stations

An analysis has been made of its expenditures by the U. S. Bureau of Mines. Expenditures chargeable to mineral mining, ore dressing, and metallurgy, and to mining and preparation of earthy minerals are calculated by the bureau to be as follows: Mine accidents, $52,669; mineral mining, $125,000; mine rescue cars and stations, $90,223, and engineering experiment stations, $170,000. This makes a total of $437,892, or if ceramics and earthy minerals be deducted the total would be $400,892.

Expenditures classed as chargeable to coal mining and combustion are as follows: Mine accidents, $268,682; fuel testing, $142,510; mine rescue cars and stations, $64,444, and engineering experiment station, $5,000.

The bureau figures that metal mining, ore dressing and metallurgical research on metalliferous minerals account for 60 per cent of the total for mining experiment stations; ceramics, 12½ per cent; petroleum, 12½ per cent; non-metallics, not including coal, 12½ per cent, and coal, 3½ per cent. Two-thirds of the mine accident appropriation is spent in coal mining districts and one-third in metal mining regions. The ratio of coal miners to metal miners is figured at 4 to 1 and the bureau holds that its division of the appropriation is a natural one. In that connection the following figures were compiled as to the value of mineral products in 1918. They are as follows:

VALUE OF MINERAL PRODUCTS IN 1918

	Value of Product	Percentage of Total
Coal	$1,801,480,347	32 63
Petroleum	690,190,000	12 51
All other non-metallic	874,653,000	15 84
Pig iron and ferro-alloys	1,296,193,500	23 47
All other metallic	856,945,500	15 55
Total	$5,519,462,347	

May Revise Income Tax Forms

Suggestions for the revision of income tax forms may be made at a hearing which will be conducted in Washington, Sept. 15, under the auspices of the commissioner of internal revenue.

War Minerals Awards

Awards recommended by the War Minerals Relief Commission during the week ended Aug. 21 aggregate $10,945. They are as follows (the name of the company, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): Southern Pyrites Ore Co., pyrites, $8,790.39, 12 per cent; Booker, Booker & Gibbs, chrome, $101.45, 26 per cent; D. McDonald, manganese, $639.31, 12 per cent, and W. G. Fitzgerald, chrome, $413.85, 58 per cent.

Chamber of Commerce on Mining Conditions

A report to the Chamber of Commerce of the United States by its Committee on Statistics and Standards has the following to say in regard to mining conditions:

"Whether mining is busy and prosperous or the reverse depends upon the nature of the metal. Gold mining still suffers from high costs of production and the stationary price of gold. Silver mining feels the effect of the decline in its price. The price of zinc is low and the demand is not equal to

the possibilities of supplies. Lead is higher because of increased demand. Copper is dull because of a supply not yet disposed of. Iron mining is good. Phosphate mines in the South are doing well after many lean years.

"Contraction and financial credits have put wildcatting in the oil regions out of business. This makes for dullness because supplies for drilling oil wells are no longer called for.

Farmer vs. Mine Operator

That the Federal Government is much more generous to agriculture than it is to the mining industry is shown by the fact that it spends only one-thirteenth as much for the promotion of the interests of the mining industry as it expends for the agricultural industry. In 1918 the total value of mineral products was roughly five and one-half billion dollars, while the value of agricultural products totaled twenty-two and one-half billion dollars. Thus the ratio of economic importance was about one to four.

Mineral Shipments Via Panama Reported

The movement of nitrate of soda through the Panama Canal during June totalled 109,953 tons. Two cargoes went to Charleston, S. C.; three to the United Kingdom; one to Norfolk; three to Baltimore; two to Philadelphia; three to Wilmington, N. C.; one to Boston and two to New York.

Only one cargo of copper moved through the canal during the month. It consisted of 2,500 tons and was shipped from Valparaiso to New York.

The fuel oil movement totalled 60,643 tons. This oil originated in Mexico and went to Chilean ports with the exception of one cargo which went to San Francisco.

Four cargoes of sulphur passed through the canal during the month under review. The total tonnage was 14,700. Three cargoes originated at Galveston. Two of them went to Portland, Ore., and one to Vancouver, B. C. A cargo originating at Sabine, Tex., went to Melbourne. A cargo of phosphate rock moved from Tampa, Fla., to Osaka, Japan.

Survey Preparing Estimates for Next Fiscal Year

Estimates are being prepared by the U. S. Geological Survey for its work during the fiscal year beginning July 1, 1921. The estimates will not vary importantly from those made for the current fiscal year, which, however, were reduced somewhat by Congress. The estimates made last year were as follows:

For geologic surveys, $500,000; investigation of the mineral resources of Alaska, $100,000; mineral resources of the United States, $200,000; chemical and physical researches, $60,000; topographic surveys, $600,000; water supply investigation, $200,000; land classification, $400,000; printing and engraving of maps, $140,000, and superpower survey, $250,000. The total of these is $2,450,000.

NEWS BY MINING DISTRICTS

MEXICO

Sonora

Pumps Pulled at Democrata Mine

Cananea — The Democrata mine is now completely shut down and for an indefinite time. The pumps have been pulled and the mine will be allowed to fill. The water will probably rise to about the fourth level. The reopening of the mine will depend upon the price of copper and the possibilities for marketing the same.

Hidalgo

Companies at Pachuca Operating on Larger Scale Than Before

Pachuca—Mines of the Pachuca district have for the most part been running steadily throughout the revolutionary period and are now operating on a larger scale than ever before. The drop in the price of silver, while felt by the companies, has less effect here than elsewhere as the Pachuca ores are of a higher grade than in some other districts. The area of the camp is only 3 by 5 miles and in it about 15,000 workmen are employed, most of them Mexican, there being only about 100 foreigners, mostly Americans, among them.

The largest operator is the Cia. de Real del Monte y Pachuca, which at present is working twelve shafts. Like some other Mexican operators, this company has been hauling its supplies for several years from the border at Laredo in freight trains pulled by its own locomotives. The trains are made up only of cars consigned to the company and run straight through from Laredo to Pachuca, taking about five days for the trip, a distance exceeding 600 miles. The road used is the Government owned main-line, the roadbed of which is and has been kept in excellent condition, the occasional destruction of a bridge excepted. The road, when built years ago, was laid with heavy rails and is said to be in as good shape today as many in the United States. For those supplies that come from within Mexico, such as limestone, the company has its own cars on account of the difficulty of obtaining rolling stock.

Power is obtained from the Mexican Light & Power Co. largely from its principal hydro-electric plant at Necaxa, about 100 miles away. Since operating supplies have been received in requisite amounts operating conditions have been very satisfactory.

Chihuahua

Madera—The Dolores Esperanza Mining Co. is overhauling its mill at the Dolores property and is installing turbo-generators at Madera. The tunnel on the 400 level is being caught up and will give access, when the work is complete, to the old Dolores workings on the 400 level and to the new Esperanza ground. The shaft is being pumped out to the 700-ft. point. At the El Rayo a winze on the bottom level is being unwatered, in which good ore had been cut before the property was shut down.

Zacatecas

Fresnille—The Mexican Corporation has taken a twenty-year lease on the Proano mines in the Fresnillo district and is installing a 2,000-ton mill, which is to be ready early next year.

PERU

Peruvian C. & S. Co. To Start Producing in November

The Peruvian Copper & Smelting Co. has increased its force to 850 men, who are employed in part on the work of finishing the construction of the new auto-truck road. The rest of the men are engaged in mining coal and copper, and in making coke. A number of new strikes of ore running about 20 per cent copper have been made on the G and J levels, the levels being 300 ft. apart, at the Yauricocha mine. It is expected that the new 200-ton blast furnace will be ready to blow in this November, by which time the company will be able to go on a production basis. The company also has a small reverberatory of negligible output. At the coal properties at Jautenhuasi, fourteen tunnels are now being driven on the veins. The announced purpose of the company is to produce copper, coal and coke for shipment. J. N. Vandegrift, the manager in Peru, is at present in New York. The president of the company, J. A. Vandegrift, is now in Peru. It is stated that if development continues as at present in the Yauricocha mines, the company will feel warranted in erecting a thousand-ton smelter.

CHILE

Santiago — Cia. de Minas de Cobre de Gatico has recently installed a powdered-coal-fired reverberatory with a bed 80 ft. long by 18 ft. wide, which is operating successfully on Chilean coal. The furnace is said to be smelting 200 tons of cold charge per day and consuming one ton of coal for five tons of charge smelted.

AUSTRALIA

Queensland

Mt. Elliott Still Down—Mt. Cuthbert's Start in May Fails—Hampden Cloncurry in Full Swing

Brisbane—In the Cloncurry copper field matters are not looking promising for the increased yield that was expected this year. The Mt. Elliott company, having failed to obtain capital from the American financiers to whom they appealed, is still in a state of inactivity, and the prospect of their Mt. Oxide mine, away to the northwest of Cloncurry, being made accessible and consequently productive seems almost as far off as ever. While the state government has authority to extend the Cloncurry railroad to a point nearly twenty miles from this mine, British capitalists have turned down the state premier's personal appeal to them for a loan, and there is not likely, as far as can be seen at present, to be money available for an indefinite period for the building of the authorized extension.

The Mt. Cuthbert company, which in May started what promised to be a successful campaign, closed down on June 21, and had not started again toward the end of July. The reason for the cessation of operations was given out as being the inability of the company to obtain further advances on a large accumulation of copper in transit or at the refining works.

The only other large company in the district, the Hampden-Cloncurry Copper Mines, is still in full swing, and a good many small mines and "gougers," or nomadic individual miners, are operating, but these are being handicapped by the reduced price of copper combined with the high cost and scarcity of mining requisites and commodities generally.

CANADA

Ontario

To Build Flume from Cobalt Mills to Cross Lake—Herrick Mine Plant Completed — McIntyre Shareholders Object to Purchase of Alberta Coal Mine

Cobalt—The lessees of the Ruby property in Cobalt have struck a small vein of high-grade and are preparing to ship.

Three new veins have recently been encountered in the underground workings of the Lumsden, one of which is reported to carry high-grade.

To dispose of about 2,000 tons of tailings a day from the Nipissing, Mining Corporation, Coniagas, and Northern Customs mills, it will be necessary to build a tailings launder to Cross Lake, at a cost of about $25,000. At present, the tailings go into the creek, but the outlet from Cross Lake is becoming blocked. It is thought that if the tailings are carried into the main body of the lake the clear water will cut a channel through them.

West Shining Tree—At the Herrick property in Shining Tree the installation of the mining plant has been completed. The shaft is being enlarged and retimbered and will be continued to a depth of 200 ft. The government has recently completed the building of a wagon road from the railway at Westtree to Shining Tree Lake, a distance of 20 miles.

Porcupine—The Porcupine district has again been ravaged by forest fires. The town of South Porcupine was in serious danger of destruction for two days and was only saved by the most strenuous exertions. No loss to mining properties has been reported.

Gold has been struck in a drill hole put down to the depth of 2,400 ft. below the surface from the 1,250-ft. level of the Hollinger Consolidated. The gold content of the drill core was not large, but a satisfactory result is that the geological formation at depth was found to be the same as that between the 1,250-ft. level and the surface.

The circular recently issued by the Dome Mines Co. to the shareholders, advising the taking over of the Dome Extension, states that a large body of payable ore has been opened up on the 600-ft. level of the latter property.

It is understood that the last four months' operation of the Trethewey in Gowganda has paid for all development and, in addition, has indicated a substantial reserve of high grade.

The Davidson has secured sufficient English money to fully develop and equip the property. Sufficient treasury stock will be sold at 75c. a share to net the company $1,125,000, the purchase to be completed by April 1, 1921. In addition they secure a two-years' option on 2,000,000 vendor's shares, half at $1 and the balance at $1.25 a share. A 500-ton mill is to be constructed in the near future.

A number of McIntyre shareholders are very critical of the company's purchase of a coal mine in Alberta. The company is paying about 15 per cent a year in dividends, but has not been able to build up ore reserves commensurate with the size of its operations. Some shareholders consider that, in view of the expenditures which will have to be made on development account at the McIntyre, they are entitled to larger returns before the surplus is put into another operation as far away as Alberta.

Kirkland Lake—It is understood that the Murray-Mogridge property in the Kirkland Lake section has secured sufficient money to finance development work.

The Lakeview property, adjoining the Murray-Mogridge, is installing a steam plant.

The Ontario Kirkland is proceeding with the construction of a 60-ton mill, and expects to haul in the machinery this winter.

It is officially stated that the Sylvanite is not included in the proposed amalgamation of the Tough Oakes, Burnside and Cobalt Aladdin properties.

Kirkland Lake—The Lake Shore during July produced $52,424 from the treatment of 1,860 tons of ore, the mill heads averaging $28.18 per ton. The total output for the year is now $339,427. A station has been cut at the 400-ft. level and preparations are being made for sinking a 3-compartment shaft to the 800-ft. level.

Blue Mountain—The old Mica mine at the head of Stony Lake, Peterborough County, has been purchased by C. L. Nicholson, of New York, and Norman Miller, of Michigan, who will start operations this fall.

Manitoba

Rice Lake—J. B. Tyrrell has presented a report on the Gabrielle mine, stating that assays offer little promise of returns from the property and advising that work be discontinued. The directors have determined to carry on operations next year.

British Columbia

Trail—Ore shipments received at the Consolidated smelter during the week ended Aug. 21 were as follows:

Mine	Location	Gross Tons
Bluebell, Riondel		314
Josie, Rossland		171
Mandy, Le Pas, Man.		1,080
Molly Hughes, New Denver		23
Monarch, Field		36
Venus, Carcross, Y. T.		34
Company Mines		7,253
		8,911

CALIFORNIA

Champion Plant Being Wrecked—Gruss Copper Co.'s Mill Started—The Trinity Copper Transfer

Grass Valley—All of the underground machinery, pumps, rails and, in fact, everything of any value, has been removed from the depths of the Champion mines and what has not been sold is now on the surface. The hoisting plant at the Providence shaft has been purchased by the Empire Mines. All the men except four have been discharged, those still employed being used in tearing down the large dry house. The milling and hoisting plants on the Champion side are still intact. It is rumored that different parties are planning on securing a bond on the Champion holdings and that the property is not likely to be closed long.

The Boundary Mines Co. has purchased the hoist and power plant of the Empire Mines at the Osborne Hill mine, and will install them at once at the Boundary. A large pump will also be installed. All underground work has been suspended during this work.

Officers of the Tightner Mining Co. were elected at the recent annual meeting as follows: President J. M. O'Brien, of San Francisco; vice-president, Dr. C. P. Jones, of Grass Valley, and secretary, C. H. Taylor, of Grass Valley.

Sonora—Frank Willetts, who for the last two years has operated the Wetmore's Dream mine, will open and develop the Mangente mine near Sonora. Machinery is being removed from the Wetmore properties to the Mangente

mine and a compressor, hoist and engine will be installed at once. Development work will be undertaken.

Quincy—The Kelly quartz mine, nine miles from Quincy, is being prepared for active development work by Kelly brothers, owners. A tramway, approximately 1,500 ft. long, will soon be constructed, and for this purpose all material, such as steel cable, lumber, etc., is on the property.

Redding—Papers filed for record at Redding show that little cash changed hands in the transfer of the claims of the Trinity Copper Co. to the Trinity Copper Corporation, as they bore no revenue stamps. The stockholders in the old company received a proportionate number of shares in the new company and the treasury stock remains in the treasury. The properties lie west of Kennett. The Trinity Copper Co. was organized by Thomas Lawson for trading on the Boston stock market. The deeds filed for record show that the Trinity Copper Co.'s sixty mines near Kennett were sold in Jersey City, N. J., on Jan. 19, 1920, to George A. Haskell, of Boston, for $210,000. Haskell immediately sold all the property to the Trinity Copper Corporation for $1. The latter company is incorporated under Virginia laws, while the old company's charter came from New Jersey. The principal mine of the company is the Shasta King, though sixty or more claims are owned. All tracks were taken out of the mine three years ago, and the Shasta King has become almost forgotten locally.

Portola—The Gruss Copper Co. in Genesee Valley, a few miles from the Engels and Walker properties on the same ridge, started its new 15-stamp mill Aug. 20. A flotation plant has been installed. The bins and dumps are stacked with ore that runs from $15 to $127 per ton and there is estimated to be sufficient ore in sight to keep the mill running for at least one year.

Colfax—The 900-ft. shaft on the Rising Sun gold quartz property has been entirely unwatered for the first time in years. The ledge is said to be 3 ft. wide in the bottom. The mill is running on night shift only. Twenty miners under E. C. Klinker are employed.

Death Valley Junction—The Pacific Coast Borax Co. is planning to enlarge its mill at Death Valley Junction by adding two more roasters which will increase the capacity about 60 tons per day, according to Fred W. Corkhill, mill superintendent. The plant is being operated with a 286-hp. semi-Diesel engine which generates power for the entire plant, lights the town, and operates a one-ton ice plant. Twenty-one miles of a narrow-gage railroad, 3 ft. wide, connect Death Valley Junction with the Lila C. and Ryan mines.

Death Valley is notoriously hot in the summer time, notwithstanding which fact there is less trouble in keeping a good supply of labor than in more favored camps. This is largely due to the methods inaugurated by Major Julian Boyd to make the men employed as comfortable as possible. The bunkhouses are two three-story concrete buildings, with hollow walls, each being 110 ft. in length, and accommodating 400 men. The hollow walls make the buildings comparatively cool in summer and easy to heat in winter, besides which they are said to rival a modern hotel in completeness of appointments.

NEVADA

Large Tonnage of Silver Ore Proved at Candelaria—Silver Peak Chemical's Mill Ready, but No Water

Tonopah—Bullion shipments to date indicate a gross production for August for the Tonopah district of about $500,000. This is normal. The principal mines of the district, the Belmont, West End, Tonopah Mining and Tonopah Extension, report regular development operations with nothing new of importance. Of the smaller mines, the Rescue, California Tonopah, MacNamara, Midway, and Halifax are regular shippers.

The Spanish Belt management have announced through their consulting engineer that their ore reserves in this property consist of 75,000 tons of probable ore of an average grade of between $20 and $30 per ton. This mine is about 60 miles north of Tonopah and about ten miles northwest of the old camp of Belmont.

Divide — Rumors are plenty regarding a new ore estimate for the Tonopah-Divide mine and there seems to be some basis for the optimistic feeling that prevails regarding the ore reserves in this mine at least. Interest is reviving in the smaller properties throughout the Divide district and during the last few days several properties which have been closed down for months resumed operations. The Gold Zone has a very creditable showing and is regarded as a prospective shipper. No other mines have reported development of importance.

Candelaria—The Candelaria Mines Co. is doing about 1,000 ft. of development per month with forty-five men. The work is confined largely to the Lucky Hill, the company's new property. Since the Candelaria mines passed into the control of interests affiliated with International Nickel the property has been thoroughly sampled and from the results of over 8,000 assays a large tonnage of ore has been proved to average between 12 and 15 oz. silver. In addition to the proved ore, and the disclosures made in recent development on the Lucky Hill, there are numerous places with good showings which will be developed later. E. E. Carpenter, who is in charge of operations, states that the Candelaria will soon be a big silver producer. The metallurgy nas been worked out but mill construction is not expected to start for several months. The first unit will have a capacity of from 125 to 150 tons daily, and the process will consist of coarse grinding, roasting and cyaniding. Roasting will be followed by a short leach.

VICTORY SHAFT, TONOPAH EXTENSION MINING CO., TONOPAH, NEV.

Silver Peak—The reduction plant of the Silver Peak Chemical Co., which is expected to turn out about 100 tons of pure potash alum daily from its property near Blair Junction, in Esmeralda County, is reported to be practically completed. Its start has been delayed, however, owing to a failure of the water supply figured on. A well is now being sunk out on the flats.

Arrowhead—The west drift on the 215-ft. level of the Arrowhead Consolidated has recently broken into good ore, according to Dr. Elftman, who is heavily interested. The original Arrowhead mine is making small shipments to the MacNamara mill at Tonopah.

ARIZONA

Jerome Verde Suspends Operations Indefinitely

Jerome—Jerome-Verde recently followed the example of Gadsden and suspended operations indefinitely. The mules have been brought out, the pumps pulled and preparations made to leave the property in good shape. Development work had been planned on the 1,200 level, corresponding with the 1,500 in the U. V. Extension. This was designed to get below promising looking oxidized and leached ground on the 1,100 level, thought to be the top of an orebody. The money was to have come from a bond issue, but the stockholders failed to back the plan. Jerome-Verde has a large acreage in the heart of the Jerome mineralized section. Several small bodies of ore have been tapped and some ore sent to smelter.

Globe—The Superior & Boston has found in resampling that the 1,250-ft. level contains ore available for immediate shipment that runs from 3 to 25 oz. silver and averages 13½ oz. over a 5-ft. width. The stopes in the footwall vein on the 4th level west are in good shipping ore, likewise the raises at the eastern end of the 4th and 6th levels. The south crosscut is expected to cut the Rigby vein soon.

NEW MEXICO

Duncan M. & M. Co. Shut Down, Pending Readjustment

Lake Valley—The Lake Valley Silver Mines Co. continues to ship silver and manganese ores regularly. Some high-grade crystalline manganese ore has been encountered.

Silver City—The Santa Fe has enlarged its ore-loading platform. This is intended to facilitate ferromanganese shipments moving to Pittsburg territory, principally from the Amory Stevens property.

The Silver Spot mine shipped a car of manganese ore to Pittsburg recently. The water flow in the main shaft is under control and mining on the 140-ft. level is under way. Bulkheads have been installed to guard against contingencies.

Carlisle—The old Carlisle mine and mill is being operated under lease by G. A. and L. Utter. A car of concentrates will be shipped to the El Paso smelter at once.

Steeplerock.—The Duncan Mining & Milling Co.'s plant has been shut down pending readjustment of financial affairs. The statement given out by W. H. Evans, former manager, of $20,000 returns from the first clean-up of the cyanide mill made about Aug. 7, has not been confirmed by the engineer in charge, who gives the amount as $1,695.

Lordsburg—The Bonney Cons. is following up a number of high-grade ore showings recently opened on the surface. Twenty men are employed. All mechanical equipment is being overhauled and pumps prepared for heavy work to start soon.

COLORADO

Diamond Drilling Progressing Near Gillett—First Hole Down 1,100 Ft.

Cripple Creek—Prospecting with a diamond drill, financed by the Cresson, Vindicator, and Golden Cycle companies, is under way in the vicinity of Gillett. George A. Stahl, general manager of the Vindicator, and W. H. Trask, of Denver, are in charge. The first hole is down 1,100 ft. At 1,084 ft. the hole is cut through the granite formation, then passed through 6 ft. of breccia, then 3 ft. of quartz and fluorite, then phonolite. The record made by the drill is reported to be gratifying. Mining men who are familiar with the Cripple Creek crater are much interested in the outcome of the enterprise.

Silverton—The Mazeppa mine, in the South Mineral district, is being developed by Samuel Heindel. A shoot of high-grade lead sulphide ore has been opened.

Mayday—Dr. W. B. Cauble, of Peoria, Ill., has secured a half-interest in the Esmeralda Convention group on the south fork of Lightner Creek from George and Milton De Luche and George Smart of Durango. A 35-ton mill will be erected.

The Mayday Leasing Co., which has been working the Mayday dumps, has quit.

Moffat County—During the last summer an attempt was made to operate one of the old placer mines in Moffat County, Col., by its owners. The attempt was not highly successful due to a heavy snow fall late in the spring and the consequent floods which washed out a series of small supply dams. As it is necessary to store the water from early in the season to maintain a supply for the entire summer, work was hampered considerably. In spite of these conditions a small plant was put into operation and run for a short time. Preparations are being made to operate a larger plant on the same ground next season.

The neighboring mines have been idle during the summer and it is doubtful when they will be worked again. During a lull in the operations for the last few years a large percentage of the land has been located for farming purposes and in some cases conflicting with the placer locations.

There are two small dredges in the district, both of which have been worked off and on for several years. It is understood that one of these dredges has been leased to an Eastern stock company and is to be run the coming season.

Very little of the ground has been prospected to any extent and the best average value is between 40 and 50c. per cu.yd. There is however practically no overburden, the dirt running from the surface down 6 to 8 ft. to a soft sandstone bedrock. The source of the mineralization is doubtful but the general theory is that it is from Hahn's Peak or vicinity, about 20 miles to the east.

LOOKING NORTHEAST UP COPPER GULCH, GLOBE DISTRICT, ARIZ. RIGHT FOREGROUND — NO. 1 SHAFT ARIZONA COMMERCIAL MINING CO. LEFT CENTER—MINE PLANT OF IRON CAP COPPER CO., NEW IRON CAP MILL AT LEFT IN DISTANCE. SUPERIOR & BOSTON'S HOLDINGS LIE SOUTHEAST OF THOSE OF ARIZONA COMMERCIAL AND IRON CAP

UTAH

King Con. at Park City Cuts New Fissures—Silver Shield at Bingham Levies Assessment

Silver City—Tintic Milling shipped a car of bullion the week ended Aug. 16. About 150 tons of ore is being treated daily, as the plant, owing to a scarcity of ore, is not running at capacity. One shift is working in the crushing department and three in the leaching and roasting departments. As has been stated before the company is making

changes and improvements in its equipment to permit the separation of the copper from the silver and gold, which will make it possible to ship the bullion directly, without further refining, to the U. S. mint.

Development is being done on the 2,200 level of the Iron Blossom in the hope of finding ore at depth.

Eureka—The Chief Consolidated expects to add to its earnings through its new leasing system whereby entire stopes are given over to groups of miners, who make more money in this way, the company at the same time being safeguarded by especial contracts. The practice of giving other leases where there are only small showings of ore is still in force, the lessee undertaking the work of development.

The Iron King is drifting on both the 1,000 and 1,500 levels, as well as shipping about a car of fluxing iron ore daily. The latter is coming from above the 350-ft. level.

The Eureka Bullion has resumed work after a month's intermission for repairs to equipment.

Active development is being done at the Emerald adjoining the Centennial-Eureka and the Grand Central and Mammoth.

American Fork—The tunnel of the American Consolidated Mines, embracing the old Bog property and adjoining ground, has cut at 1,800 ft. the fissure for which it was being driven. Drifting both ways has been started on the fissure, which is 10 ft. wide at the intersection. Some mineralization shows the fissure to be the same which produced considerable ore in the Bellerophon.

Gold Hill—The Western Utah Copper in the Deep Creek district is to increase its shipments of lead-silver ore largely. A railroad into this district was completed two or three years ago.

Bingham Canyon—The Silver Shield reports that a change in the character of the orebody from which a number of shipments were made has resulted in a loss to the company. The lead ore has been replaced by zinc. Improvements made since the ending of the war have resulted in an indebtedness of about $18,000, to meet which an assessment of 3c. per share has been levied.

Alta—The winze from the 300-level of the Emma Silver shaft has been unwatered to about 75 ft. below the level. Diamond drilling is to be started again when this work has been completed and ore will be shipped from the Emma stope. Prospecting is being done in a number of places in the mine.

The Alta Tunnel & Transportation Co. has let a contract for the extension of its east drift, in the face of which oxidized vein matter with some galena is beginning to show. Ore was opened further back some time ago and is said to be 6 ft. wide with more high-grade showing as development progresses. Poles for a power line have been cut and seasoned. The road from the property is being improved.

Big Cottonwood—Some ore is being taken out at the Woodlawn property. The tunnel face at the Cottonwood King is entering gray limestone showing iron and copper stains.

Park City—The Judge Mining and Smelting is encouraging the employment of married men on its working force.

Silver King Consolidated is reported to have cut another set of fissures in the tunnel which it is driving both for the purpose of exploring new ground and for making connections with its California-Comstock holdings. The tunnel has almost reached its objective point.

The Park-Utah is developing and extracting ore in the south drift from the crosscut. Paul Hunt is superintendent.

IDAHO

R. N. Bell Takes Option on Red Bird at Clayton—Ramshorn Mill at Bayhorse Running

Clayton—Robert N. Bell, the retiring state mine inspector, has secured a long lease and option to purchase the property of the Clayton Mining & Smelting Co. near Clayton in Custer County, the principal claim of which is the Red Bird, which is developed 900 ft. deep through crosscut tunnels. A 50-ton concentrator will be erected and is expected to be in commission within 60 days. The property has a 100,000-ton reserve of 10 to 15 per cent lead ore in the form of sand carbonate associated with a soft limonite gangue. The silver averages about ¾ of an oz. per unit of lead and extensive mill tests indicate a good recovery by simple jigging and table concentration.

The mine is 65 miles from the nearest railway shipping point at Mackay and involves a truck or wagon haul charge of $20 per ton. The mine has produced $1,500,000 in its past operations, $300,000 of which has come from lessees operating on a small scale, who have been "gouging" for rich pockets of high-grade ore during the last three years.

Bayhorse—At Bayhorse the new concentrator of the Ramshorn Mines Co. has been in operation for the last two months. Although difficulty is being experienced in holding down the tailings losses, owing to the large proportion of silver chloride in the ore in spite of a preliminary sulphidizing bath and a modern flotation plant, a product of 300-oz. concentrates is being made that is gradually being improved upon. A lower adit, now being reopened for stoping, carries a more primary ore that will give a much closer saving in milling. The Ramshorn vein is a very persistent steep fissure in slate that was formerly extensively developed by adit tunnel but idle for 25 years until the present operation, which was started two years ago. It has an ore shoot 1,000 ft. long, except for a few short pinches, that varies from 1 to 5 ft. in width.

The Beardsley mine, at Bayhorse, is being operated by lessees and is developing much good ore. Between 700 and 800 tons of ore are now on the dump, that averages 20 per cent lead and 40 oz. silver per ton. This new development, on an old property idle for 25 years with a former record of several million dollars produced, is more definitely related to a pronounced contact of limestone and shale than any of the other ore shoots formerly worked. The inference seems permissible that only the blossoms of this important contact have been developed and that the string of other properties extending for more than 2 miles along the vein may prove equally productive.

Mackay—In the Mackay district of the same county, the Empire Copper Co. is operating 20 small leasing units and shipping about a car of crude 5-per cent copper ore per day to the Salt Lake Valley smelters. The ore also runs well in silver and gold.

In the adjoining limestone-lead belt the U. S. Smelting, Refining & Mining Co. is developing two very promising lead-silver prospects, one of which, the Horseshoe group, is shipping 20 cars a month of low-grade lead-silver ore carrying 12 per cent lead and 10 oz silver and an excess of iron oxide. The Kennedy group, of the same company, now developed 250 ft. deep, has one ore shoot 40 ft. wide and 60 ft. long.

At the Doughboy adjoining, a 25-hp. gasoline hoist is being installed. There is an inclined shaft, 300 ft. deep, sunk on a persistent contact fissure vein 3 to 5 ft. wide, disclosing a pay course of rich jigging ore in the form of hard carbonate and galena carrying silver in a gangue of lime porphyry breccia.

The lead-silver ore of the Mackay copper district occurs in paleozoic limestones extensively intruded with nearly vertical porphyry dikes. The ores have proven almost completely oxidized so far to a maximum depth of 300 ft. They occur usually in a succession of lenses and pipe-like shoots at the contact of the nearly vertical dikes and locally marbleized blue limestones, and give decided evidence of permanency.

Coeur d'Alene District

Red Monarch Con. To Resume—St. James and La Fleur Consolidate

Wallace—The Red Monarch Consolidated Mining Co. is preparing to begin work after a year's suspension. The property is on Beaver Creek and the main development is a crosscut tunnel 4,400 ft. long which has cut three promising veins. The first is 2,900 ft. from the portal and a drift several hundred feet long and a 75-ft. raise have exposed considerable lead-silver ore. It is now proposed to sink on the ore.

The St. James Mining Co., which owns a group of claims on Sunset Peak covering an extension of the famous Sunset vein, and the La Fleur Mountain Copper Mining Co., which has a copper property in Stevens County, Wash., have been consolidated, the new company being called the St. James-La

Fleur Mining Company. In the formal announcement of the merger the president of the St. James states that it is expected that the earnings of the La Fleur will provide funds for the development of the St. James.

An important strike of lead-silver ore is reported in the Bryan property, about five miles from Saltese, Mont., on the west fork of Packer Creek. The strike is described as 7 ft. of ore, having high values in silver. Control of the property is owned by the Days, of Wallace.

MONTANA

Anaconda Experimenting With Storage Battery Locomotives—Butte-Jardine Breaks Ground for 100-Ton Plant

Butte—For some time Anaconda has been experimenting with three different Edison storage battery locomotives. Others have been ordered but deliveries are slow. An official of the company has expressed himself as being highly satisfied with results to date, although no data have as yet been assembled as to relative cost of these compared with trolley locomotives. The chief difficulty that the company had experienced in the use of trolley locomotives had been in protecting the overhead wire at the mouths of chutes, where it was difficult for a workman to avoid striking it with bars.

The Nettie and the Emma mines, the latter the property of the Butte Copper & Zinc Co. but being operated under lease by Anaconda, are popularly considered among the best earning mines of the Anaconda at present. From the Nettie is coming a considerable tonnage of silver ore. Manganese ore is being mined at the Emma, a portion of which is being shipped to the ferromanganese plant at Great Falls, Mont., and the balance direct to eastern rolling mills.

Deeper development at the Black Rock mine of Butte & Superior appears to indicate a lessening of the iron content with an increase in the zinc. Results attending the employment of more than 1 per cent of oil in the flotation process at the Black Rock mill are proving satisfactory, 97 per cent being shown for July, 3 per cent more than the monthly average for the past few months and 4 per cent more than for June. Under the ruling of the United States Supreme Court in the Minerals Separation case, to avoid patent infringement more than 1 per cent of oil must be used per ton of ore, and this the Butte & Superior seems to have accomplished. Butte & Superior ores are averaging from 14 to 15 per cent of zinc and slightly more than 5 ounces of silver per ton.

Net earings of Tuolumne Copper are ranging around $18,000 monthly. Sinking of the Main Range shaft from the 1,200 to the 2,000 ft. level is expected to start within a week or ten days.

The objective vein of the crosscutting on the 2,700 ft. level of the Colorado mine has been reached, showing more than 20 ft. of first-class ore, that is, ore in which the copper content is 5 per cent or more.

Development work by North Butte has increased ore reserves somewhat the last quarter and with improved market conditions it is believed that the present tonnage can be increased.

Monthly shipments from the Crystal Copper Co.'s properties near Basin, Mont., and from the Goldsmith mine in the Butte district are amounting to eight cars. The orebody at the Goldsmith ranges from 18 in. to 7 ft., with the grade high, particularly in silver.

With more of the details coming to light in connection with the compromise reached between the Anaconda and the Elm Orlu over a disputed section of the Pilot-Butte, it appears that the former won something of a victory over the Anaconda, as vein territory of much richness in the Pilot Butte claim of the Anaconda passes to the Elm Orlu through the apexing of a vein in the Elm Orlu which, on dip, united with the Pilot-Butte fissure.

Elkhorn—Boston & Montana continues drifting in ore in the Blue Jay vein on the 300 ft. level. Several smaller veins have been opened carrying ore and the tonnage of milling rock appears to be increasing. Raising for the Park vein is in progress from the 300 level.

Troy—Merger of the Silver Tip Mining Co. with the Troy and the J. P. Lead companies is proposed. The three corporations hold 26 mining claims near Troy, Mont. Spokane interests are behind the proposed consolidation.

Boulder—Work has been resumed at the Robert Emmet and two well defined veins are being opened.

Comet District—Plans are under way by the Montana Cons. for a resumption of milling operations. A large tonnage of silver-zinc ore is available.

Champion District — Ground was broken by Butte Jardine last week for the construction of a 100-ton flotation plant, to cost an estimated $65,000. The flow sheet is so arranged as to permit of increasing the capacity to 200 tons. Timber to the amount of 135,000 ft. has been cut and the power and water lines are in. Since the latter part of June, first class ore to the amount of $16,000 has been shipped. A body of milling ore 351 ft. long with the ore still continuing has been officially reported. This shoot has an everage width of 5 ft. and grades about 18 oz. silver and $1.50 gold.

MICHIGAN

The Copper District

Seneca To Start Development of 5th Level

Houghton—The depression in the copper situation continues to influence adversely the condition of every copper mine in northern Michigan. Perhaps the worst feature is the psychological depression on the men employed in the mines and upon the business people of the community. The coal problem has been relieved to a considerable degree but the price paid for coal is simply another additional problem. The labor problem has been alleviated.

Additions to the cost of production cannot readily be met by Michigan copper mines. Under the circumstances the further increase in freight charges is embarrassing. Rates now will vary from 20 to 40c. a ton, depending upon the distance of the haulage. Two years ago the lowest rate was 10c. a ton and the highest 18 cents.

Calumet & Hecla's operations are now confined to the conglomerate lode and to the extraction of copper from the lake sands. But one shaft continues in operation on the Osceola lode. That is No. 15, No. 16 having suspended.

Mayflower's raise in the west crosscut is in over 70 ft. and fairly good vein matter has been showing for ten days. In the southerly drift, 160 ft. from the shaft, there is more vein matter.

Seneca's work at the Gratiot property has now reached a point 700 ft. to the south on the 13th level. The character of the formation indicates that it ought to run 25 lb. to the ton. For a distance of 200 ft. the Gratiot opening has been in rock of this grade. Practically all the way from the shaft the openings have been in average Kearsarge lode ore which may be mined and milled profitably under normal cost conditions.

Development of the 5th level at the Seneca is about to be started. The depth has been attained and the lateral tunneling to the lode will be under way within a few days. Then the raise to the level above will be driven and the drifts in the vein, both north and south, started. The 4th level south has reached the Ahmeek boundary. The 3rd and 4th levels have now been driven 670 ft. to the north and the only noted improvement has been in the general character of the ground in that direction. The conditions of the ground in the both levels on the south has been indicative of a lode formation that will compare favorably with that which was milled last spring. It is now planned to boost the tonnage to 2,000 daily as soon as the hoisting plans are completed to take care of such an output. The underground development of the average Lake copper mine is ordinarily away behind the equipment of the surface plant.

Menominee Range

Much Diamond Drilling Under Way in Crystal Falls Field

Crystal Falls—Considerable diamond drilling is being conducted in the Crystal Falls field at present, there being more drill outfits in operation than for some time past. New orebodies are being sought, but no results are obtainable. The Cleveland-Cliffs Iron Co. is again drilling on the lands in Sect. 12, 42-33. Ore was found here a few years ago, but sufficient work was not done at that time to prove the extent of the deposit. Oglebay, Norton & Co.

have two drill outfits going on their property in Sect. 24, 25 and 26, 43-33. The McKinney Steel Co. is making a geological survey of its properties on the range and it is likely that drilling will follow. B. C. Neely and associates have a drill in operation on Sect. 7, 42-32. This property has been drilled several times in years past, but the orebody has never been outlined in detail. J. M. Longyear has two drills working on the southward extension of the iron formation of the old Mansfield mine.

Gogebic Range (Including Wisconsin Section)

Mellen, Wis.—At the Berkshire mine near Mellen, Wis., at the western end of the Gogebic range, preparations are being made to resume operation. It is a low-grade, open-cut proposition, and the ore, though largely magnetic, is wet-concentrated with jigs after being crushed. The crushing is not so fine as to require sintering of the concentrates. At the same time this prevents obtaining concentrates of high iron content. If results can be obtained that are satisfactory, it will be of great interest to the district as there are undoubtedly large amounts of low-grade "ore" on the range which would be susceptible to similar treatment. The Gogebic iron range as known at present extends in an east and west direction about 55 or 60 miles, but the producing mines are all contained in the portion beginning at the middle of the range and extending eastward about 18 miles. The Berkshire is 18 miles west of this productive section, but if the concentration process proves successful in the long run, there will undoubtedly be other mines opened up in the section now regarded a barren of merchantable ore. At the eastern end of the productive section the Morgan mine is in the development stage, and eight miles east of that the Whitesides interests of Duluth are still drilling the old Presque Isle mine property.

Ironwood, Mich.—The steel headframe at the "II" shaft of the Pabst mine is about completed as far as the steel work goes.

The Newport mine has built a garage and a large stable, both of concrete.

The Tilden mine is to have an electric haulage system installed in No. 10 shaft; it will be a trolley system supplied from a rotary converter to be placed in the new engine house.

MINNESOTA

Hill-Trumbull Makes First Shipment—Washing Plant Going Up at Mariska Mine

Coleraine—The Hill-Trumbull mine of the Mesaba Cliffs Iron Co. has made its first shipment under the new ownership. It was opened by the Oliver Iron Mining Co. in 1909, but was surrendered at the time the Oliver surrendered all its Great Northern leases. In 1919 it was taken over by the present operators, who have continued the development of the open pit and have installed a one-unit washing plant that can handle 80 cars per shift to care for the siliceous ore. The shipment made was of merchantable ore but the washing plant will be running soon.

Construction of the Hill-Annex washing plant of the Interstate Iron Co., adjoining the Hill-Trumbull, is progressing. Structural steel is practically all in place and the half-mile approach, which has been built of overburden stripped in opening the mine, has been completed. The Hill-Annex has a reserve of approximately 22,000,000 tons, wash and merchantable.

Gilbert—Work is progressing rapidly on reopening the old Mariska mine. Bowe-Burke Co. are the new operators and J. C. Hartness of the Eveleth is in charge. Erection of a small washing plant to serve the mine is under way. It will be the first installation of its kind in the immediate vicinity.

Pickands, Mather & Co. has started to deepen No. 2 shaft at the Corsica mine. It will be deepened about 100 ft. to develop the lower area of the orebody.

ALABAMA

Birmingham Ore Mining Co.'s Washing Plant Near Completion

Birmingham—The recent cargo of manganiferous iron ore brought up from Brazil, via Mobile, is now being delivered to bins and stacks in the yards of the Tennessee Coal, Iron & R.R. Co. at its Ensley plants. Some of it is being brought up the Warrior River on the Government-owned and operated barge lines and some by railroad. There is about 7,500 tons of ore to be moved and it is understood that shipments will continue. Furnaces are desirous of getting a good supply of ore on hand and are making heavy demands on the railroads. Preparations are being made for winter. Reports from the ore mines throughout the district indicate that colored labor which wandered north is gradually returning.

The Sloss-Sheffield Steel & Iron Co. is making some investigations looking to the development of ore deposits around Compton, about 20 miles north of Birmingham. The vein is rather thin but if the demand warrants may be profitably worked.

The Birmingham Ore & Mining Co. will complete its jigging plant in the next fortnight at the Helen Bess mines, on Red Mountain, not far from the heart of Birmingham and will then wash all the ore mined there. Construction was begun months ago but met with delay. It has already been in partial operation.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Tampa Company To Seek Deeper for Better Ore—Hawkins, at Hockerville, Buys Mill

Baxter Springs, Kan.—Although getting all ore from its No. 3 shaft, the Lucky Jew Mining Co. is drifting at No. 1 shaft and sinking at No. 2. The mine, which is eight miles west of Baxter and at the extreme northwestern point of development of the Miami-Picher-Baxter field, was long considered a doubtful proposition by most mining men. Recently it has developed into a steady producer, the average recovery being approximately 11 per cent (in local terms), the company making about 30 tons of concentrates daily, operating the mill single shift. Drifting and sinking now under way at the No. 1 and No. 2 shafts are for the purposes of tapping lead runs indicated by drilling. A very fair percentage of the concentrates now being made are lead of a premium grade. The zinc concentrates also average from 61 to 62 per cent metallic zinc. Operations are conducted at a depth of 320 ft. at the No. 3 shaft, and at slightly shallower depths at the two others. W. C. Bowman is president and M. G. West secretary and manager, both being from Kansas City, Mo. H. Stout is superintendent.

The U. S. Smelting Co. is completing the sinking of a shaft one-half mile west of its No. 2 mill, near Baxter, not far from the Lucky Jew property. The shaft was put down in a lime bar, but heavy water was tapped only a few feet from the bottom, which is at the 320 ft. level. One 3-in. and one 7-in. steam pump have been installed and another will follow. Good lead cuttings have come up in the water but exploration has been impossible. It is planned to connect the shaft with a surface railroad that probably will tap one or two other shafts between this one and the mill. D. R. Muir, Baxter, Kan., is manager.

The Tampa Mining Co. is planning to sink, expecting to find better ore. It is now working at 265 ft. and surrounding mines have ore at 300 ft. and below. This company recently spent $3,000 to drain the water at one of its shafts, preparatory to sinking, only to have its activity stopped by lack of coal. G. C. Warner, recently of Tampa, is principal owner.

Picher, Okla.—The Huttig L. & Z. Co. has completed the first of four field shafts that will be put down between its No. 1 and No. 2 mills northwest of Picher. Dirt from this new shaft will be taken to No. 2 mill over the surface road, for which an 11-ton Davenport locomotive was recently delivered. The site for a second field shaft has been located and sinking begun. Ore from it also will go to No. 2 mill, as well as from the third shaft. Ore from the fourth field shaft will be carried to No. 1 mill by an incline tramway. This plan will obviate the necessity of the company taking its surface railroad across the tracks of the Southwest Missouri interurban railroad. The first field shaft has gone into good ore.

Hockerville, Okla.—The Hawkins Mining Co., which recently discovered a rich deposit of lead ore on a lease just south of town, has purchased a concentrator at Sunnyside, three miles distant, and is moving it to the mine. The mine continues to be a big lead producer. One chunk of ore weighing about 1,000 lb. will be sent to the Missouri State Fair at Sedalia.

THE MARKET REPORT

Daily Prices of Metals in New York

Aug.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
26	18.10@18.30	43.00	46.75@47.00	8.50	8.60@8.75	7.90@7.95
27	18.10@18.30	43.50	47.00@47.50	8.40	8.75	7.90@7.95
28	18.10@18.30	43.50	47.00@47.50	8.35	8.75	7.85@7.95
30	18.10@18.30	43.00	46.25@46.75	8.35	8.75	7.85
31	18.10@18.30	42.50	45.50@45.75	8.35	8.50@9.00	7.85
Sept. 1	18.10@18.30	42.50	45.50@45.75	8.35	8.50@9.00	7.85

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered" which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price, to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Aug.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
26	93⅜	95¼	111	269½	278	35⅜	35⅞	39¾	41¼
27	94¼	95¾	111	274¾	282¼	35⅞	36	40	41½
28	....	....	....	....	....	....	....	....	....
30	94¾	96	111	273	281½	36½	36¾	40	41½
31	95	96½	111	272	279	36⅝	36¾	39½	41
Sept. 1	95	96½	111	269½	276	36½	36½	39¼	40½

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Aug.	Sterling Exchange	Silver			Aug.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
26	357½	99½	98	61⅛	30	355	99½	94¼	59⅝
27	357½	99½	97¾	61	31	354½	99½	92⅝	58¾
28	356	99½	97½	60⅝	Sep 1	356	99½	91½	57⅝

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Sept. 1, 1920

Price changes since last week have been of little importance. Sales of metal for August have generally been light, with the exception of lead, for which a good demand has existed. Low prices in London are acting as a brake on the metal market here.

Copper

No buying of importance is yet taking place at anything like the prices which the large producers are asking, viz. 18¾@19c. delivered. A few lots are being marketed at about 18¼c. delivered, but should the demand pick up this price is almost certain to increase. It is the general opinion that September will see a real buying movement, and that the average price will be at least ¼c. above that at which copper can now be had. Fundamental conditions are good.

Lead

A peculiar situation exists in the lead market. The A. S. & R. contract price continues at 9c., New York, and considerable metal is sold on this basis. On the other hand, lead can be imported from Europe and sold at a profit here at 8¼c. It is understood that 300 tons is on the dock here looking for a buyer at that price. This European lead is, in general, good Mexican and Australian brands. We quote prompt lead, New York, for the week at 8.25@8.50c., and forward delivery, 7.85@8.25c.

The dearth of lead in the Middle West and the fact that large quantities are being imported at New York for western delivery have caused the St. Louis price to rise above that quoted in the East. This is an unusual situation, which will continue until consumption slackens, or until domestic production is able to supply the demand. Small lots of favored brands for September shipment are commanding 9c. in St. Louis today, though some metal is being offered at ¼@⅜c. under this.

Zinc

Producers have been compelled to reduce their prices to 7.85c. to meet European competition. Even at this price some arguments have to be used to induce consumers to buy the domestic product, such as the fact that the brands are well known, as are the producers, and there will be no uncertainty as to shipment. Heretofore, we have quoted the New York price of zinc at 35 points above the St. Louis price, but in view of the abnormal conditions now existing, we quote, on Sept. 1, the New York price equal to the St. Louis price, 7.85c.

Tin

Some optimism was shown Thursday and Friday when the London market took a little spurt, but this week tin sellers are as doleful as ever, and report almost a total lack of business. The 99 per cent grade was depressed all of last month by the presence of about 1,300 tons of Chinese tin. Rarely has the tin market had a more quiet month.

Monthly Average Prices for August

Copper:	
New York Electrolytic	18.346
London Standard	93.935
London Electrolytic	111.143
Lead:	
New York	8.687
St. Louis	8.725
London	36.304
Silver:	
New York, foreign	96.168
New York, domestic	99.673
London	59.875
Sterling Exchange	360.404
Zinc:	
New York	8.185
St. Louis	7.835
London	41.220
Tin:	
99 per cent	43.856
Straits	47.620
London	274.048
Antimony	7.177
Quicksilver	83.806

Straits tin for future delivery: Aug. 26th, 46.75@47.25; 27th, 47.50@48.00; 28th, 47.50@48.00c.; 30th, 46.25@46.75c.; 31st, 45.75@46.00c.; Sept. 1st, 45.50@45.75c.

Arrivals of tin in long tons: Aug. 26th, China, 20; 27th, Liverpool, 75; 28th, Singapore, 200.

Silver

The silver market ruled steady and firm on China buying until Aug. 30. The London market was then demoralized by weakness in Indian exchange and continued sales by the bazaars. Supplies of foreign silver in our market continue limited and as the U. S. Treasury is buying all the Domestic output, exports to London are nil and only moderate amounts are available for China shipments.

Mexican Dollars—Aug. 26, 75; 27th, 74½; 28th, 74¼; 30th, 71⅞; 31st, 70¾; Sept. 1, 69½.

Gold

Gold in London on Aug. 26th, 115s.; 27th, 115s.; 30th, 115s. 5d.; 31st, 115s. 6d.; Sept. 1st, 115s. 1d.

Foreign Exchange

Yesterday francs were 6.97c.; lire, 4.67c.; and marks, 2.05c. New York funds in Montreal declined to 11⅝ per cent premium, probably due to the commencement of exportation of this year's grain. Only slight changes characterized the exchange market during the last week.

Other Metals

Aluminum—Ingot, 99 per cent and purer, 35.1c.; 98@99 per cent, 34.9c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Market continues weak. Spot, 7c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7c. W. C. C. brand, 9@9½c. [1]Chinese needle antimony, lump, firm at 8@9c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb., for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100@$110 per oz.

Platinum—Firm at $115@$120 per oz. $105 per oz. in 100 oz. lots.

Quicksilver—Market quiet; $75 per 75-lb. flask. San Francisco wires $75. Barely steady.

Ruthenium—$200@$220 per troy oz.

[1]Selenium, black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 80@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. The ore movement is better than at any previous time this season.

Manganese Ore—70@80c. per unit, 50 per cent Mn content, c.i.f. Atlantic seaport; chemical ore (MnO_2) $75@$85 per gross ton.

Molybdenum ore—85 per cent MoS_2, 75@80c. per lb. of contained sulphide, New York.

[1]Tantalum Ore, guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

Titanium Ores—Ilmenite[1], 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]Zircon—Washed, iron free, 5c. per lb.

[1]Zirkite—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Zinc and Lead Ore Markets

Joplin, Mo., Aug. 28—Zinc blende, per ton, high $52.70; basis 60 per cent zinc, premium $48.50; Prime Western, $47.50; fines and slimes, $45@$42.50. Calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $47.16, calamine, $38.18; all zinc ores, $47.12.

Lead, high, $110.25; basis 80 per cent lead, $110; average settling price, all grades of lead, $104 per ton.

Shipments for the week: Blende, 13,591; calamine, 33; lead, 2,121 tons. Value, all ores the week, $862,870.

A total of 295 carloads of blende were shipped at an average of 46.2 tons per car. The larger tonnage is being shipped in coal cars, as few box cars are provided.

Platteville, Wis., Aug. 28—Blende, basis 60 per cent zinc, $52.50 per ton for high grade. Lead ore, basis 80 per cent lead, $105@$110 per ton. Shipments for the week: blende, 1,373; lead, 60 tons. Shipments for the year: blende, 47,143; calamine, 2,330; lead, 3,900; sulphur ore, 1,209 tons. Shipped during week to separating plants, 2,107 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots. Market very strong, owing to heavy demand and a production that is 25 per cent below normal. Higher prices for all grades of material are expected soon.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground,

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@ $30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $25@$30 car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@ $23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@ $55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

Gypsum—Raw crushed rock, $3.50@ $4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. The last price quoted for plaster of paris in carload lots was $4.25 per 250-lb. bbl., alongside dock, New York; but a new price, not yet made public, will soon be effective.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $65@$75 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—Imported block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $85@$100 per ton, Philadelphia.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 17½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15-18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12 to $15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $200@$210, freight allowed; last half, $170; English, $190@200, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $80@$85, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $150 @$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22½@ 23c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$100@$110 per net ton, carload lots, eastern shipping points.

Chrome Cement—40 to 45 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio, and Kentucky works; second quality, $50@$55. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$110@$120 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110 @$120.

Silica Brick—9-in. per 1,000, $56@ $61, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $65, Chicago district.

Iron Trade Review

Pittsburgh, Aug. 31, 1920

The continued stagnation in the steel market is having its effect on some producers, leading them to plan curtailments in production, but no effect upon prices, which are stiffly maintained. This is in line with pre-war experience, when sellers felt that to reduce prices would be to discourage buying. Such demand for steel products as exists is for early deliveries, and for such deliveries steel is still scarce. The practical ending of the midsummer period, normally dull, with the market grown still duller nevertheless, is regarded in some quarters as ominous.

Transportation conditions continue to improve and are likely to be practically normal within a few weeks.

Pig Iron—Actual market prices on bessemer and basic have been developed by a few transactions totaling only a few thousand tons, at $48 Valley, for both grades, previous market prices having been $47 and $46.50, respectively. Foundry remains at $50, Valley, to which level it recently advanced. Inquiry for all grades is very light and there is likely to be a deadlock for some time.

Steel—There is only occasional demand for billets, chiefly from brokers, and sheet bar demand has become light, but mills show relatively little disposition to shade prices. We quote billets at $60 and sheet bars at $67.50.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $20@$22; foundry, $23@$24.

COMPANY REPORTS

Alaska Gold Mines Co.

Gold; Alaska

The following is a comparative summary of results of mining and milling of the Alaska Gastineau Mining Co. for the periods indicated:

	Second Quarter 1920	First Quarter 1920
Tons milled	537,754	625,890
Gross value	$0.85	$0.84
Yield per ton	.68	.66
Tails per ton	.17	.18
Extraction	79.39%	79.16%
Value recovered	$0.68	$0.66
Operating expenses, less miscellaneous income	$0.79	$0.79
Loss per ton	$0.11	$0.13

During the quarter 646,327 tons of ore was broken in the mine and 535,874 tons trammed to the oreways, as compared with 561,358 tons broken and 627,451 tons trammed during the previous quarter. Of the amount trammed about 41.6 per cent represented excess ore drawn from the caved stopes. The transportation division operated satisfactorily throughout the quarter. A total of 537,754 tons of ore was milled, compared with 625,890 tons for the previous quarter.

The gross value of ore delivered to the mill during the quarter averaged $0.854 per ton, or an increase over the first quarter of $0.019. Operating expenses, less miscellaneous income, amounted to $0.79 per ton, as compared with $0.79 per ton for the previous period. The miscellaneous income showed a net loss of $10.67, the loss sustained in the operation of the company's boarding houses having been in excess of the amount received from the sale of power.

The following statement compares the operating results:

	Second Quarter 1920	First Quarter 1920
Revenue:		
Gross value of bullion and concentrates produced	$364,866.48	$413,246.04
Expenses:		
Ore production and transportation	$237,696.86	$285,406.01
Milling	150,980.00	172,441.33
Shipping and smelting charges	15,339.45	17,572.48
Administration and general expense	22,520.62	22,410.60
Total operating expenses	$426,536.95	$497,830.92
	$61,670.45*a*	$84,584.88*a*
Miscellaneous income	10.67*a*	2,966.94
Operating loss	$61,681.12	$81,617.94

(a) Loss.

Included in costs in the above statement are prepaid development items representing costs of breaking and preparing ore in previous periods, which have been carried on the books as deferred charges. Consequently, although the above operating statement shows a loss after including these charges, the actual cash receipts and disbursements for the period reflect a cash gain of $8,603.46.

International Nickel Co.

Nickel; U. S. and Canada

The consolidated general profit and loss statement of the International Nickel Co. for the three months ending June 30, 1920, follows:

Earnings		$2,172,097.06
Other income		272,208.32
Total income		$2,444,305.38
Administration and general expense	$160,651.38	
Reserved for U. S. and foreign taxes (estimated)	306,973.33	467,624.71
Net income		$1,976,680.67
Depreciation and mineral exhaustion		574,611.74
Profits		$1,402,068.93
Dividends		
Preferred No. 59, payable Aug. 2, 1920		133,689.00
Balance		$1,268,379.93

Union Miniere du Haut-Katanga

Copper; Congo Free State

The report of the Union Minière du Haut-Katanga for the year 1919 indicates that seven copper mines were regularly in operation during that year, producing 876,000 tons of ore suitable for direct smelting and 316,000 tons of ore unsuitable for that purpose. The output of smelted copper amounted to 23,028 tons, against 20,238 tons in 1918. The number of native workmen increased from 6,000 in 1918 to 12,000. The average producing price per metric ton c.i.f. European ports was 2,500 fr., not taking into account the charges arising through the transfer of the company's office from Antwerp to London during the war and its becoming liable to British income and other taxes thereby. The copper production during the first six months of 1920 was affected by strikes on the railways connecting Katanga with Beira, and only amounted to 10,251 tons.

New Jersey Zinc Co.

Zinc; New Jersey

A statement of the New Jersey Zinc Co. for the quarter ending June 30, 1920, follows:

Income (including dividends from subsidiary companies) after deductions for expenses, taxes, maintenance, repairs and renewals, betterments, depreciatioo aad contingencies		$3,341,576.98
Deduct interest on first mortgage bonds	$ 40,000.00	
Reserve for retirement of bonds	75,000.00	
Reserve for federal taxes	470,000.00	585,000 00
		$2,756,576.98
Dividends		
Quarterly, 4 per cent:		
Payable Aug. 10, 1920		1,680,000.00
Surplus for the quarter		$1,076,576.98

Cerro Gordo Mines Co.

Silver, Lead, Zinc; California

The fourth annual report of the Cerro Gordo Mines Co. for the year 1919 indicates that 357 tons of lead-silver ore, of a net smelter value of $26.21 per ton; 167 tons of zinc ore, with a net smelter value of $12.45 per ton; 159 tons of slag worth $3.92 per ton—a total of $12,060.66—were produced. Operations for the year resulted in a deficit of $26,481.27, and were abandoned in June, 1919.

August Mining Dividends

The following is a partial list of mining dividends paid during August, 1920:

U. S. Mining and Metallurgical Companies.	Situation.	Per Share.	Totals.
Am. Zn. Ld. & Sm., pfd.	U. S.	$1.50q	$120,810
Anaconda Copper Min., c, s, z	Mont.	1.00q	2,331,250
Barnes-King Develop., g	Mont.	1.65q	20,000
Gemini, g, s	Utah	6.00k	30,000
Internat. Nickel, pfd.	U. S.-Can.	1.50q	133,689
Miami Copper Co.	Ariz.	0.50q	373,557
Mohawk Mining Co., c	Mich.	1.50q	150,000
New Cornelia Copper Co.	Ariz.	1.25q	450,000
New Jersey Zinc Co.	U. S.	4.00q	1,680,000
United Verde Ext., c	Ariz.	0.50q	525,000
Canadian, Mexican, Central and and South American Companies			
Amparo Mining, g, s	Mex.	0.05qx	100,000
Coniagas Mines, Ltd., s	Ont.	0.12½q	100,000
Greene-Cananea Copper	Mex.	0.50	250,000
Hollinger Consol. Gold	Ont.	0.05bl-m	246,000
Ouro Preto Gold	Brazil	1sh., s-a	£1,358.05
Holding Companies.			
General Development Co.	U. S.	0.50k	60,000

m, monthly; q, quarterly; s-a, semi-annual; k, occasional; x, includes an extra dividend.

Greene-Cananea Copper Co. resumed dividends on Aug. 23, the first payment since February, 1919.

Bankers Trust Co., New York City, declared its readiness to pay the initial dividend of $1.35 on the "American shares" of Rand Mines, Ltd., on Aug. 27.

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York		London			
	1918	1919	1920	1918	1919	1920
January	88 702	101 125	132 827	44 356	48 438	79 846
February	85 716	101 125	131 295	42 792	48 027	85 005
March	88 082	101 125	125 551	43 620	48 171	74 154
April	95 346	101 125	119 779	47 215	48 886	68 848
May	99 505	107 135	102 585	48 986	52 104	60 010
June	99 500	110 430	90 957	48 875	53 896	51 096
July	99 625	106 394	91 971	48 813	54 133	53 736
August	100 292	111 370	96.168	49 077	58 835	59 875
September	101 125	114 540	.	49 500	61 668	.
October	101 125	119 192	.	49 500	64 049	.
November	101 125	127 924	.	48 969	70 065	.
December	101 125	131 976	.	48 492	76 432	.
Year	96 772	111 122	.	41 516	57 059	.

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York — Electrolytic		London — Standard		(*b*) Electrolytic	
	1919	1920	1919	1920	1919	1920
January	(*a*)	18 918	92 238	118 095	106 619	123 738
February	16 763	18 569	78 700	120 188	95 700	124 950
March	14 856	18 331	76 821	109 533	82 071	118 348
April	15 246	18 660	77 300	103 025	82 200	111 500
May	15 864	18 484	77 767	96 750	81 227	109 700
June	17 610	18 065	83 062	87 864	85 900	101 909
July	21 604	18 576	99 576	90 148	103 046	106 455
August	22 319	18 346	97 300	93 935	106 429	111 143
September	21 255	.	100 767	.	.	.
October	21 534	.	103 418	.	.	.
November	19 758	.	98 894	.	.	.
December	18 295	.	103 708	.	.	.
Year	18 691	.	90 796	.	.	.

(*a*) No market. (*b*) See note on page 499.

Lead

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	5 432	8 561	5 316	8 300	37 227	47 095
February	5 057	8 814	4 784	8 601	28 675	50 256
March	5 226	9 145	4 992	8 894	27 952	46 054
April	4 982	8 902	4 722	8 618	24 888	39 225
May	5 018	8 576	4 773	8 352	23 852	38 488
June	5 340	8 323	5 070	8 169	22 544	34 330
July	5 626	8 338	5 408	8 783	23 457	34 963
August	5 798	8 687	5 583	8 725	25 330	36 304
September	6 108	.	5 853	.	28 473	.
October	6 487	.	6 249	.	34 731	.
November	6 808	.	6 649	.	41 202	.
December	7 231	.	6 955	.	.	.
Year	5 759	.	5 530	.	28 590	.

Tin

	New York			London	
	1919		1920		
	99%	Straits	99%	Straits	1919	1920
January	67 702	.	61 596	.	248 557	376 512
February	66 801	.	58 466	59 932	223 963	395 750
March	67 934	.	61 032	61 926	236 843	369 489
April	72 500	.	61 120	62 115	225 275	345 450
May	72 500	.	53 230	55 100	234 398	294 813
June	71 250	.	46 125	48 327	238 263	250 614
July	68 000	.	45 798	49 154	253 272	261 886
August	57 226	.	43.856	47.620	273 625	274 048
September	54 482	.	.	.	280 102	.
October	53 307	.	.	.	279 239	.
November	53 307	.	.	.	283 556	.
December	53 870	.	.	.	314 113	.
Year	63 328	.	.	.	257 601	.

Zinc

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	7 272	9 483	6 922	9 133	56 045	58 643
February	6 623	9 058	6 273	8 708	46 150	61 338
March	6 500	8 881	6 150	8 531	38 500	53 437
April	6 465	8 534	6 114	8 184	36 118	47 388
May	6 429	7 938	6 079	7 588	35 477	45 088
June	6 901	7 815	6 551	7 465	36 763	41 193
July	7 873	8 070	7 523	7 720	41 815	41 886
August	7 789	8 185	7 160	7 835	39 338	41 220
September	7 510	.	7 473	.	40 955	.
October	7 823	.	7 827	.	43 630	.
November	8 177	.	8 350	.	46 588	.
December	8 700	.	8 350	.	53 101	.
Year	7 338	.	6 988	.	42 879	.

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer *		Basic †		No. 2 Foundry	
	1919	1920	1919	1920	1919	1920
January	$33 60	$40 47	$31 40	$39 88	$32 40	$39 86
February	33 60	42 954	31 40	42 61	32 40	43 40
March	32 54	43 40	31 40	42 90	29 12	43 40
April	29 35	43 72	27 15	44 22	28 15	43 90
May	29 35	44 003	27 15	44 885	28 15	45 36
June	29 35	44 89	27 15	45 41	28 15	46 40
July	29 35	47.21	27 15	47 42	28 15	46 56
August	29 35		27 15		28 15	
September	29 35		27 15		28 15	
October	29 35		27 15		28 30	
November	31 60		31 56		32 16	
December	36 57		35 32		36 86	
Year	$31 11		$29 26		$28 35	

‡ As reported by W. P. Snyder & Co.

Antimony, New York; July, 7 500c., August, 7 177c.

Quicksilver, New York; July, $90.333, August, $85 355

Monthly Copper Production

The crude-copper content of blister copper of the principal producers, in pounds, for April-July, 1920, follows:

MONTHLY CRUDE COPPER PRODUCTION, 1920

	April	May	June	July
Alaska shipments	6,507,515	7,331,590	7,213,820	5,797,645
Arizona:				
Arizona Copper	3,000,000	3,000,000	3,000,000	3,000,000
Calumet & Arizona	3,176,000	4,760,000	4,764,000	4,232,000
Cons. Ariz. Smelting	1,200 000	1,250,000	940,000	750,000
Inspiration	6,000,000	7,500,000	7,300,000	6,500,000
Magma	895,087	918,321	755,601	865,774
Miami	4,924,420	5,054,760	4,400,000	4,549,298
New Cornelia	3,560,000	3,720,000	3,664,000	3,522,000
Old Dominion	2,180,000	2,287,400	2,999,000	2,640,000
Phelps Dodge	5,700,000	6,761,000	6,125,000	5,955,000
Shattuck Arizona	214,122	219,118	198,327	166,938
Ray	4,500,000	4,260,000	4,520,000	4,500,000
United Verde	5,300,000	5,400,000	5,880,000	5,085,140
United Verde Extension	3,270,718	3 219,934	2,828,020	3,304,878
Michigan:				
Calumet & Hecla	9,532,476	8,803,811	9,022,879	8,312,025
Other Lake Superior	6,420,000	6,200,000	6,200,000	6,200,000
Montana:				
Anaconda	15,800,000	9,700,000	12,700,000	11,700,000
East Butte	1,291,840	1,412,760	1,396,140	1,537,880
Nevada				
Nevada Cons	4,140,000	4,350,000	4 650,000	4,650,000
New Mexico:				
Chino	3,543,471	3,930,728	4,010,069	4,300,932
Utah				
Utah Copper	9,313,227	9,904,781	10,000,000	8,500,000
Eastern Smelters	1,610,000	1,600,000	1,600,000	1,600,000
Total reported	102,078,871	101,584,207	104,166,856	97,729,510
Others, estimated	14,000,000	13,380,000	12,000,000	12,000,000
Total United States	116,078,871	114,964,207	116,107,856	109,729,510
Imports: Ore and concentrates, etc	7,766,457	1,607,003	35,911,009	
Imports in blister, etc	14,182,933	43,253,540	15,619,398	
Grand total	138,028,261	168,824,750	167,638 263	
British Columbia				
Granby Cons	2,105,400	2,131,219	2,079,000	2,400,000
Mexico				
Boleo	1,063,168	650,908	802,474	781,613
Cananea	4,000,000	4,300,000	3,750,000	3,500,000
Phelps Dodge Mexican properties	2,098,000	1,141,000	1,427,000	2,402,000
Other foreign				
Cerro de Pasco	3,942,000	3,890,000	3,944,000	3,652,000
Chile	8,172,000	10,300 000	7,500,000	
Katanga	2,601,428	3,847,027	4,323,221	
Backus & Johnston	1,354,000	1,726,000	1,382,000	1,458,000

Domestic copper production for 1918, 1919, and part of 1920 follows:

	1918	1919	1920
January	165 431,568	135,733,511	121,903,744
February	160,011,364	111,649,512	117 450,000
March	185,525,168	102,040,460	120,309,316
April	163,207,096	98,808,998	116,078,871
May	181,070,150	92,052,975	114,964,207
June	166,723,599	95,856,570	116,107,856
July	159,329,131	100,369,247	109,729,510
August	165,550,799	107,994,040	.
September	157,992,487	108,703,075	.
October	168,638,775	115,143,143	.
November	159,217,588	117,289,735	.
December	161,801,916	102,997 633	.

MINING STOCKS

Week Ended August 28, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	..	..	*50	..	..
Ahmeek	Boston	57½	57	57½	June '20, Q	50
Alaska-B.C.	N. Y. Curb	1 3/16	7/8	1 1/16	..	..
Allouez	Boston	23	23	23	Mar. '19,	1 00
Anaconda	N. Y.	53½	51½	53	Aug. '20, Q	1 00
Ariz. Com'l	Boston	10	9½	9½	Oct. '18,	50
Big Ledge	N. Y. Curb	⅜	3/16	⅜	..	..
Bingham Mines	Boston	8¼	8⅛	8⅛	Sept. '19, Q	.25
Calumet & Ariz.	Boston	55¼	54	55¼	June '20, Q	1 00
Calumet & Hecla	Boston	295	290	290	June '20, Q	5.00
Canada Copper	N. Y. Curb	3/16	2/16	2/16	..	..
Centennial	Boston	9⅛	9⅛	9⅛	Dec. '18, SA	1 00
Cerro de Pasco	N. Y.	39⅛	37⅛	39	June '20, Q	1 00
Chief Consol.	Boston Curb	..	..	3	Feb. '20, Q	10
Chile Copper	N. Y.	14⅜	14	14⅛	..	..
Chino	N. Y.	25⅞	26⅛	28⅛	June '20, Q	.37½
Columbus Rexall	Salt Lake	*40	*38½	*39½	..	..
Con. Ariz	N. Y. Curb	1/16	1/16	1/16	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	..	..	2⅛	..	..
Copper Range	Boston	34⅛	33⅛	34⅛	June '20, Q	50
Crystal Copper	Boston Curb	*41	*35	*40	..	..
Davis-Daly	Boston	7⅞	7⅛	7⅛	Mar. '20, Q	25
East Butte	Boston	10⅛	10	10⅛	Dec. '19, A	.50
First Nat'l	Boston Curb	*80	*70	*75	Feb. '19, SA	15
Franklin	Boston	2⅛	2⅛	2⅛	..	..
Gadsden Copper	N. Y. Curb	..	..	*71	..	..
Granby Consol	N. Y.	36⅛	34⅛	35⅞	May '19, Q	1 25
Greene-Cananea	N. Y.	25⅜	24⅛	25⅛	Aug. '20, Q	50
Hancock	Boston	3⅛	3	3⅛	..	..
Houghton	Boston Curb	..	..	*40	..	..
Howe Sound	N. Y. Curb	..	..	3⅛	July '20, Q	05
Inspiration Con.	N. Y.	46¼	44⅞	46	July '20, Q	1 00
Iron Cap	Boston Curb	..	..	8½	Feb '19, M	25
Isle Royale	Boston	27⅛	26⅛	26⅝	Sept. '19, SA	.50
Kennecott	N. Y.	24⅞	23⅝	24	June '20, Q	.50
Keweenaw	Boston	..	..	1⅜	..	..
Lake Copper	Boston	3⅜	2⅛	2⅛	..	..
La Salle	Boston	2⅜	2⅛	2⅛	..	..
Magma Chief	N. Y. Curb	..	..	*21	..	..
Magma Copper	N. Y. Curb	..	..	25½	Jan. '19, Q	50
Majestic	Boston Curb	*11	*11	*11	..	..
Mason Valley	N. Y. Curb	..	..	2⅜	..	..
Mass. Con.	Boston	3	3	3	Nov. '17, Q	1 00
Mayflower-O.C.	Boston	6	5	5⅜	..	..
Miami	N. Y.	19⅜	19⅛	19¼	Aug. '20, Q	.50
Michigan	Boston	..	..	3½	..	..
Mohawk	Boston	59	58	59	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb	5⅛	5⅛	5⅛	..	..
Nevada Con.	N. Y.	11	10⅞	10⅞	June '20, Q	.25
New Arcadian	Boston	2⅛	2⅛	2⅛	..	..
New Baltic	Boston Curb	..	..	3	..	..
New Cornelia	Boston	17	16⅛	17	Aug. '20,	.25
Nixon Nev.	N. Y. Curb	..	..	*9	..	..
North Butte	Boston	17⅛	14	16⅛	Oct. '18, Q	.25
North Lake	Boston	..	..	⅜	..	..
Ohio Copper	N. Y. Curb	..	..	1 3/16	..	..
Oilway	Boston	..	..	..	..	..
Old Dominion	Boston	22	21⅜	22	Dec. '18, Q	1 00
Osceola	Boston	37⅞	36⅛	37⅛	June '20, Q	.50
Phelps Dodge	Open Mar.	†195	†180	..	July '20, Q	2 50
Quincy	Boston	44⅛	43⅛	44⅛	Mar. '20, Q	1.00
Ray Con.	N. Y.	15⅜	14⅛	15⅛	June '20, Q	.25
Ray Hercules	Boston Curb	..	..	*60	..	..
St. Mary's M. L.	Boston	36	36	36	June '20, K	2.00
Seneca	Boston	15⅞	15⅜	15¼	..	..
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	8⅞	8⅛	8⅛	Jan. '20, ?	.25
South Lake	Boston	..	..	2	..	..
South Utah	Boston	..	..	*15	..	..
Superior	Boston	4	4	4	Apr. '17,	1 00
Superior & Boston	Boston	3⅛	2⅞	3⅛	..	..
Tenn. C. & C.	N. Y.	9¼	9⅛	9⅛	May '18, I	1.00
Tuolumne	Boston	*59	*59	*59	May '13,	.10
United Verde Ex.	Boston Curb	31	30	30⅛	Aug. '20, Q	.50
Utah Con	Boston	7	7	7	Sept. '18,	.25
Utah Copper	N. Y.	62⅛	59⅛	62	June '20, Q	1.50
Utah M. & T.	Boston	1⅛	1	1⅛	Dec. '17,	.30
Victoria	Boston	2	1⅛	1⅛	..	..
Winona	Boston	..	..	*40	..	..
Wolverine	Boston	13⅛	12⅛	13⅛	Jan. '20, Q	.50
LEAD						
Heela	N. Y. Curb	4 3/16	4⅛	4 3/16	June '20, QX	.20
St. Joseph Lead	N. Y.	16⅞	16⅛	16⅛	June '20, QX	.50
Stewart	Boston Curb	..	..	*16	Dec. '15,	.05
Utah Apex	Boston	1⅞	1⅛	1⅛	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	12⅛	12⅛	12⅛	May '17,	1 00
Am. Z. L. & S. pf.	N. Y.	45	44⅛	44⅛	Aug. '20, Q	1 50
Butte C. & Z.	N. Y.	7⅛	6⅞	6⅞	June 18, 1	.50
Butte & Superior	N. Y.	20⅛	18⅛	19⅛	Sept. '17,	1 25
Con. Interst. Cal.	N. Y.	11⅛	10	10	June '20, Q	.50
New Jersey Z.	N. Y. Curb	185	183	184	Aug. '20, Q	4 00
Sueeges	N. Y. Curb	*5	*4	*4	July '16,	.03
Yellow Pine	Los Angeles	‡	..	1 01	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅜	1⅛	1⅛	..	..
Alaska Juneau	N. Y.	1⅜	1⅛	1⅛	..	..
Carson Hill	N. Y. Curb	..	..	24	..	..
Cresson Consol. G.	N. Y. Curb	1⅞	1⅛	1⅛	June '20, Q	10
Dome Ex.	Toronto	*38	*35½	*37	..	..
Dome Mines	N. Y.	11⅛	11¼	11⅜	July '20, Q	25
Golden Cycle	Colo. Sprgs.	‡	..	*73	May '20, Q	02
Goldfield Con.	N. Y. Curb	*10	*8	*9⅜	Dec. '19,	05
Hedley	Boston	..	..	4¼	June '19,	10
Hollinger Con.	Toronto	5.70	5.60	5.70	Aug. '20, BM	05
Homestake	N. Y.	..	..	50	Sept. '19,	50
Kirkland Lake	Toronto	*56⅓	*54⅓	*54⅓	..	..
Lake Shore	Toronto	..	..	1 14	Oct. '19,	02½
McIntyre-Porcupine	Toronto	2.02	1.99	1.99	May '20, K	05
Porcupine Crown	Toronto	*26⅓	*25	*26⅓	July '17,	03
Portland	Colo. Sprgs.	‡	..	*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb	5	4	4	May '19,	.05
Silver Pick	N. Y. Curb	*7	*5	*6	..	..
Teck Hughes	Toronto	..	..	*8	..	..
Tom Reed	Los Angeles	‡	..	1.08	Dec. '19,	02
United Eastern	N. Y. Curb	2⅛	2⅛	2⅛	Apr. '20, Q	21
Vindicator Consol	Colo. Sprgs.	‡	..	*18	Jan. '20, Q	01
West Dome Consol	Toronto	*6	*6	*6	..	..
White Caps Min.	N. Y. Curb	*8	*7⅜	*8	..	..
Yukon Gold	Boston Curb	..	..	1⅛	June '18,	02½
SILVER						
Arizona Silver	Boston Curb	*17	*14	*15	Apr '20, M	03
Beaver Con.	Toronto	*44	*43	*43	May '20, K	03
Coniagas	Toronto	2.55	2.50	2.55	Aug. '20, Q	12½
Crown Reserve	Toronto	*24½	*24½	*24½	Jan. '17,	05
Kerr Lake	Boston	..	..	3⅜	Sept. '19,	1 00
La Rose	Toronto	*33⅜	*33⅜	*33⅜	Apr. '18,	02
McKinley-Dar.	N. Y. Curb	*55	*55	*55	July '20, Q	03
Mining Corp.	Toronto	..	..	1 75	June '20, Q	12½
Nipissing	N. Y. Curb	9⅛	8⅞	9⅛	July '20, Q	25
Ontario Silver	N. Y.	5⅛	5	5	Jan. '19, Q	50
Ophir Silver	N. Y. Curb	1/16	1/16	1/16	Jan. '12,	10
Peterson Lake	Toronto	*13⅞	*12⅞	*13⅞	Jan. '17,	01½
Temiskaming	Toronto	*35	*32⅛	*32⅛	Jan. '20, K	04
Tretheway	Toronto	*28⅛	*2 ⅛	*2⅛	Jan. '19,	05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1⅞	*2	..	..
Barnes-King	Butte	‡	..	1 11	Aug. '20, Q	05
Bost. & Mont.	Boston	..	..	63	..	..
Cashboy	N. Y. Curb	*8	*6	*7½	..	..
El Salvador	N. Y. Curb	1⅛	1⅛	1⅛	..	..
Jim Butler	N. Y. Curb	*14	*12	14	Aug. '18, SA	07
Jumbo Extension	N. Y. Curb	*5½	*4	*5	June '16,	05
Louisiana Con.	N. Y. Curb	⅜	⅛	1/16	..	..
MacNamara M.	N. Y. Curb	1/16	1/16	⅛	May '10,	02½
N.Y. Hond. Rosar	Open Mar.	†14½	†10½	..	July '20, QX	50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan. '20, Q	05
Tonopah-Divide	N. Y. Curb	2⅛	1⅜	1 3/16	..	..
Tonopah Ex.	N. Y. Curb	2	1⅞	1⅛	July '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1 1/16	Oct. '19, SA	15
West End Con.	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA	05
SILVER-LEAD						
Caledonia	N. Y. Curb	*22	*19	*21	July, '20, M	.01
Consol. M. & S.	Toronto	25⅛	25⅛	25⅛	July '20, Q	62½
Daly Mining	Salt Lake	2.50	2.50	2.50	July '20, Q	10
Daly-West	Boston	4⅛	4⅛	4⅛	July '20, Q	25
Eagle & Blue Bell	Boston Curb	..	..	2⅛	Apr. '20, Q	10
Electric Point	Spokane	*34	*34	*34	May '20, SA	03
Fed. M. & S.	N. Y.	10	10	10	Jan. '09,	1 50
Fed. M. & S. pf.	N. Y.	35⅛	33	33	June, '20, Q	1 75
Florence Silver	Spokane	*40	*35	*40	Apr. '19,	01½
Grand Central	Salt Lake	..	..	*37½	June '20, K	03
Iron Blossnm	N. Y. Curb	⅞	½	½	Apr. '20, Q	02½
Judge M. & S.	Salt Lake	3.97½	3.90	3.97½	July '20, Q	12½
Marsh Mines	N. Y. Curb	*19	*14	*18	..	..
Prince Consol.	N. Y. Curb	½	½	½	Nov. '17,	02½
Rambler-Cariboo	Spokane	*14	*12	*14	Feb '19,	01
Rex Con.	N. Y. Curb	*6	*6	*6	..	..
South Heela	Salt Lake	*94	*93	*93	Sept. '19, K	0 15
Stand. S. L.	N. Y. Curb	½	1/16	½	Oct '17,	05
Tamarack-Custer	Spokane	2.25	2.00	2.25	Dec. '19, K	03
Tintic Standard	Salt Lake	3.40	3.37½	3.40	June '20, Q	0 10
Wilbert	N. Y. Curb	*4½	*3	*4	Nov. '17,	01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	20¼	19½	20	Mar. '19,	50
Internat'l Nick.pf	N. Y.	..	..	80¼	Aug '20, Q	1 50
QUICKSILVER						
New Idria	Boston	..	..	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	..	..	*13	..	..
VANADIUM						
Vanadium Corp.	N. Y.	73⅛	68	70	July '20, Q	1 50
ASBESTOS						
Asbestos Corp	Montreal	80	86½	80	July '20, Q	1 50
Asbestos Corp. pf	Montreal	93	97	93	July '20, Q	1 75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	56	54	55⅜	June '20, Q	1 00
Am. S. & R.pf.	N. Y.	90⅜	90⅛	90⅛	June '20, Q	1 75
Am. Sm. pf.A.	N. Y.	70⅛	70⅛	70⅛	July '20, Q	1 50
U. S. Sm. R. & M.	N. Y.	53⅛	52	53⅛	July '20, Q	1 50
U.S.S.R.& M. pf.	Boston	44	42⅛	43⅛	July 20, Q	87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, semi-annually BM, bimonthly. K, Irregular. I, Initial. X, includes extra

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
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Volume 110 New York, September 11, 1920 *Number* 11

The Co-ordination of the Mining Industry

*By J. E. SPURR**

MR. STOUGHTON, I understand, was to have spoken of the Federated American Engineering Societies. I am glad to add my vote to the effect that this is a big idea. It means an organization that will make it possible for the great and powerful engineer class of the country to act as a unity and therefore effectively, instead of as individuals or scattered and separate societies, and therefore ineffectively. By all means we should support this enthusiastically. It will make engineers better citizens.

But there is another classification in which we fall, besides being engineers. We are also miners—that is, representatives of the mining industry; and I venture to say that we are as much wrapped up, heart and soul, in our business as miners as we are in our profession as engineers. Looking at this phase we find that other engineers have less in common with us than many groups who are not engineers: the civil engineers, the architects, the highway and sanitary engineers, ordinarily concern us less closely than do the various groups other than engineers that form an integral part of the mining industry—namely, all those who mine, mill, smelt, transport, sell and manufacture the products of the earth. Engineering is our profession, mining is our business; we should organize for efficiency along both lines, and they lead us in different directions. Organization as engineers will allow us to use our training and skill for the greatest general service as citizens: organization as miners will promote the scientific progress of the great basic industry for which we are so largely responsible.

That organization of the industry has already gone far is shown by the record of this society. There are also other organizations devoted to various phases of our industry. We have a Mining and Metallurgical Society of America and an American Mining Congress. We have in Washington the Bureau of Mines and the Geological Survey; and in many of the states Mining Bureaus and Geological Surveys; in the legislative branch in Washington we have standing Committees on Mines and Mining. We have various other societies, such as the Zinc Institute and the newly organized Society of Economic Geologists; and we have a press devoted to the various phases of mining, from engineering to marketing. These elements of the government of the mining industry are like the thirteen colonies before they cast around for a plan whereby they might work as a unit. At present they often work at cross purposes, thus neutralizing their strength.

Yet those who conduct the industry have a heavy responsibility. This country has been more than all other nations endowed with great deposits of minerals. But the wise use of this power is an opportunity that will come to us just once in all eternity. As the stock phrase goes, "these ores are wasting assets." Our responsibility is to so manage the industry, with the aid of science, technical skill, knowledge of political economy, and of national and international relations, that the greatest benefit shall be obtained for the greatest number for the longest time.

The American Institute of Mining and Metallurgical Engineers specializes on the sciences of mining, metallurgical and geological engineering; the Mining and Metallurgical Society on the philosophical problems of mining; the American Mining Congress represents the mining interests, as the United States Chamber of Commerce does the manufacturing and trading interests, and has special direct methods for influencing direct governmental action in favor of mining. The Bureau of Mines specializes largely in safety work and metallurgical research; the Geological Survey on mining geology and the condition of the mining industry.

There is much overlapping, and there are many gaps. No attempt at co-ordination or the invention of a central co-ordinating device is described. Indeed, I believe that no two of these are co-ordinated. Is it not plain that we could progress further and faster if it could be done?

Granted that this is desirable, how shall we go about it? First, perhaps, for each group to find out what the other groups are doing. Has the Institute made any critical study of the Bureau of Mines or of the Mining Congress? I know that Mr. Callbreath, secretary of the Mining Congress, who is here, has appointed a committee to consider the co-ordination of the Institute and the Congress. How many of these organizations have made a critical study of the various branches of executive control of the mining industry in Washington or the mechanics of mining legislation by Congress, or the machinery which imposes tariffs on ores or their products? It is very much their business to do so.

Investigation, therefore, should come first. Then, in any event, co-ordination. Possibly a central council could be devised, a central mining council, scientifically chosen from the principal mining groups. If any special program agreed on by such a council should be supported by all the groups they should represent, the effect would be instant and powerful. It is not too much to say that the mining industry could thus be steered in the general direction of the greatest good to the greatest number for the longest time.

*This address, on account of lack of time, was read only by title at the banquet of the American Institute of Mining Engineers in Minneapolis on Aug. 26, 1920.

There is no use in imagining that any one organization like the Institute can swing the whole thing itself. It won't do it, and it can't do it. These other units are solid facts, like itself; and they have originated from fundamental needs, though ever so clumsily expressed. Mining engineers cannot afford to be narrow and clannish in this respect. It only reacts against them and diminishes their influence and authority.

Who controls the representation of the mining industry in Washington? In the executive branch, a lawyer; in the legislature, a conclave of farmers, lawyers, doctors, and what not. There is not a mining engineer on the Mines' Committee of either house; nor have they even a consulting engineer. You may imagine that the Bureau of Mines and the Geological Survey act in this capacity; but they do not. When the engineers of these bureaus appear before the committees, the committee has the same defensive and offensive attitude as it has toward the engineers with axes to grind for special interests. Its members believe that the Government bureaus are primarily interested in their own expansion, or, more specifically, in appropriations.

When the exigencies of the war showed the necessity of a close study and control of the mining industry no attempt was made to consult the industry itself, nor any one of its representative bodies. The control was left uncertain and remained split among half a dozen departments and special war boards. Necessity developed gradually a sort of central informal council out of this confusion, which became more definite toward the close of the war; but all this strenuous effort vanished with the armistice. In England they were not so quick to forget what they had learned as to the close relation between mining, political economy, and statecraft. In this country, at least, we must organize the relations of the mining industry and the Government largely from without the Government, for the inevitable bureaucratic organizations at Washington are not so free to speak or to work for reform and progress. Without outside stimulus they tend to become crystallized, set, and sometimes reactionary. But they are, I believe, in general, thankful for the outside stimulus.

The theme of my story is therefore: First a liberal attitude of one mining organization toward the others; second, an interested and thorough investigation by each of all the rest; third, co-ordination among all; and fourth, the suggestion of the achievement of this co-ordination through a central council.

Contracting and Leasing

CHANGED economic and labor conditions have brought into prominence both the contracting and leasing systems in mining operations. It is unnecessary to dilate upon the broad conditions affecting the mining industry, but high labor costs, diminishing tons per man per shift, have stirred mine managements to the point where they find it necessary to make a considerable amount of change in procedure. How to secure co-operation of mine workers in an enterprise is a critical problem, which affects the worker's interests as well as the industry as a whole. Contracting development work and leasing a block of ground in a mine have long been established practice, but there is a preponderance of the day's pay system. The bonus system has been thoroughly tried out, and it is doubtful whether it has adequately met the situation. At best it is a modification of the contract system.

The contract system has the advantage of putting a contract crew upon its mettle and establishing a definite responsibility for results. By making it complete—that is, making the contractors responsible for tools, supplies and power used—the company supplying only the necessary timber for support of workings and the general equipment for hoisting and haulage, the system has the advantage of establishing a definite business relationship between the company and the men on a basis distinct from day's pay and putting the details up to the men themselves. There is a real opportunity for a man to make better than day's pay. Skill and foresight will bring an added reward. The result to the company is a greater stabilization of operating conditions.

In leasing operations with payment on a sliding scale of royalties based on the recoverable value in the ore mined, the lessee has a stake in the enterprise. He is under the incentive to practice selective mining and to keep his own costs at a minimum. He occupies a higher place in the community in which he lives. The leasing system operates to produce cleaner mining and the lessee is alive to the following of leads and stringers of ore, with the result that sometimes blocks of ground abandoned as unprofitable under regular company operation become once more remunerative. A mine with well-developed ore bodies cannot lease its ground to advantage, but where ore bodies are numerous, irregular, and uncertain in size, as well as distributed over a wide area, the conditions are much more favorable for the leasing system. It is in mines of this kind that leasing is successful, though in mines of the developed type stoping on a contract basis presents distinct advantages.

We believe that under existing conditions both the contract and leasing systems warrant extensive use.

The Public and Mining Information

NOWADAYS one has but to enter a drug store to satisfy a desire for about everything from drugs to books and furnishings. Similarly with the press. For example, to be properly informed on the copper situation, perusal of the pages of a periodical ordinarily devoted to society news, fashions, art, and the theater seems to be in order. We were surprised to see in the September *Vanity Fair* an article covering the copper situation—for the layman (and by one?). It was easy reading, but that is about all that can be said for it. Excepting obviously erroneous statements, as "the well-known public . . . is completely deprived of knowledge as to developments in copper," which the Government and the technical press have been providing for years; "as a result, the price quoted by the great producers is to an exceptional extent nominal, and *occasional sales are made by smaller dealers below the market*," and other conclusions of the writer requiring either qualification or elision, the article is commendable, if only as an attempt to clarify the situation for the benefit of the magazine's readers.

Oddly enough, comparatively little emphasis is placed by the popular press as a whole on the importance of the two great fundamental industries of the world—agriculture and mining. Considering humanity's su-

preme dependence upon these two activities, one would logically expect the conditions in farming or mining to be stressed more than they are by the general press. We have financial and class organs which make a specialty of covering particular fields, but, nevertheless, public ignorance concerning these two foundation piers to our commerce and prosperity needs much enlightenment.

We wish that knowledge of the copper industry's troubles were more generally disseminated, that information concerning our vanishing gold-mining industry were spread broadcast—by no means in a partizan sense—so that suggested remedies for the mining industries' ailments might be based on sound and fair premises through public understanding and co-operation; and that other phases of mining and metallurgy were better understood by the people at large.

Through its close contact with mines and minerals it is one of the functions of the technical mining press to inform the reading public of all phases of the industry. Necessarily, however, much of its published matter must be devoted to material that is intended for the specialist—the engineer—and hence will have only casual if any interest for other readers. Frequently articles are published, be they editorials, special contributions, or other matter, which are more general in appeal and purpose, but ordinarily they are only those embodying a broad economic discussion of some mining problem. But it is just these matters which the public should find of interest, and for which it should turn to the technical press for illumination. To keep pace with the expanding fund of human knowledge in all its branches is prima facie impossible, but to lose sight of the developments on the farms and in the mines means neglecting an inspection of the keystone of our prosperity.

"Salting"

IN A PREVIOUS editorial we touched upon the methods and ethics of dressing a mine for sale. The art of dressing progresses insensibly to that of salting. For the dresser may go further than putting his best foot foremost: he may so do this that it comes plainly under the category of sinful salting. An instance may be cited of a silver quartz vein, where the values were largely in streaks and spots of silver sulphides—argentite and tetrahedrite. This mine was sampled by many prominent engineers, who took every known precaution against salting. Their results varied widely, let us say from $16 to $23 average per ton; a final sampling gave, let us say, $12. The divergence was said to be due to the spotty nature of the ore, and the highest average was claimed to be as likely as the lowest. But the facts, as divulged by one on the inside, were that the moilers were miners from the vicinity, and that the owner of the mine rewarded them privately (in addition to their wages from the examining engineers) if they would simply hit the rich silver streaks a little harder and oftener in cutting the samples than they did the barren quartz. This was imperceptible to the watchful engineers who stood by; but if the mining costs were, say, $8, the difference between an average assay value of $12 and $16 doubled the net value of the mine.

The coarser and commoner tricks of salting are well known—as salting ore faces with a spray of gold or silver solution; or, more economically, salting samples, by inserting a syringe through canvas bags or in some other way—even through a keyhole a secondary enrichment may be accomplished. Salting of ore in place is expensive if the examining engineer takes large samples, and mill samples will exhaust the ammunition of a salter of this kind, and show a surprising discordance with the hand sampling. Therefore, salting the fluxes in the assayer's laboratory is a favorite trick, though easily detected if the assayer takes care to assay his materials continually.

We have seen samples, intended to promote investment or sale, that were salted in a cruder fashion. Dentist's gold, plugging the vesicles of a gray obsidian, caused a certain stampede in Nevada in the early days, and nearly procured for the enterprising prospectors the unloading of their claims; and a Colorado diamond-drill core of dioritic rock, with the softened feldspar neatly plugged with gold, caused an investment in the drilled ground by some noted mining engineers and financiers, and the plugger retired to the life of a country gentleman.

Placer ground is easily and, one might almost say, habitually salted. Fine placer gold mixed with tobacco and smoked as a cigarette eluded the vigilance of engineers who were examining placers in Santo Domingo. The natives washers had to smoke cigarettes, of course, and a little of the ash accidentally dropped in the pan separated some enterprising Americans from their roll. We have seen a very good "string of colors" in a gold pan which under the magnifying glass showed the shot-like form of assay buttons, instead of the familiar scales of placer gold.

There is no real safeguard against this dishonesty. A certain mine in the south showed excellent values on salting, but the shrewd purchaser insisted on a mill test, and a number of tons were run through. A little fine gold dropped by the owner at the head of the mill was recovered on the plates to the satisfaction of all; and the sale was made.

There are many engineers who will declare that they "cannot be salted." It is an unwise boast: any engineer can be salted. But a careful engineer can always discover it before it is too late. A system of duplicate and even triplicate samples, numbered variously by a secret system; occasional dead-head samples of known worthless material run in under the guise of ore samples; and a system of duplicate and even triplicate assays by independent and widely separated assayers, unknown to one another, form a precautionary armor which it is difficult for the swindler to pierce.

More Unemployment Problems

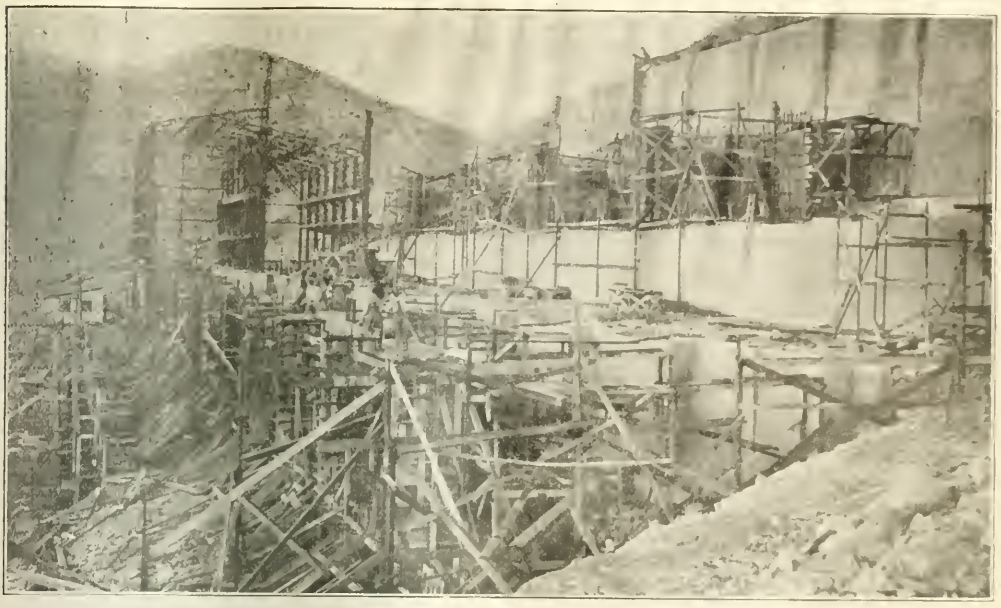
JUST when we are assured that the labor situation is becoming easier and that the cost of living is decreasing, another orgy of strikes has broken out in New York. First it was the baggage men, as a result of which it will now cost you 25c. more to have your trunk smashed in the metropolis. Now, the Brooklyn Rapid Transit is demoralized, and those who ride at all must do so in steel-caged cars, like the tigers in a circus parade. Moving-van men, painters, and plumbers have also quit work. From Pennsylvania comes word of 125,000 anthracite miners "on vacation." (A "vacation" is a strike not sanctioned by union officials.) British miners are likewise restless, and there are threats of a general walk-out. Striking metal workers in Rome, according to report, have seized several factories.

Unquestionably, the most pressing problem before executives is the cure of the existing industrial unrest.

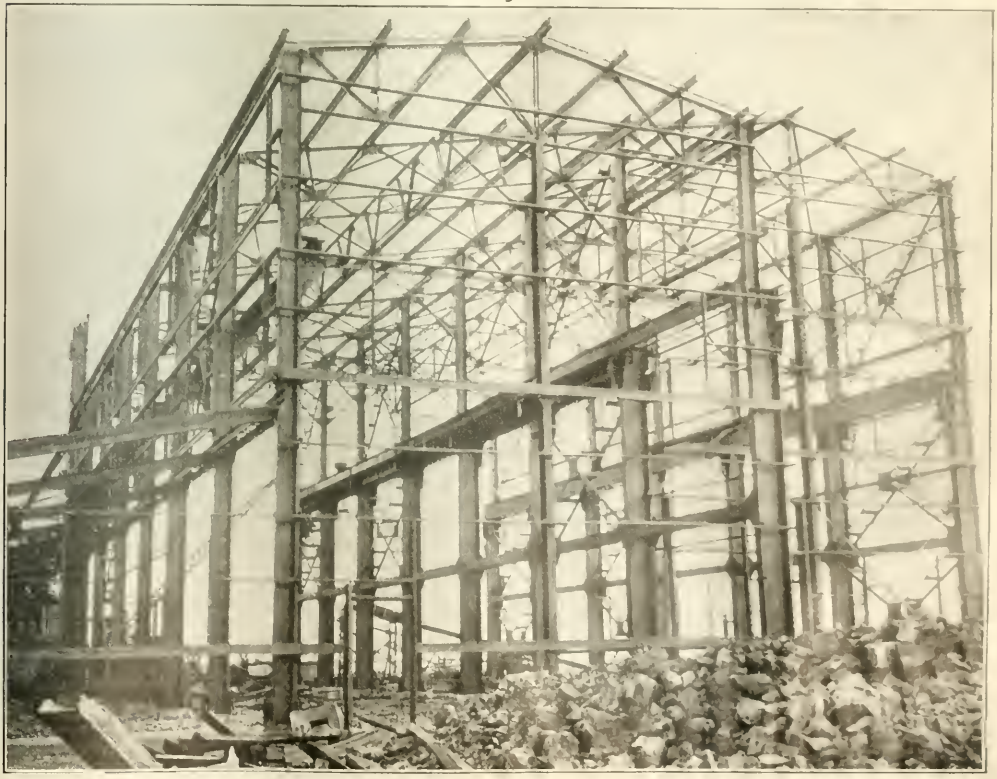
Copper Queen Concentrator, Warren, Ariz.

LOWER TIER OF SHOPS AND RAILROAD RECEIVING POINT FOR MATERIALS OF CONSTRUCTION

COPPER QUEEN CONCENTRATOR FROM LOWEST OR SHOP LEVEL



GENERAL VIEW, SHOWING PROGRESS OF STEEL WORK, JUNE 1, 1920



STEEL WORK OF MACHINE SHOP, COPPER QUEEN CONCENTRATOR

The Economics of Copper Blast Furnace Charging

Analyses Not Alone To Be Considered—Method of Calculating Costs of Great Importance—Graphs, as for Slag Losses, Plotted From Experimental Data, Almost Indispensable—Degree of Sulphur Oxidation and How It May Be Varied

By C. A. GRABILL*
Written for *Engineering and Mining Journal*

TO DETERMINE what should go into a copper blast furnace requires common sense, a lead pencil, and a correct idea of the value of money; the only indispensable requirement is common sense, though often it seems more rare than might be expected. Chemical reactions, heats of combination, melting points, formation temperatures, trisilicates, and similar data, are merely aids to the understanding of the complex action going on within the four walls of the blast furnace, and the moment they fail to simplify the conception of conditions or subsequent calculations they should be dropped, temporarily or permanently, as the situation demands. Some are merely terms used as adjuncts to a theory which is not proved, nor of much importance if proved, and all such terms are but tools of the trade to be used when required, and only when required; otherwise, they are likely to be worse than useless.

Simplicity of Blast Furnace

To get away from much of the mystery of the blast furnace it is well to consider the process going on inside it as akin to that in the kitchen range, and a study of the kitchen fire will help to picture in the mind's eye the conditions that exist in the former. Blowholes, crusts, cold bottoms, and irregularities in the air supply are common to both, as is the blowing-in process with wood fuel.

As for formulas, such as given by Furman, I can only say that in twenty years' experience I have met only one metallurgist who used them in practice; the others, like myself, use the method of "cut and try, and add ten kilos." One reason for this is that conditions change so often that the preparation and application of a formula is more laborious than the direct calculation. Another is that one becomes so familiar with the situation and the materials available that often a correct guess can be made the first time, and in many instances one must be guided by conditions rather than by figures.

Practical Determinations Preferred

As for the terms bisilicate, trisilicate, and similar designations, I have found them merely ingenious terms for causing labor and befogging the issue. The use of percentage composition, plain and unadorned, is far simpler, more practical, and just as accurate, particularly because the idea underlying the terms mentioned is certainly disputable if not positively incorrect. Balling's very elaborate tables are a trap for the unwary. The metallurgist should learn to associate the properties of slags with their percentage composition and thus avoid the intermediate calculations. The assay office does not report in silicate ratios, and the furnace will not wait while the metallurgist hunts up a mislaid copy of the "Metallurgist's Handbook" to consult the tables.

To a somewhat similar category belong the type slags of the lead smelter. These type slags were postulated many years ago, and doubtless represented a condition due to the composition of certain ores; but the attempt to apply them to all ores is a failure because the genuine type slag does not exist. The attempt to adhere to one may be a costly hobby. By type slag I of course refer to that hypothesis which stated that in a few slags the silica, lime and iron bore a simple ratio to each other and were therefore superior to other slags of approximately the same composition.

The most practical conception of slags is that they are mutual solutions of a number of silicates containing dissolved substances, all of which are dissociated, and that naturally they follow the laws of mixed solutions, their properties varying gradually and not in units. Unfortunately, the physical data are lacking to permit much use of these laws, so the question arises, "What basis can be taken for metallurgical calculations?"

Fundamentals of Pyrometallurgy

Fundamentally, the pyrometallurgist considers two facts: The first is that gold and silver are soluble in lead and copper, either in metallic form or combined with sulphur, or dissolved in iron sulphide, and that the fused compounds or mixtures are only slightly soluble in, heavier than, and therefore separable from, the fused oxides, their mixtures, compounds and solutes known as slags. The second is the profit to be derived from making this separation.

The first part of this statement is necessarily broad, not for the reason that metallurgists are confined to the use of a bisilicate or a "quarter" slag because of a sharply defined limiting property of silicates, but owing to the balancing of the cost factors. The kind of slag used will change up and down, not because of a change in properties of matter, but in prices and costs. No physical reason is approved that would prevent the design and operation of a furnace that would run on a pure quartz slag with a matte product. The cost would be high; say, $30 per ton. Nor is there any fixed limit at the other end. It is the custom to think of silica as necessary because of its cheapness and universal occurrence. Silicate slags are almost universal, not because of pre-eminent qualities only, but because of their cheapness; otherwise it is conceivable that borates, aluminates and ferrites might be used.

The same may be said of iron and lime as fluxes. In Russia, barium has been used in place of both, and in common with most metallurgists I have used dolomite

*First of a series of three articles on this general subject.

instead of limestone. Alkalies would be satisfactory, and, indeed, have been used. The whole question is merely one of cost and by cost I do not mean the price of the article alone but the total effect on operating results.

Costs as Important as Analyses

The metallurgist must, therefore, calculate his charge with the costs as elements just as much as the chemical elements, but to know his costs he must have figured the charge. I once wasted several days developing a formula for the cost of smelting, and ultimately did succeed in getting one that was not outrageously inaccurate, but it was so cumbersome that the waste basket was the only suitable place for it. The only practicable plan of calculation is by approximations. Plotting the results of calculations made by varying one element at a time often gives valuable and unexpected aid.

Slags are usually classed as silica, iron, and lime compounds because of the greatly preponderating proportion of these oxides. Comparison of results at the various copper-smelting plants of the United States will show that the ordinary limiting figures are: SiO_2, 25 to 50 per cent; FeO, 15 to 65; and CaO, 0 to 30 per cent; and 38 per cent SiO_2, 30 per cent FeO, and 22 per cent CaO may be said to represent a fair average condition, and, although not ideal, is still an approximation to that condition. I consider 36 per cent Cu a representative matte, and therefore a fairly satisfactory one.

To obtain these mixtures the metallurgist has available: SiO_2 and its substitutes, acidic; FeO and its substitutes, basic; CaO and its substitutes, basic; S, matte forming, and acidic in effect on the others in removing a portion of the Fe; coke; air (the air must not be overlooked, as it weighs twice as much as the rest of the charge), and miscellaneous impurities. The products of the treatment of the mixture are: Gases, fume, flue dust, matte, and slag.

Now, if the ore contains the first four items in exactly the right amount to produce the ideal slag and matte when the proportion of the coke and air is at the point of maximum efficiency, the metallurgist has an easy task, but a change in the price of coke would throw the operation out of balance. If the coke increased in cost it would be more economical to reduce the amount on the charge, and that would probably imply slower running and a higher-grade matte, more slag loss and more iron oxide in the slag, and consequently a smaller percentage of silica and lime.

Preferred Method of Computation

The metallurgist is confronted by the question as to whether it will pay to buy a siliceous ore to utilize the excess ferrous oxide, and if so what he can afford to pay for extra silica. This question is not a simple one, yet it is the fundamental factor in making up the charge, and recourse must be had to the records of the cost of smelting operations either at the same plant or at similar plants, as a starting point. The oldest method is to base the costs of operation on the ton of ore, irrespective of its composition, and charge against it the cost of the fluxes actually used. Although this is an important figure, as a tool of the metallurgist it is of a decidedly antiquated pattern. The better method is to base all cost statistics of operations on the ton of charge, consisting of the ore and fluxes (but not including secondaries, i.e., foul slag, cleanings, and such materials), but with the original price paid for the fluxes omitted, they being considered exactly as an ore on which a loss is incurred. The price of the ore would not appear either in these figures.

The cost of treatment of a ton of any ore, commonly referred to as the cost of smelting, would then be the cost of smelting a ton of charge plus a correction for the lime, silica, and other fluxes, determined in the manner shown later. Owing to the prevalence of siliceous ores in custom practice, these corrections are usually based on the cost of fluxing a ton (or unit[1]) of silica, but if there are more basic ores than needed this will automatically change the basis to the cost of fluxing a unit of Fe or CaO, as the case may be; in special instances the basis might be on zinc, barium, or sulphur.

Calculations Incorrectly Made Very Misleading

To the metallurgist the manner in which these costs of operation are calculated is of great importance, and I regret to say that it is not often correctly done even by some of the large companies. At the moment of writing I have before me the smelting costs of several companies, and not one of the lot is in a form usable by the metallurgist. This is because most cost systems are devised by an office force, frequently without metallurgical experience, and situated far from the plant. They are designed to be used as a guide from the financial standpoint, or to form a basis of suppositious comparison of work at both mine and smelter, and are frequently very misleading. As above indicated, they should be based on the ton of charge smelted and grouped first by class of operation performed, so that, in considering any particular ore only the costs applicable would be charged against it. Obviously it would not be correct, ordinarily, to charge limestone with a smelting cost that included roasting.

In any ordinary work the costs might be classified as follows: Sampling and assaying; sintering; roasting; briquetting; bedding and recovery; smelting; converting; recovery of fume and flue dust; overhead and general expense; construction and any unusual expense.

The cross classification would be divided according to the effect on increased tonnage: Overhead and general expense; construction; special; fixed expense (those expenses in addition to general and overhead expense and construction which are independent of the tonnage smelted, such as foremen, lights, and like charges); variable expense (those which vary directly with the tonnage smelted, such as coke and ore shovelers); and semi-variable expense (those which vary with the tonnage but not directly, for example, slag motors and matte tappers).

These classification are of course only general; each case requires individual consideration and in any event each of the above classes will have many necessary subdivisions.

The next matter to be determined is the value of the recoverable metals at the works. There is of course expense in shipping, refining, and selling the product, and this should not appear as an expense of operation, although it may be handled in that way if kept separate from the other accounts. The most convenient system

[1] "Unit" as commonly used, is equivalent to 1 per cent of a ton, or 20 lb.

is to use it in the form of a deduction from the selling price stated in cents per pound or per ounce. Stated in this manner it may be called "marketing expense."

The laws that govern the metal losses are next in importance. "Very easy," says the amateur: "Gold, 100 per cent recovery; silver, 95 per cent recovery; and copper, 1 per cent of the copper contents of the matte equals the copper assay of the slag. Q. E. D. Only there *is* a gold loss, and 5 per cent silver loss is merely the average of a number of discrepancies, and the assay of the slag varies like sin. In these days of high costs and close competition the professional must make a lot better guess than that.

Several years ago I cal'ed attention to the fact that the losses of copper in copper smelting were dependent on several factors, of which the solubility of copper sulphide in silicates, the flotation of copper matte by small bubbles of gas, and the solubility of the metal or the oxides due to imperfect mixing of an overblown portion, were the principal causes; and that, in a well-

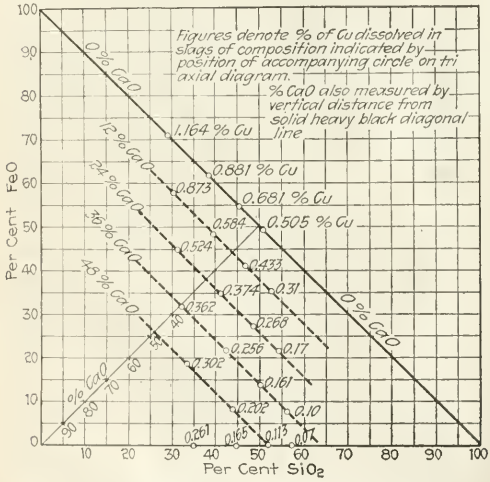


FIG. 1. COPPER CONTENTS OF SILICA-IRON-LIME SLAGS FOR MATTES WITH 30 PER CENT COPPER. FROM EXPERIMENTAL DATA

run plant, the first factor is decidedly the most important, the others coming into action only in case of furnace troubles.

Work of Wanjukov

Wanjukov published, in "Metallurgie," in 1912, the results of some experiments on this solubility, and from his data I have made Fig. 1. Comparison with actual results obtained is satisfactory, making due allowances. Wanjukov's results are usual'y higher than those found in practice, apparently because his figures are based on slags consisting of pure mixtures of silica, iron, and lime, whereas the ordinary slag contains a number of elements that have a favorable effect, such as magnesia. It should also be noted that the alumina must be calculated as silica. Wanjukov's own plotting of his results in accordance with the silicate degree fails to show this (Fig. 2), but recasting his figures on the percentage basis, with the curve showing the variations in the copper assay caused by the substitution of alumina for silica, unit for unit (Fig. 3), does do so. With the exception of two doubtful results, the maximum variation is about 0.05 per cent. This is, however, the least satisfactory part of his work, owing to the paucity of the data in the area practicable for smelting purposes.

As the result of a comparison of a good many years'

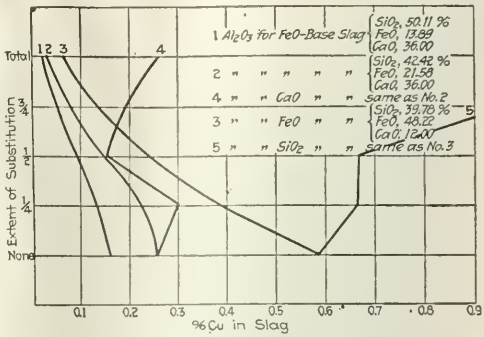


FIG. 2. WANJUKOV'S RESULTS. SUBSTITUTION OF CHEMICAL EQUIVALENTS OF ALUMINA FOR THE OTHER CONSTITUENTS OF VARIOUS SLAGS

work, involving the smelting of ores which have produced matte all the way from 4 to 79 per cent Cu and "black copper," I drew up the curve in Fig. 4.

These two diagrams have helped me immensely in my work, but, as Jeff says to Mutt, "Use discretion." In the first place, as Wanjukov points out, the solubility is dependent on the grade of matte; on the presence of small amounts of other substances than silica, iron and lime; on the temperature; and on the sulphur ions in the slag, the last factor being influenced by the others. I have found that calcium fluoride has a favorable effect, probably owing to reduction of the melting point, and, consequently, of the temperature. Reference to the beneficial effect of the fluoride is found in a Spanish work on smelting published in 1799, so the discovery is not new. The presence of small amounts

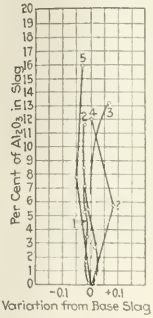


FIG. 3. WANJUKOV'S DATA FOR SUBSTITUTION OF Al_2O_3 FOR SILICA

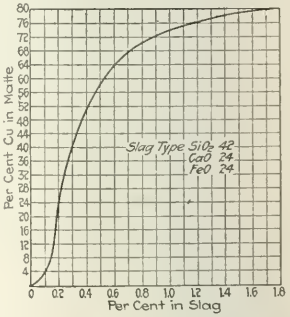


FIG. 4. APPROXIMATE RELATION BETWEEN THE COPPER CONTENTS OF SLAG AND THE ACCOMPANYING MATTE

of *any* base should lower the melting point and influence the solubility.

My own method is to tabulate all the slag assays available at the plant under consideration, plotting them against the grade of matte, silica, iron and lime, differ-

ent classes of ore, furnace speed, matte fall and the ratio between matte and slag to the same factors and to any other factor that might influence the loss, and thus determine the direction and extent to which the primary curve is modified.

Silver losses usually are found to follow the copper. I have never been able, however, to plot a general curve

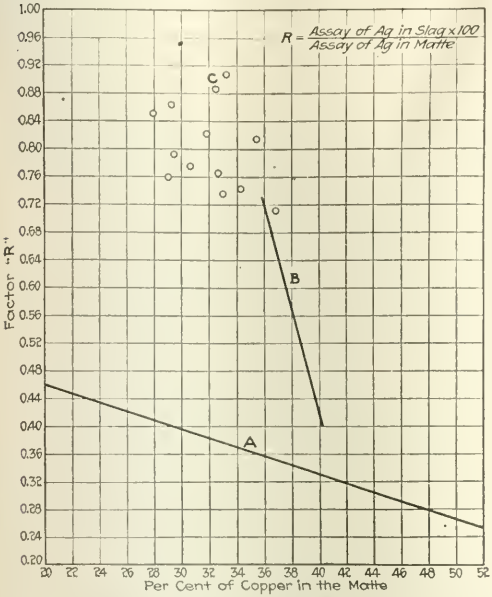


FIG. 5. RELATION BETWEEN SILVER IN SLAG AND COPPER IN MATTE

in the same way as for copper, apparently because the graphs which represent the effects of the various influences do not have a uniform curve; and the compound curve formed by a combination of the simple curves is therefore erratic.

Illustration of Curve Readings

In Fig. 5 I show a graph of the results obtained at three different plants. Curve *A* was drawn from results that harmonized well among themselves. Curve *B* was for a similar grade of matte, and the slag did not vary much from that in *A*, but there is no resemblance between the constants in the two cases. Curve *C* is merely a collection of points which have no resemblance to a curve, and it is apparent that any relationship that exists between the silver in the slag and the copper in the matte is masked by some much more important factor. *R* is simply the ratio, expressed in percentage, that the assay value of the slag was to the assay value of the matte. If, however, the points of *C* are plotted in accordance with the silver in the mattes, they fall into a regular curve, with two exceptions, as shown in Fig. 6. The dotted lines show the effect on the factor *R* caused by the minimum error of weighing in making the assays.

The differences between these curves were all explainable. When the amount of silver in the matte is small, variations in it have an important effect, but the collecting power of the copper in the matte is not of much effect. When the silver becomes a considerable part of the matte, as in *A* and *B*, the solvent effect of the copper overshadows changing amounts of silver.

The difference between *A* and *B* was due to certain constituents of one of the ores at the *B* plant, and other local conditions. These curves are inserted merely to show how easily incorrect conclusions may be reached and the care that must be taken in the use of these tools. Deductions from them always should be verified by direct experiment where possible, but with suitable precautions the use of curves in this manner is of more value than incomplete experiments, with the presumption, of course, that the curves represent the plotting of results obtained from much more work.

Consider the curve shown in Fig. 6 for example. The points on this curve represent about 800 samples taken during a year's work. The results and the deductions from them, therefore, are much more to be depended upon than conclusions reached from a few days' test. The curve could not be applied to the work of another plant without full knowledge of all the circumstances, but that fact does not destroy its value. Consider Curve *B* of Fig. 5. The fact that the steep pitch of this curve was due to strictly local conditions was of help in determining and controlling them, and although the steepness was apparently due to the collecting power of the copper, in reality it was attributable to certain influences which in this instance coincided with the grade of the matte. Impurities in the sulphide ore were one of the causes. The curve in Fig. 6 is shown as a straight line, but in reality is bowed slightly, with the concave side upward.

As far as my experience goes, the slag composition has more effect on the gold loss than do the copper or gold values in the matte.

The volatilization of silver must be remembered, but that of gold and copper is without importance except in the presence of chlorides. With baghouses and Cottrell plants the volatilization of silver may be neglected. Of course this refers to the fume and not to the flue dust question, which must always be watched.

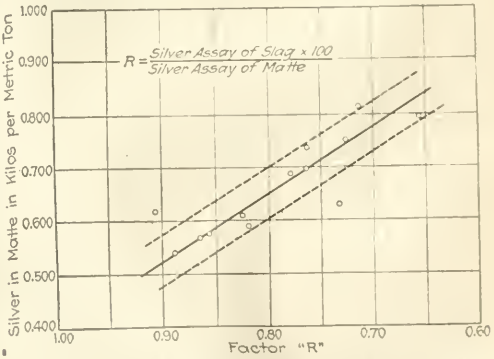


FIG. 6. RELATION BETWEEN SILVER IN SLAG AND SILVER IN MATTE

Limit of Error Must Be Watched

In plotting the assays of slags it should be remembered that the personal equation of the assayer, and the cupellation losses have a large percentage effect on the assays. Also, that a small flotation bubble of matte in

one sample will throw a number of assays out of balance, and yet these bubbles help to make up the average loss. Similarly, the limit of error in the ordinary slag assay is about 5 per cent, so that a close agreement with a theoretical formula is not to be expected. It is precisely for these reasons that the use of formulæ and curves is desirable. They do away with a constantly recurring error of judgment. It is easy to say that the slag from a certain 40 per cent matte will contain 0.3 per cent Cu, and so to calculate it, and the probable error is not large; but if it is found from tested curves that the true assay under the circumstances is 0.33, and that this extra 0.03 is due to the presence of a particular ore on the charge which comprises only 50 per cent of the total, then instead of an error of 0.03 per cent there is one of 0.6 per cent, or 12 lb. of copper for the offending ore, and $2.64 per ton with 20-cent copper, which is of importance.

Properly tested curves are simply tools corresponding to the vernier on the transit, and permit the metallurgist to read his calculations a decimal place further than he could otherwise.

Sulphur Oxidation an Important Consideration

Another important item is the percentage of sulphur recovered, but to make graphs for this factor is not of much use. Peters, I believe, says to assume the grade of matte that previous experience indicates will be produced. This is not much comfort for a new man, at a new plant, with a new ore. Sticht and Freeland are responsible for the doctrine that in pyritic smelting the oxidation of the sulphur, and, therefore, the amount recovered and the grade of matte produced, are controlled by the amount of free silica present. My own experience with pyritic smelting is limited, but with semi-pyritic smelting and straight matting, I must confess that I have not been able to identify that effect.

On the other hand I do believe that the metallurgist can control the sulphur recovery within wide limits by varying the quality and quantity of the coke, aided a little by changes in the air supply.

The first important factor is the quality of the coke. I recall an experience at one plant where the change from large, firm English coke, to small, brittle Connellsville, dropped the grade of matte, other things being equal, about 50 per cent. Pocahontas coke will permit the recovery of a much higher portion of the sulphur than will Dawson coke. I know of no definite method for grading coke on this basis, but an ocular examination coupled with analytical results will give a fair idea of the results to expect in practice. I think that the burning test in a tube, determining the relative amounts of CO and CO_2 formed under standard conditions, together with a crushing and sizing test, should give satisfactory results, but I have seen no comparative tests to substantiate this belief.

With smooth-running furnaces and average coke there is not as great a difference in the sulphur oxidized as is commonly believed. Most of the large differences reported are due to methods of calculation. One plant will base figures on sulphur volatilized, and count everything except the sulphur in the matte as volatile sulphur, neglecting the sulphur in the fume, dust, and slag; another will include the sulphur in returned matte and secondaries as part of the sulphur on the charge.

With a large coke charge the returned matte in the furnace will undergo little oxidation, but when the coke charge is reduced, as in concentration charges, the sulphur in the matte will be oxidized, though never to the extent that it is in the ore. Probably the correct way would be to assume a factor, based on experiment, for the oxidation of the returned matte, varying from nil at 16 per cent coke to, say, 40 at 6 per cent, but this factor would have to be varied with the quality of the coke. The sulphur oxidized is also influenced by the amount of copper on the charge, which has a protective influence when the ratio of copper to sulphur is large.

In a rough way, about 15 per cent of the sulphur in the crude ore will be recovered in the matte with 10 or 12 per cent of average coke on the charge. This figure will vary 5 per cent either way, depending on the quality of the coke, and another 5 per cent depending on the amount and manner of driving.

Metallurgist's Schedule Is Guide to Mining and Treatment

With the information indicated, and the cost and analysis of his base ore and fluxes (iron ore, sulphide flux, limestone, and quartz), the metallurgist is in position to make his calculations to see what price can be paid for the ores available in the district, whether they are from the company's own mine or purely custom ores, because, however carried in the cost system current at the smelting works, the metallurgist should prepare a schedule or tariff, from which the proper method of mining may be deduced. Otherwise the miner is working inefficiently and in the dark. This tariff should fix a treatment charge; a premium for all valuable elements, and a penalty for all harmful ones; premiums for increased tonnage, if desirable, and all so arranged as to promote the utmost economical development of the company's property.

The mine superintendent may say, "I can reduce mining costs per ton by including a little low-grade stuff from the walls. Shall I do it?" The metallurgist's tariff, combined with the mining costs, should answer the question definitely to the best interests of the company. With custom ores the question is different, in that provision must be made for a suitable profit. (The word suitable covers all requirements and is charitable.)

Discoveries of Copper Ore in Northern Finland

Two mining companies, the Finland Copper Co. and the Salla Mining Co., have bought some large deposits of copper ore, according to Consul L. A. Davis, which have been discovered in Kuolajarvi Parish, in the Oulanka River Valley, in northern Finland. Geological examinations have shown that the copper near the surface is rich, and if exploration and tests are made with the diamond drill it can probably be ascertained whether mining on a large scale will be profitable or not. The directors of the companies have applied for a government subsidy for this purpose, as security for which they offer shares of old stock at a nominal value of 200,000 Finnish marks.

They had planned diamond drilling last year, but contented themselves then by blasting with dynamite, which was carried on by a German engineer. In his opinion nineteen claims are so rich in copper that diamond drilling ought to be undertaken to ascertain if mining can be carried on profitably. There are also rich veins of iron glance and of sulphur pyrites in the same place, the latter amounting to several million tons.

Gold Dredging—Actual Recoveries Compared With Estimates

The Accuracy of Prospecting Drill Methods as Illustrated by Examples That Have Been Taken From Practice—Factors That May Be Used To Reduce Sampling Error—Churn Drilling a Satisfactory Method of Prospecting Gold Placers

By W. H. Gardiner

Written for *Engineering and Mining Journal*

DREDGING possibilities may easily be investigated and prospected—not only the value per cubic yard estimated with much accuracy, and the cost of operation predetermined with precision, but the extent of the deposit may be ascertained before recovery is begun. If the margin of profit is attractive, outside capital is not invited. If unfavorable, even the most plausible promoter has little to offer—which is why so little stock in dredging companies is offered to the general public.

With lode mining it is different: the element of speculation is much higher. A risk is to be shared, instead of a certainty jealously guarded. It may be said that the prospecting of a quartz mine is an investigation in three dimensions; a dredging property in two. A placer deposit covers a hundred or more acres and is 20 to 8 ft. in depth. The vein of ore would have to be exposed entirely on one side to be appraised with equal accuracy.

Sampling Dredging Gravel

The churn drill, steam or hand power, has been widely used in the last twenty years to determine the gold contents of dredging gravel. Heavy casing, fitted with a beveled-edge cutting shoe, is driven to bedrock. Every foot or two the sand, gravel, and boulders, loosened and broken by a heavy drill, are panned and the gold is recovered. Care is taken to keep the core to about the volume displaced—always maintaining a few inches of gravel between the bottom of the shoe and the pump to prevent the crowding out or forcing in of material not in the path of the pipe.

Vast acreages of gold-bearing gravels have been exploited throughout the world on the simple story of the drill. Even greater areas have been explored and "turned down." Sometimes check shafts were employed, but more often water would not permit them. For many years the prophesied returns have been checked closely by actual recovery.

Actual Recovery Estimates

Variable factors cannot be eliminated in making such comparisons—the personal equation and methods of estimating. Not all drilling has been done by the same engineer, with like crews or similar equipment. On one property the drilling yielding high assays was checked by more in the same locality, and the final results were enriched by averaging all these favored holes. On another the work was done in winter—the panner working in ice-cold water under inadequate cover. The figures given herewith, however, are generally from the records of conservative, experienced engineers and successful companies.

In drilling a level, extensive "blanket" deposit, holes are customarily put down at the corners of regularly plotted rectangles. The prospecting of a stream or channel, on the other hand, necessitates a line of holes close together, these lines being repeated at considerable distances apart—a cross-sectioning, so to speak. The final estimate must allow each hole to "govern" only the proper amount of area.

The conservative engineer figures 33⅓ cu.ft. of gravel to a hundred feet of pipe (7½ in. cutting shoe). The more optimistic prospector, on the other hand, has figured 27 cu.ft. Today it is not uncommon to figure 30 cu.ft. (there being 30.68 cu.ft. in a cylinder 100 ft. long and 7½ in. in diameter). A table follows showing a short-cut to drill-hole estimates, the factor being 33⅓.

TABLE FOR FINDING VALUE PER CU. YD. FROM TOTAL AMOUNT OF GOLD RECOVERED BY DRILL

Diameter cutting shoe 7½ in. Constant 33⅓. To find value in cents per cu. yd. multiply number of milligrams of gold recovered from drill hole by the number in table opposite depth to bedrock.

Depth to Bedrock in Feet	Factor	Depth to Bedrock in Feet	Factor	Depth to Bedrock in Feet	Factor
10	.4860	26 5	.1834	43	1130
10 5	.4629	27	.1800	43 5	1117
11	.4418	27 5	.1767	44	1105
11 5	.4226	28	.1736	44 5	1092
12	.4050	28 5	.1705	45	1080
12 5	.3888	29	.1676	45 5	1069
13	.3738	29 5	.1647	46	1057
13 5	.3600	30	.1620	46 5	1045
14	.3471	30 5	.1593	47	1034
14 5	.3351	31	.1568	47 5	1023
15	.3240	31 5	.1543	48	1013
15 5	.3135	32	.1518	48 5	1002
16	.3037	32 5	.1495	49	0992
16 5	.2945	33	.1472	49 5	0982
17	.2859	33 5	.1450	50	0972
17 5	.2777	34	.1429	50 5	0963
18	.2700	34 5	.1408	51	0953
18 5	.2627	35	.1388	51 5	0944
19	.2558	35 5	.1369	52	0935
19 5	.2492	36	.1350	52 5	0925
20	.2430	36 5	.1331	53	0917
20 5	.2371	37	.1313	53 5	0909
21	.2314	37 5	.1296	54	0900
21 5	.2260	38	.1279	54 5	0892
22	.2209	38 5	.1262	55	0884
22 5	.2160	39	.1246	55 5	0876
23	.2113	39 5	.1230	56	0868
23 5	.2068	40	.1215	56 5	0860
24	.2025	40 5	.1200	57	0853
24 5	.1984	41	.1185	57 5	0845
25	.1944	41 5	.1171	58	0838
25 5	.1906	42	.1157	58 5	0831
26	.1869	42 5	.1143	59	0824

Bear in mind that the engineer is not so much concerned with the actual total gold content as with the amount that of a dredge will recover. There are no data available as to the percentage that escapes the riffles—certainly over 5 per cent but probably under 20 per cent, conditions being ordinarily favorable.

A carefully prospected property will have a hole to every two to five acres. Sometimes the actual returns of dredging along one side of an area will reduce the drilling necessary to forecast the value. Some deposits have been perforated with holes in a feverish endeavor for meticulous accuracy. With one or two notable exceptions, all drilling in excess of one hole to two acres was so much wasted energy.

The estimated returns of the long-continued operations of the Butte Dredging Co. and the El Oro Dredging Co. may be tabulated as follows:

Location	Company	Estimate	Recovery, Cents per Cu.Yd.
Oroville, Cal.	Butte Dredging Co.	25 0	13 69
Jenny Lind, Cal.	Butte Dredging Co.	22 0	18.30
Oroville, Cal.	El Oro Dredging Co.	47 0	16.50
Yuba, Cal.	El Oro Dredging Co.	15.0	15 44

It will be noted that actual returns at Oroville were much less than expected. The management accounts for this by the fact that the gravel was somewhat cemented—bound together by clay that interfered with complete washing. The tailings from other operations in this neighborhood have been reworked at a profit, the air-slacked chunks yielding up their gold to rewashing.

The Yosemite Dredging & Mining Co., at Snelling, used a factor of approximately .27, but discounted final figures by 20 per cent as a factor of safety. Unusually high assays were cast out. Ground was loose and gold was well distributed. One piece of thirty acres, carefully prospected, showed a recovery of 6.74c. per cu.yd., against an estimate of 4.44c. Final returns, after working some acreage of much more compact deposit, showed a recovery of approximately 15 per cent greater than drill results.

In somewhat similar ground, although located at the Calaveras River, the Isabel Dredging Co. reports a much greater recovery than expected. On one piece of twenty-three acres, covered by twenty-five holes, the estimate was 2.35c. and the recovery 8.8c. Here, as elsewhere, it has seemed that the drill fails to recover all gold in certain kinds of gravel.

Further Examples

The Yuba Consolidated Gold Fields, at Hammonton, Cal., with its fleet of huge dredges digging 80 ft. below water level—five of them individually handling 300,000 cu.yd. per month—have washed an enormous volume of gravel. Some of the operations were carried on with little exploration, it being known that it would be profitable to work certain acreages from results on bordering tracts. Results as a whole have checked estimates closely, although many times there has been a wide variance in individual blocks. For instance, recovery in one tract was within a tenth of 1 per cent of the forecast; in another only 60 per cent; in a third 195 per cent—the three tracts involving a total of over 500 acres.

Perhaps no stream deposit has been more carefully drilled than the ground of the Powder River Dredging Co., at Sumpter, Ore. Dredge No. 1, in the lower valley, worked in deeper ground—a field prospected by two different crews at different seasons, although under the same engineer. On the shallower up-stream areas Dredge No. 2 operated over a rough, hard bedrock. Dredge No. 1, in 369.5 acres, showed a gain of 39.8 per cent over the estimate. Dredge No. 2 failed by 7 per cent to yield to expected returns. Refiguring the latter property to a factor of .3068 would show an almost exact check of estimate and recovery.

The discrepancy of the results of Dredge No. 1 may be partly explained by the presence of a narrow but rich "pay streak" that meandered down the creek, dodging most drill holes, and failing to make itself apparent when tapped. The very irregular bench line caused a marked variation between estimated and workable *area*.

On the extensive properties of the National Companies, of California, on the American River, there occur many widely differing conditions—heavy wash and cemented gravel on the benches and broad acres of more shallow, softer ground down-stream. A check made four years ago on the operation of three dredges resulted as follows:

Dredge	Area, Acres	Time of Operation, Years	Per Ceot of Estimate Recovered
No. 5	180	10	86
No. 8	106	4	87
No. 9	135	6	101

These results are based on a factor of .30. During the last four years these dredges, as a total, have produced about 101 per cent of the expected recovery.

A KEYSTONE DRILL IN KOREA WITH A FENCE TO KEEP OUT PREDATORY NATIVES

"Old No. 1," worked in 25-ft. ground—loose and easy to dig—recovered 125 per cent of the drill returns, these being figured with a .27 factor. In a soft sandy deposit on the Sacramento Bar the actual dredging results fell far short of the estimate. It will be noted later that probably the pressure of underground water forced gold into the casing. On the benches, where clay was encountered, there have been notable instances of the failure of actual dredging to give estimated returns, fine gold having been lost in the muddy water. On the acreage worked by Natoma No. 7, the returns held up to the estimate as long as the gold

was reasonably coarse, but on the edges of the deposit, where there were areas of fine gold, returns would immediately drop below expectations. It was concluded that the drilling was accurate enough, but that the size of gold particles affected recovery in the unavoidably dirty water.

Other reports are available, but sufficient evidence has been produced to confirm important conclusions recently advanced by dredge engineers.

It may be observed that the accuracy of results gained by drilling is surprising, considering the comparatively small size of the sample. For example, one hole to two acres in 50-ft. ground would mean that $\frac{1}{328,000}$ part of the gravel was examined. Of course one hole by itself means nothing—it is only a carefully charted series that reliably represents actual conditions.

All available data seems to point to the following facts regarding the accuracy of drilling:

1. Drill results give high assays where gold is fine.
2. Estimates will tally with returns where gold is reasonably heavy, ground is compact with a little clay, and prospecting and dredging are intelligently done.
3. The drill will exaggerate the value of *very* loose ground where sand or water pressure crowd material into the bottom of the pipe.
4. The drill will signally fail to show recoverable gold in areas of moderately loose ground where gold is distributed and in comparatively small amount.

This fourth conclusion is of considerable importance. Dredging at Jenny Lind, at Natoma, at Yuba, on the Merced, at Cottonwood, and many other places has proved its truth.

DRILLING OUTFIT ON CHISTOCHINA RIVER, ALASKA

James W. Neill, in writing on the subject, says: "If the driller keeps his bit behind his shoe, and sees that he gets a correct amount of core, there should be little question of the correctness of a *large general average*, and the engineer can use such factors of safety as his experience and the character of the ground indicate. In very loose ground, I personally look for a recovery of full drill values where the gold is coarse and is entirely contained in the foot or two above bedrock. I think one will usually also overrun the drill, provided the bedrock can be dug. That is about the sum of our experience at Snelling."

In loose ground the drill churns up the gravel and crushes stones before pumping. Its jarring action induces the settling of the gold, making it most difficult to procure by pumping. On the other hand, very loose sandy ground with free water content may force gold into the pipe, even if pains are taken to keep the core within safe limits. This explanation partly accounts for the recovery of 8.79c. in a Colorado property where the drill sheets indicated 17.19c.

When a certain readjustment of economic conditions or legislative relief increases the value of gold in terms of commodities, there is destined to be a renewed interest in dredging. Most of the gold-bearing river gravels of Oregon, Montana, Idaho, Colorado, Arizona, New Mexico, and California have been drilled by dredge capitalists, and the vast majority of the possible fields rejected as too low in value or too difficult to dredge. The modern dredge man, with improved machinery and methods, fears the boulders, the clay, and the deep or hard bedrock much less than a half-dozen years ago. Engineers will review properties once rejected.

A DRILL OPERATING IN CALIFORNIA

The Huancavelica Mercury Deposits, Peru*

Geology of an Old South American Mining District Located at Great Altitudes in Sedimentary Formations of the Andes, and Difficult of Access — Attempts To Exploit Them Profitably With Modern Mining Methods Now Being Made

By Joseph T. Singewald, Jr.
Written for *Engineering and Mining Journal*

AMONG the notable mining districts of the Spanish colonial empire was Huancavelica. The mercury ores were known to the Incas before the Spanish conquest, and were utilized by them as a pigment. There is some uncertainty as to the exact date of their discovery by the Spaniards. In 1570 the Santa Barbara mine, which was already productive, was sold to the Spanish crown, and henceforth all mercury discoveries were declared crown property. Mismanagement on the part of the administrators sent out from Spain led to such poor financial results that subsequently the Huancavelica mines were turned over to the "Gremio de Mineros," a sort of miners' guild, which was required to sell the output to the crown at a fixed price.

The recorded output during the colonial period amounted to about 550,000 tons of metallic mercury. In those days the Santa Barbara mine was heralded as "the greatest wonder of the world." For some years after Peruvian independence the district lay idle, until in 1836 to 1839 an unsuccessful attempt was made to revive mining to supply the local consumption of mercury. Since that time there have been desultory operations resulting in a small annual production. In the early history of the district, mining was often carried on in a haphazard and unsystematic way; and, in the eagerness to extract the richer ore, pillars were robbed without regard to the safety of the mine, so that several disastrous cavings occurred, and a few years ago the old workings of the Santa Barbara mine were practically inaccessible.

Recent Development

About 1915 E. E. Fernandini, the well-known Peruvian mine operator, bought up a large part of the district, including nearly the whole of the old productive area about the Santa Barbara mine. Mr. Fernandini has had the old Belen Tunnel cleaned out, opened up a part of the workings at the Brocal, and has started a new crosscut tunnel to get under the main creshoot of the Santa Barbara mine. He has also erected experimental furnaces to work out an efficient method of treating the ore. The district gives promise, therefore, of once again becoming an important contributor to the mercury production of the world.

The city of Huancavelica is situated in the valley of the Huancavelica River, a branch of the Mantaro River, on the eastern side of the Western Cordillera, at an elevation of 3,792 meters. Its former importance is attested by the ruins of ancient buildings and by the eight churches which still try to eke out an existence at the expense of the diminished and impoverished population. Today it is a backward town of several thousand inhabitants, consisting almost entirely of Indians.

Formerly access to Huancavelica was by way of the port of Pisco. This necessitated a five-day muleback ride of 370 kilometers, involving crossing the Cordillera at an elevation of 4,900 meters. The completion of the railroad to Huancayo, made the district more accessible, but even the trip from Huancayo to Huancavelica requires a journey of 120 kilometers, or two days, on muleback over a highly accidented trail. A further extension of the railroad to Ayacucho is under construction and should soon be completed as far as Izcuchaca, at the mouth of the Huancavelica River. The district will then be only fifty kilometers from the railroad, and if the prospecting that is now being done is rewarded with the hoped-for success, doubtless the construction of a spur to Huancavelica will be the next step.

General Features of Region

The prevailing rock of the district is Cretaceous limestone, in which are intercalated zones of sandstone and shale. Outcropping over considerable areas are limestone conglomerates. The sediments are intruded by large masses of basalt and porphyrite, and along the mineralized zone are small andesite intrusions. A mineralized belt extends discontinuously from Chunamachay in a southeasterly direction through Huancavelica to beyond San Antonio, a distance of about sixty kilometers, and has a width of one to three kilometers. It follows a belt of sandstones in the limestone, and the ore usually impregnates the sandstones. Where they are compact and their texture is unfavorable, and when the limestone has been shattered, the ore enters the latter rock. Some mineralization of the igneous rock has also occurred.

Mercury ores have been worked at a number of points in the mineralized zone, but the great bulk of the production has come from the vicinity of the city, from the hills that overlook the town on the south. Extensive workings there, known as the Santa Barbara mine, are evidence of the former activity of the district, and the present explorations purpose reaching the continuation in depth of the old productive orebodies. This part of the district is, therefore, that of the greatest past and present interest.

The Santa Barbara Mine

The old Santa Barbara mine consisted of a group of outcrop workings on the top of the mountain directly south of the city of Huancavelica and extensive underground workings, of which the most important were those of the Belen Tunnel. Most productive seem to have been the vicinity of El Brocal and the Hundimiento Morroqui, two large open cuts, the size of which is due, however, largely to the collapse of underground workings. The Brocal is at an elevation of 730 meters (2,400 feet) above the level of the Huancavelica River.

The most elaborate work in the early history of the mine was the driving of the Belen Tunnel, which was begun between 1601 and 1617, and completed in 1642. It had a length of 600 meters, a width of three to four meters and in places was four meters (13 feet) high. The

*George Huntington Williams Memorial Publication No. 3.

entrance to the tunnel became the center of operations for the mine. It cut the orebody at a depth of 160 meters, beneath the Brocal. The ambition to reach the orebody at much greater depth is represented by the beginnings of the Pochcoco Tunnel at an elevation of fifty meters above the river, or 520 meters below the south of the city of Huancavelica. Rising precipitously above the city is a series of steep westerly dipping beds, which are called on the map the Grand Farallon limestones. They are characterized by wide and frequent variations in chemical composition. There are transitions from pure limestones, through increasing argil-

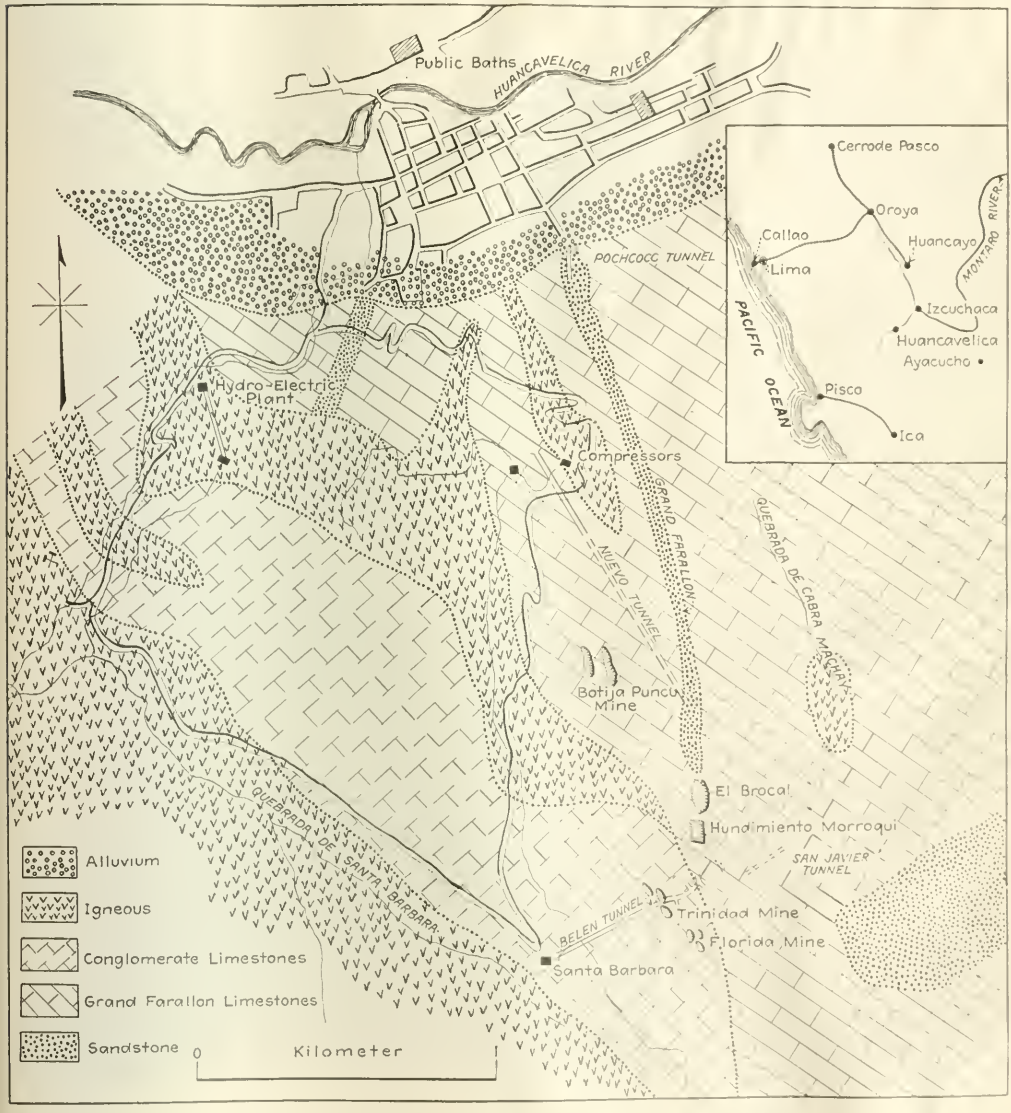


FIG. 1. GEOLOGIC MAP OF CENTRAL PART OF HUANCAVELICA DISTRICT, PERU

Belen Tunnel. This work was abandoned after penetrating only 60 meters. A new attempt to get beneath the Santa Barbara orebody is now being made by Mr. Fernandini, who is driving a tunnel at an elevation of 350 meters above the river, or 220 meters below the Belen Tunnel.

Fig. 1 is a geologic map of the area immediately

laceous content, into shales, and, through increasing silica content, into sandstones and quartzites. A well-marked horizon of cherty limestone characterized by bands and nodules of chert lies about 250 meters above the Grand Farallon sandstone. Most abundant in this series are beds of argillaceous and siliceous limestone.

A prominent feature of these beds is a great ledge of

massive and in many places remarkably porous sandstone. It extends across the river in a direction a little west of north at the town of Huancavelica. On the south side its outcrop is so prominent that it is called the Grand Farallon. In the mass of debris and old dumps about the cave-in of the Hundimiento Marroqui this prominent sandstone outcrop suddenly disappears. With like abruptness a similar sandstone with equally

FIG. 2. THE GRAND FARALLON SEEN FROM THE PLAZA DE INDEPENCIA, HUANCAVELICA. DIFFERENCE IN ELEVATION ABOUT 2,000 FT.

prominent outcrop appears 600 meters to the southeast and swings around to the northeast toward the Huancavelica River some distance below the city. On account of the mass of debris which covers the ground on each side of its outcrop the contact of the Grand Farallon sandstone with the adjacent beds is generally obscured. On top of it—that is, on its west side—is a horizon of shale nearly 100 meters thick, in which there are gray, red, and green zones. A similar series of shales overlies the heavy sandstone southeast of the Grand Farallon, but here the sandstone and the shales are much thicker than in the Grand Farallon. The great sandstone outcrops appear to belong to opposite limbs of an anticline, the axis of which pitches toward the southwest and the nose of which has been faulted out.

A second series of limestones extends from the southwest corner of the map in a southeasterly direction to the Belen Tunnel and the Hundimiento Morroqui. The upper part and the greater thickness of this series consists of a conglomerate, the pebbles, boulders, and cobbles of which are limestones. The fragments range in size from small pebbles to cobbles more than twenty centimeters in diameter, and in general are but little waterworn and rounded. The matrix of the conglomerate varies from fairly pure calcium carbonate to a reddish sand material. The lowest beds of the series are not conglomeratic.

The Conglomerate limestones have been regarded by some as late surficial deposits, but their strike and dip and their relation to the present topography are such as to indicate that their origin has no relation to the present surface. On the other hand, their relation to the Grand Farallon limestones is not known. Where the two series ceme in contact, at the Hundimiento Morroqui and to the south, the beds are much disturbed and outcrops very meager. The beds are older than the period of mineralization, as ore deposition has taken place within them.

Several igneous intrusions outcrop within the area of the map. For the most part the rocks are highly altered. In general character they appear to be of andesitic composition, and such differences as are noted are probably due mainly to minor variations in chemical composition and to variations in texture. The area in the southwest corner of the map is the edge of an extensive igneous mass. At its base, that is, between it and the Conglomerate limestones, in the canyon below the Belen Tunnel, is a horizon of stratified tuffs. A large intrusion also separates the two series of limestones over most of their outcrop. In addition to these, several smaller areas of volcanic rock occur.

FIG. 3. THE GRAND FARALLON AT THE BROCAL, ELEVATION 15,000 FT., SHOWS OLD MINE OPENINGS AND DEBRIS OF FORMER OPERATIONS

The Huancavelica valley is covered with alluvium and with extensive deposits of calcareous tufa. The latter deposits are still being formed in and about the city by warm springs, the temperature of the waters of which is about 30 to 35 deg. C. One group is utilized at the public baths on the north side of the city.

The areal geology and the observations in the tunnels show clearly that the district is one of tight folding, with much slipping along bedding planes and the development of jointing. The frequence of discordant strikes and dips and the separation of the two big sandstone outcrops indicate considerable faulting. It seems, therefore, that the principal mineralized area is coincident with an area of great disturbance.

Mineralization has been widespread, and the mineralizing solutions entered and deposited their mineral content in all of the rocks of the district. The center of mineralization, however, was at the south end of the Grand Farallon, from the vicinity of which almost all the production has come.

indicates, however, that the ore followed planes of bedding and jointing in the limestone.

Of least importance have been the ore occurrences in the igneous rocks. In fact, they are of interest chiefly in fixing the period of mineralization subsequent to their intrusion.

The mineralization of the district is, consequently, an impregnation by cinnabar and its associated minerals of porous and jointed rocks in an area of igneous intrusion and tectonic disturbance. In the absence of well-defined fissures the mineralizing waters were compelled to spread over a wide area and follow less pronounced openings.

The Grand Farallon limestones are of Upper Cretaceous age. The Conglomerate limestones are younger than these. The igneous rocks are of still later age. As mineralization has taken place in all of these rocks the period of mineralization would appear to be at least as late as Tertiary. There is no necessary connection between the present warm springs and the

FIG. 4. THE BOTIJA PUNCU MINE. MINE OPENINGS IN LIMESTONE. GRAND FARALLON OUTCROPS ON RIGHT. HUANCAVELICA VALLEY IN DISTANCE

Maximum ore deposition took place within the Grand Farallon sandstone itself, in the form of an impregnation of its porous parts. The cinnabar and its associated minerals occur chiefly as a filling of the interstices between the sand grains. Where the rock is more compact the minerals have been deposited in tiny cracks in the form of stringers and veinlets.

Next in importance to the ore deposition in the sandstone was that in the limestone. The most productive deposits were in the Botija Puncu, Trinidad, and Florida mines. The Botija Puncu orebodies occurred in the Grand Farallon limestones, and seem to have been quite large (Fig. 4). Somewhat less extensive are the workings of the Trinidad and Florida mines, which are in the Conglomerate limestones. As all visible ore has been removed from the accessible portions of these workings, knowledge of its mode of occurrence depends largely on second-hand information. The nature of the workings

mineralization, but they may represent the final stage of an igneous sequence of which the volcanic rocks represent the first and the cinnabar mineralization an intermediate stage. In that event the period of mineralization was probably late Tertiary.

MERCURY ORES ASSOCIATED WITH OTHER MINERALS

The condition of the workings of the Huancavelica mines is such that practically no ore in place can be seen. It is only in the sandstone of the Brocal that some lean pillars are accessible Here the ore is primarily an impregnation of a porous, clean sandstone, either by uniform impregnation of the rock, or along certain planes, giving the ore a banded appearance, or in veinlets and stringers. In places the cinnabar occurs alone, but it is usually associated with a black or dark bituminous substance, pyrite or marcasite, and some very fine-grained galena. Here and there is a little

realgar. No native mercury was seen, and it is said to have been very rare. Considerable quantities of native mercury are reported to have been found beneath the city in digging foundations for houses. As this may have come from various sources, it is of no particular significance in connection with the genesis of the ore deposits.

Reliable data concerning the mercury content of the ores that have been produced are impossible to secure. The average of several samples of the ore left in the mines, taken by Umlauff some years ago, was about 2 per cent mercury. Specially selected samples ran as high as 10 per cent. These figures are of little significance, however, as an aid in determining the metallic content of the ores formerly produced, or in attempting to estimate the probable content of ores that may be developed in the future. The only certain information that history affords is that this was a rich and important ore deposit in this old and geologically interesting Peruvian mercury field.

Present Operations Experimental

An inappreciable and desultory production of mercury is accomplished by small operators in outlying parts of the district. The center of interest and future promise lies in the result of the present attempt of Mr. Fernandini to get under the old Santa Barbara orebody, and thus again make this famous mine a producer. If these operations are successful, the Huancavelica district will once more become an important mercury producer. Fernandini's efforts are being centered in two major operations—one, the driving of a crosscut tunnel to get under the old oreshoot; the other, the operation of experimental furnaces at Santa Barbara with which to determine the best method of recovery of the mercury content and the limits of profitable mining and metallurgical operations.

The requisite length of the Nuevo tunnel will be at least 1,200 meters. Work on this is being pushed rapidly in two eleven-hour shifts daily, with a progress of about forty-six meters per month. Power is furnished by the hydro-electric plant, which is equipped with a Pelton wheel. A flow of three litres per second, with a fall of 140 meters, generates 106 hp. The power is stepped up to 4,800 volts for transmission to the compressors, where it is reduced to 480 volts. There are six 15-hp. compressors, all of which are run at 60-lb. pressure.

Trial Furnaces Recover Over 80 Per Cent of Mercury

Two small trial furnaces have been built at the Belen Tunnel, nine meters high and with a total charge capacity of seven tons. Ore is passed through the furnaces at the rate of 200 to 500 kilograms every three hours, and roasted at a temperature of 800 deg. C. Taquia, llama dung, is used for fuel, and the roasting requires 10 per cent more fuel than ore. The taquia costs $3 to $4 per ton. The sublimed gases are passed through a series of nine condensing chambers for the recovery of the metallic mercury. The ore for the trials is obtained from the old workings of the Brocal and averages 0.2 per cent mercury. Under the conditions of these experiments, the recovery is said to be 80 to 83 per cent. It is estimated that 0.5 per cent ore is necessary to meet expenses under the conditions that exist in the Huancavelica mercury district.

Resumption of Mining in Argentina

The mining activities of the Rosario district, Argentina, according to *Commerce Reports*, though never of prime importance, show a tendency to revive after the suspension due to the war. The Corporación Minera Famatina sent a representative, Bancroft Gore, to the United States to study the class of installation best suited to replace the water-jacket furnaces at their copper mine in Chilecito, Rioja. The company produced 733 metric tons of copper in seven months, which resulted in a financial loss, but the outlook for the future is said to be favorable and a production of 300 tons of metal per month thought possible.

The new company, known as the "Pumahuasi Industrial de Plomo," has under lease two lead properties in the Province of Jujuy, with a foundry located in Buenos Aires. The revival of the borax workings at Rosario de Lerma, in Salta, and at Santa Catalina, in Jujuy, has recently been discussed.

The beginning of a revival in building in the north is indicated by renewed activities of the marble and granite quarries and lime workings of northern Cordoba after six years of depression. By a system of co-operation the lime interests of northern Cordoba maintained themselves during the depression by pooling all orders and giving them to the concerns that most needed the business. Now that prosperity has returned, the producers prefer their independence, and this co-operative system has been discontinued.

The Japanese Iron Industry

The iron ore used in Japanese furnaces is obtained in part from domestic mines and in part from Korean, Manchurian, and Chinese mines. The iron ore produced in Japan comes mainly from the Kamaishi group of deposits in the northern part of the island of Honshu. The iron ore reserves of Japan are estimated at about sixty million tons.

The Korean iron ores used in Japan have come mainly from the surficial limonite deposits of Hoang-hai-do, about one hundred miles northwest of Seoul, which have been actively mined for ten years or more.

Chinese iron ore used in Japan has been obtained from the Tayeh mines of Hupeh Province. A part of the ore from these mines goes directly to Japan, and a part goes to the Han-Yang furnaces, near Hankow, to be manufactured into pig iron and steel products, which also go to Japan. The Han-Yeh-Ping Iron & Steel Co., which owns both the Tayeh mines and the Han-Yang furnaces, is a Chinese concern the capital of which is at present controlled largely by Japanese banking firms.

Two important Japanese-controlled iron and steel manufacturing projects are at present being developed in Manchuria.*

French Interests in Georgia

A French group, according to *The Ironmonger*, is reported to have applied to the government of the Caucasian Republic of Georgia for the concession to build a hydraulic station on the river Kur for supplying electric energy to the manganese mines at Tchiatury. The same group intends to take up the manufacture of ferromanganese on the spot.

*Harder and Eddingfield, "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

A Picturesque Mining Experience—III

The Bucking Aërial Tram

BY HARRY J. WOLF
Written for *Engineering and Mining Journal*

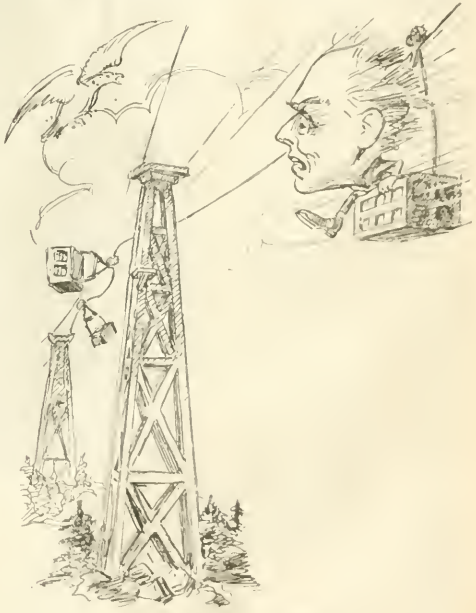
THE mining engineer's moving picture film of memory is almost sure to contain certain vivid sections which record particularly thrilling or unusual experiences. In throwing the following picture on the screen for the amusement of my friends I recall the serious state of mind of the photographer at the time the original exposure was made, and how thankful he was soon afterward when he found that the camera was not smashed.

The picture was made in the San Juan Mountains, in Ouray County, Colorado, in the gulch leading from the Camp Bird mine to the cliffs above the mill, in the winter season early in the year 1907. It was necessary for me to go from the mine to the mill. Much snow was on the ground; more was falling; the snowslides were getting ready to run; and the trail was slippery and uninviting. What could be easier than to take passage on the wire-rope tramway that carried down the $35 mill dirt that we were producing about that time? On that tramway was one special bucket that we called the "Pullman" because it was long enough for a man to lie down in and go to sleep, if he did not care to enjoy the scenery on the way. In anticipation of a possible "hang up" on the line in blustery weather, I put on a warm sweater, and a blizzard cap provided with a visor which could be pulled down over the face, and which contained two holes to look through. On reaching the upper tram terminal I learned that the special car was at the other end of the line, so I climbed into an ordinary ore bucket, in which I sat in a cramped position as the attendant clamped it to the traction cable, and we were launched out over the snow.

The first lap of the journey was uneventful. In about a quarter of an hour I reached the curve station, where I greeted the attendant as he unclamped my bucket from the upper section of the tram and pushed it along the curved rail past the bullwheel of the lower section. With a cheerful "all's well" and "good luck to you," he clamped my carrier to the traction cable and away we went on the second lap, and here is where the fun began.

I had scarcely left the curve station when I felt a slight pulsation on the cable, which I attributed to the clamping on of the bucket of ore which followed me, and thought nothing more of it. My bucket was about fifteen feet above the ground, and I experienced a pleasant sensation skimming along over the snow and listening to the click of the bucket pulleys over the saddle that supported the track cable at each tower along the line. In a drowsy state of mind, my imagination made of my bucket a rowboat drifting over the crest of a wave each time we passed a tower, for at this point towers were rather closely spaced because they were not very high.

I was awakened from my reverie by the realization that I had felt another pulsation on the cable. The first little jerk meant nothing to me, and I had disposed of it to my satisfaction, but a second, exactly like the first, might be significant. I waited for a third, and sure enough it came, and I imagined that it was just a little heavier than the first. Now I sat up and began to take a real interest in the phenomenon. I commenced a deliberate analysis of the situation by considering first the interval of time between jerks, and I was surprised and somewhat pleased at my conclusion that the period of time elapsed between the jerks was about the same. "Ping" went the cable for the fourth time, and I was sure the interval was uniform. Each jerk was a little more pronounced than the preceding one, so that my original explanation would no longer hold water. There was no time to lose. I must investigate hurriedly, or I might not be able to solve the mystery before the trip would be over. It was also necessary to decide at once whether I should hang over the side of the bucket and drop about fifteen feet into the snow, or go ahead and



'TIS A SAD TALE, MATES

see the trip through, for the cables were rapidly rising higher above the ground. My decision was that it would be more interesting to solve the mystery than to risk breaking a leg by dropping from the tram.

The next idea that occurred to me was to find out if the distance between buckets on the line bore any relationship to the interval between pulsations on the cable. At the very next jerk I noted the position of my bucket to be about ten feet past a tower. Then I kept my eyes on the next bucket following me until it reached the same position that my bucket had occupied a few moments before, and "bing!" went the cable. The problem was now almost solved. It was evident that each bucket on the loaded side of the line was hitting something, but the obstruction was not sufficient to stop

the tram, and apparently the attention of either of the tramway attendants on the section on which I was riding had not been attracted.

My bucket was now approaching a rise, beyond which there was a basin-like depression crossed by the tramway in a few long spans between high towers. The last of these high towers was at the top of the cliff above the mill, and below it was the big rock barrier which had been built to protect the mill against a repetition of the snowslide disaster of 1906. Beyond this tower was a group of smaller towers, arranged to let the cables curve gradually over the cliff on their dip into the mill terminal.

The last jerk on the cable had been an angry one, as if to warn me that fate was out of patience with my bravado, and that I had better be less theoretical and more practical in the solution of my difficulty. I looked ahead over the long spans between me and the tall tower at the rock barrier, and it was evident that there were interesting manifestations deserving of no light consideration. The sixth bucket ahead of me reached the tall tower. It did not rise as high as the bucket coming toward me on the other cable. Apparently the track cable had jumped out of its saddle on the tall tower, and was hanging against the side of it. The bucket seemed to grab the tower for an instant and then let go, at the same time executing the most fantastic contortions as it lunged for the next tower beyond.

I viewed the show grimly, but with some consternation. The pulleys on the bucket carriage were wider than the diameter of the cable, and as the track cable was against the side of the tower the pulley would go up against the timber and try to stop; but the traction cable kept right on going and made the bucket pulley lose its grip on the tower and move along with the procession.

The fifth bucket ahead of me now had its turn, and as it lost its grip on the tower it swung from side to side through an arc of more than 180 degrees, but stayed with the track cable, thanks to the downward pull of the traction cable at this point. Next came the fourth bucket ahead of mine. I watched it execute its "shimmy" and disappear with a wiggle over the cliff. The show was becoming exciting, I began to feel warm in spite of the cold weather, and as near as I can remember, I experienced an extreme sensation of exultation somewhat comparable to that of the small boy at the circus, just as the snare drum begins to roll, and the high diver begins to lean. As the third and second buckets ahead of me did their turn, I studied their positions at the tower. The last bucket's stunt was my cue, so I stood up on the edge of my bucket, and held on to the bail, prepared to jump for the leg of the tower just before my bucket should strike. It appeared to take my bucket an interminable length of time to reach the tower, but it finally arrived, and I jumped.

An engineer is supposed to be accurate in his calculations, but my time calculation was off by a fraction of a second: at any rate the bucket and I jumped at exactly the same time, and I was shot out into space where there seemed to be nothing to grab but the air. For an instant I seemed headed for the rock pile below, and everything turned black.

A thud awakened me, and I found myself clinging to one of the legs of the tower, at the same time supported by a small temporary platform less than two feet square, which a contractor who had recently painted the towers had neglected to remove. This was the only platform of its kind on the whole line. Fate had placed it directly in my trajectory. I had fallen six feet!

Mazapil Copper Co. Operation

The Mazapil Copper Co., an English corporation with main office in Saltillo, Mexico, has a three-furnace lead smelter on the outskirts of Saltillo, southwest on the mesa. This smelter has a capacity of 300 tons of ore per day and is now smelting 200 tons daily, with a monthly output of about 720 tons of lead-silver bullion. This is shipped to England via Tampico. About 200 natives are employed and 10 foreigners. The peon wage is 1.75 pesos per day.

The same company has a larger smelter at Concepcion del Oro, in northeastern Zacatecas. This smelter handles copper ore, having an equipment of four furnaces with blowers and a battery of six boilers. It has a capacity of 25,000 tons of ore per month and is now smelting about 15,000 tons, the present monthly output of copper matte being about 350 tons. This smelter employs 500 natives and 30 foreigners. The peon wage is 1.75 pesos per day.

In the region of Concepcion del Oro are the following mines belonging to the Mazapil Copper Co.: Aranzazu, producing 15,000 tons of copper ore per month and employing 1,500 men; San Eligio, producing 4,000 tons of lead-silver ore per month and employing 550 men, and Cata Arroyo, producing 4,000 tons of sulphur and iron flux and employing 250 men. The Mazapil Copper Co. is providing employment to approximately 3,000 men.

Manganese Industry in Japan

The expansion of the Japanese shipbuilding industry and other iron and steel manufacturing industries during the war brought about a greatly increased demand for manganese, according to Vice Consul H. C. Goodier, as is shown by the fact that 125,683,952 lb., valued at $973,153, was produced in 1918, a gain of 85,417,067 lb. in production over 1913. Of the 1918 output, Kyoto produced 24,422,317 lb., valued at $185,794; Hokkaido, 18,408,075 lb., valued at $143,060; and the remainder was produced by Gifu, Aomori, Oita, Tochigi, Nagano, and Shizuoka prefectures. No statistics are available for 1919, but it is estimated the production was small, owing to the marked decrease in domestic demand that has followed the cessation of hostilities.

In 1918, Japan proper consumed 106,235,000 lb. of manganese, two-thirds of which was used in the manufacture of iron and steel and the remainder for smelting and other purposes. It is believed the consumption in 1919 was not more than a third or a half of the 1918 amount.

Japan in 1918 imported ferromanganese to the amount of 1,697,280 lb., valued at $203,452, of which Australia furnished 1,132,800 lb., valued at $141,139, and Great Britain 564,480 lb., valued at $62,313. The principal countries to which Japanese manganese is exported are the United States, Great Britain, France, and China. In 1918 Japan's exports to these countries aggregated 5,229,864 lb., valued at $176,120, and in 1919 the exports amounted to 6,158,932, having a total value of $237,365.

Government Officials Influential in Mining

Frank J. Katz

In Charge of Mineral Statistics for the Census Bureau

TEN years ago the census reports on the mineral industries were done so poorly that their value frequently has been called into question. In an effort to improve on past performance arrangements were made for close co-operation with the Geological Survey and the Bureau of Mines during the taking of the present census. With the approval of the Bureau of Mines, F. J. Katz, a geologist long connected with the mineral resources division of the Survey, was appointed by the Superintendent of the Census to direct the gathering of the mineral statistics. He is now actively engaged in tabulating the vast amount of information which has been collected. The work has gone far enough to determine that 47 per cent of all mining and quarrying operations have as their object the securing of oil or gas. The remainder of such operations is divided as follows: Coal, 18 per cent; gold, silver, lead, copper and zinc, 21 per cent; quarries, 11 per cent; iron, 2 per cent; all others, 1 per cent. Mr. Katz has warned against a possible disappointment in the work of this census, owing to inadequacy of funds and to the policy of continuing tables so that they will be comparable with those of previous censuses.

FRANK J. KATZ

Mr. Katz was born in New York City. His early education, however, was obtained in the public schools of Milwaukee. After being graduated from the Milwaukee high school he entered the University of Wisconsin, where he completed the regular course in 1905. He did a year's post-graduate work at the institution and took further post-graduate work at the University of Chicago.

When Mr. Katz entered the University of Wisconsin he expected to do only a limited amount of work there, preparatory to entering a school specializing in metallurgy. Prof. C. K. Leith and the late Prof. C. R. Van Hise made the geology classes so interesting, however, that he gave up his idea of being a metallurgist and made geology his specialty. His first work was exploration of iron lands for a private company. Even then he devoted a portion of his time to the U. S. Geological Survey. In 1907 he abandoned private work and began giving his entire time to the Survey. He spent four years in the division of Alaskan mineral resources and later did general geologic field work, chiefly in New England. In 1912 he was assigned to the division of mineral resources, where he has specialized in abrasives, feldspar and silica. During the early war period he did emergency work on manganese in Virginia. With the formation of the Joint Information Board, early in 1918, he was assigned exclusively to its work. One of Mr. Katz's principal activities during the war was as an expert on the abrasive industry. This important industry was continually under investigation by the War Industries Board, the Bureau of Mines and the War Trade Board. The various kinds of abrasives of varying hardness, which are used in the finishing of all metal, were indispensable war necessities, and the minerals used as natural abrasives were produced both in the United States and elsewhere. In the vexing problems of securing a sufficient supply, coupled with economy of effort and conservation of shipping space, Mr. Katz's special knowledge made him an invaluable stabilizer of half-cock impulses; and at times also he lent his knowledge to preventing raids on the Treasury by politicians who seized the war as a cover for attemping to push through schemes to promote unnecessary abrasive mining in their home districts. Prior to his census assignment Mr. Katz had been promoted to the post of administrative assistant to the chief of the mineral resources division.

Those who know Mr. Katz best agree that the conferences among the Census Bureau, the Geological Survey, and the Bureau of Mines, which resulted in his appointment, picked a good man. The official in charge of mineral statistics for the last census was, according to tradition, the secretary of a cloakmakers' union; at any rate, some of the statistics were such that they were very much criticised by experts in the mining industry. However much Mr. Katz may be hampered by precedent, the results of his work are bound to be important in giving a more correct picture of the industry than was presented before.

HANDY KNOWLEDGE

Prolonging the Life of Elevator Belts

By DONALD M. LIDDELL

Written for *Engineering and Mining Journal*

The life of the elevator belts at the Butte-Kansas mill, near Waco, Mo., has been more than doubled by putting strips of belting between the cups and the belt.

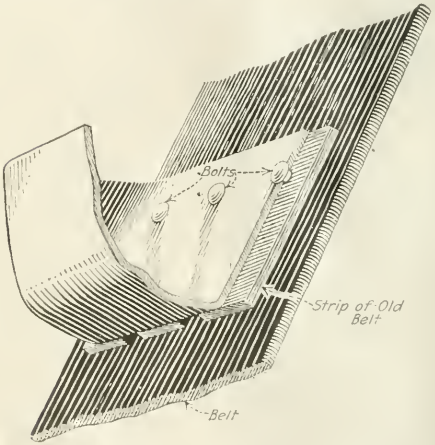


FIG. 1. METHOD OF ATTACHING ELEVATOR CUPS

Old belting is cut into strips about $1\frac{3}{4}$ in. broad and 5 in. long, and a hole punched at one end of the strip through which the cup bolt passes. Three or four

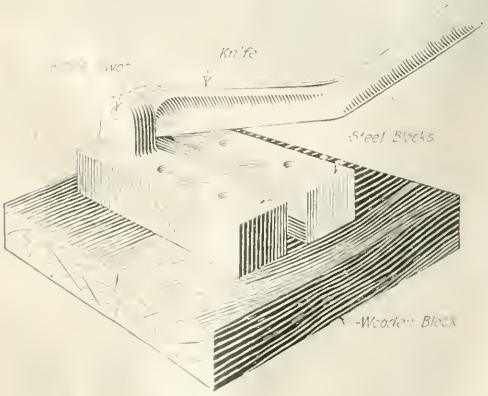


FIG. 2. KNIFE FOR CUTTING STRIPS OF BELTING

of these, depending on the number of cup bolts, are then used behind each cup. With these strips of old belt behind the cup the belt does not crack along the line of the upper cup edge. When the belt does begin to show wear, the cups are all set in new positions. Sometimes the cups can be reset three times.

A large knife (Fig. 2) has been made, with a lever handle, especially for cutting the old belt into strips. The knife blade comes down between the steel blocks, shown in the cut, which must be set not much further apart than the thickness of the knife blade.

The experiment has also been tried of crowning some of the elevator pulleys with old belting, which apparently saves both pulleys and elevator belts.

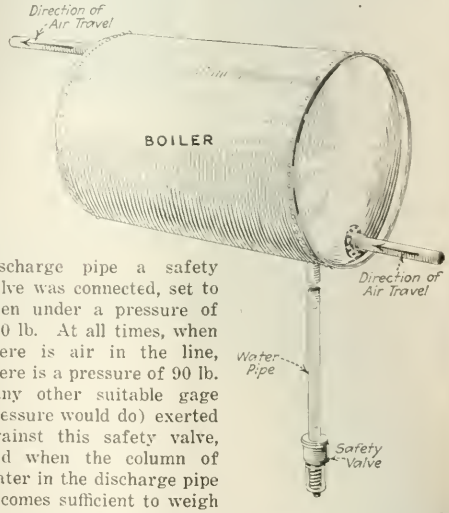
Water in Compressed Air

By G. L. SCHMUTZ

Written for *Engineering and Mining Journal*

The presence of water in compressed air is one of the principal causes of machine-drill repairs, owing to the fact that water in the air, in a few strokes of the machine, replaces the oil, leaving the drill to run without lubrication until the machine is again oiled; but even then, it is only a short time until the machine is again divested of its lubrication. This is a source of loss of time as well as money, and the obvious solution is to remove the water from the compressed air.

One method which has come to my attention consists in incorporating an old steam dome, or boiler, into the main air line leading away from the compressor, at a sufficient distance from the compressor to permit the precipitation of the humidity in the air. The air line enters the bottom of the boiler and passes out through the top at the other end, the boiler being used as a catch basin for the precipitated water. To dispose of this water automatically a 2-in. pipe leads away from the bottom of the boiler and down an old winze, or down the sides of a hill. On the end of this water-



discharge pipe a safety valve was connected, set to open under a pressure of 100 lb. At all times, when there is air in the line, there is a pressure of 90 lb. (any other suitable gage pressure would do) exerted against this safety valve, and when the column of water in the discharge pipe becomes sufficient to weigh 10 lb., making a total of 100 lb. exerted on the valve, it opens, thereby automatically releasing the water from the air line. Operation and maintenance involve no expense.

By The Way

Early Smelting in Nevada City

"In 1851 the people of Nevada City were led widely astray to their great cost and disgust by an individual, who called himself Dr. Rogers," runs a passage in Hittel's "History of California." "It cannot be affirmed that he was a fraud in the same sense that Captain Slater, of Downieville, was; he probably deceived himself as well as others; but the story of the excitement of the people of Nevada City at the time referred to, and the wild-goose chase that Rogers led them, illustrates another phase of early mining days, which was often exhibited. The discoveries there and in that neighborhood of extensive auriferous quartz veins attracted much attention to the nature of siliceous rock and the possibility of extracting gold from it. Dr. Rogers professed to know all about the subject; and as he made great pretensions and talked learnedly and glibly, almost everybody believed in him. He said that quartz was of a porous or cellular structure; but that the interstices between the crystals were not large enough in the ordinary state and at the common temperature to allow the particles of gold to drop out. By the expansion of heat, however, the pores would open and the metal have free egress either in form of minute grains or, if the heat was sufficient, as a melted current. All that was needed was the appliances for heating and giving it a complete shaking up. To the Nevada City people this looked reasonable enough; and there was no difficulty whatever in raising all the money needed, while everybody who had the opportunity of contributing reveled in the idea of soon rolling in gold. A capacious furnace and large chimney were built at great expense and a mammoth wheel erected on Deer Creek about a mile below the town. Wood, coal and ore in immense quantities having been brought to the place, a large iron reservoir at the bottom of the furnace was filled with water to receive and cool the precious metal as it loosened and fell or flowed from the rock. Everything being ready, the furnace was filled with alternate layers of fuel and auriferous quartz; the fire was kindled; and, as the mass burned down and lowered in the furnace, more and more wood and rock were added at the top. The great man, in whose capacious brain the whole process lay prefigured and who was receiving a salary commensurate with the magnitude of the undertaking, rode up occasionally, and with the air of a commander-in-chief gave orders, which were obsequiously obeyed, while the expectant millionaires stood around, eager for a sight of the first fruits of the princely harvest they were to reap. At length, after tons of rock had passed through the fiery ordeal and it was supposed that the iron reservoir must be about running over, a suggestion was made that it would be well to take out a few millions so as to give place for more. The cinders and ashes were accordingly scraped away and the cauldron was hauled forth; but it was as void of gold as when originally put in position. Not a pore of the burnt quartz had opened, or, if it had, not a particle of the rebellious gold had come out of it. The entire scheme, which had been based upon ignorance and presumption, instead of knowledge or experience, was a complete failure; and the prospective Midases reaped no harvest except the consciousness of having long ears. Rogers himself left in disgust; the quartz was pronounced a humbug, and property in Nevada City, which had gone up in the excitement, fell to a lower figure than it was before."

Versatility

An artesian flow of hot water was recently encountered in the Wheeler Oil Syndicate's well at Stillwater, Nev., which is said to have spouted to a height of 100 ft. and to have shown "unmistakable signs of oil." "The well is versatile," according to a local published account, which goes on to say:

> Not alone has hot water come from several stratas, but silver and gold were found at the 140-ft. level. This paystreak was found above the first flow of hot water, and it is asserted that a vein of sulphide ore was penetrated that is from four to five feet in thickness. The assayer made a determination of values of the samples released by the drill and found that they contained 7.29 oz. silver and $1.20 in gold—a total of $8.49. Three days later the drill released a small seepage of oil, which was followed by a vast and constant flow of hot water from the stratum reached Saturday. It must be seen that the Wheeler Oil Syndicate is at work exploring a wonderland that has never been understood, yet gives promise of yielding both metal and oil in paying quantities.

Some of the holes being drilled on the Comstock at present, which may not be dignified by being called "wells," will no doubt show just as much gold and silver and even more hot water, unless the Comstock has gone dry below as well as on top. And, perhaps, as a sweetener, there will be a dash or two of oil, to say nothing of acid and other things, the recital of which would make this sound like a recipe for something or other. But this is hardly versatility.

How To Be Poetical Though Practical

A correspondent sends us one of his mining reports, from which we quote an excerpt:

> Those snowfields and glaciers, those raging torrents and gentle streams and rolling rivers have come from afar from the sun-kissed waters of the Pacific, and they have been borne here on the wings of the wind and deposited on the hills and mountains to gladden the heart of man and give life and joy to the world. Their task being done they return to the great ocean whence they came.
>
> Keats, or Francis Thompson, or some other of the mystic poets, must have had this vision of the moving waters in mind when he wrote:
>
> "Henceforth live as becometh the God's elect,
> And though thy sins be countless as the seashore sands,
> Thy life as loathsome as the sulphurous pit,
> All shall be forgiven and forgot and thou, thyself,
> In time shall be dissolved,
> In the great ocean of God's unfathomable love."
>
> Looking down the Valley of the Sheep one sees two lofty and rugged ranges towering over it on the north and south. Torrents and slides and rivulets have worn deep in the sides of these mountains, and in the gorges and gulches, woods and groves are plentiful, save where avalanches and rock slides have played havoc. The ridge on the south is a formation of sandstone and shales in alternate layers, and in this formation are some thirty or forty layers or seams of coal. The coal seams dip to the south and west at an angle of 70 deg., being thus nearly vertical, and they vary from a few inches to forty or fifty feet wide.

What Color Is a Cape?

"A deputation representing the Cape-coloured Mine Workers waited on the Chamber in April and presented a petition setting out certain grievances."—Transvaal Chamber of Mines, Report of the Executive Committee, June 19, 1920.

CONSULTATION

Dollar Silver Payments

"In the *Engineering and Mining Journal*, issue of July 24, Vol. 110, p. 147, the first page, and also on page 188, you make some statements upon which I should like to have a little advice.

"1. Page 147, article entitled 'The Fixed Price of Silver': 'The silver so bought will be minted into coins or placed in the Treasury vaults as a reserve against the silver certificates outstanding or to be issued.' The 'outstanding' leaves me with the impression that our Government has issued silver certificates certifying that the silver has been deposited in the U. S. Treasury without its actually having been done so. I beg to inquire whether or not such is the fact.

"2. Page 188, 'On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States.' I beg to inquire whether or not there is any known method of determining whether the silver delivered has been mined, smelted, or refined in the United States or some other country. If it can be purchased cheaper in some other country, is not there considerable temptation to introduce some of this silver in that mined, smelted and refined in the United States?

"As far as I can see, the only thing which has maintained our silver dollar on a par with the gold dollar is that it was redeemable in gold, and its value consisted of the metal in it and the guarantee of the Government behind it. I have been told, and have no reason to question it, that on the Mexican frontier people have taken our United States silver dollar into Mexico, purchased a dollar's worth of goods there, and brought back a Mexican silver dollar having as much silver in it as ours. It, however, was different in this respect from ours: it was worth nothing more than the silver in it, whereas ours, upon being taken to the United States Treasury, could be exchanged for a gold dollar, with which you could buy twice as much silver as there was in our silver dollar, and take it to Mexico and get it coined into two silver dollars.

"3. I beg to inquire in what form is the payment made for silver which the Government purchased at $1 an ounce. Is it in silver certificate, silver dollar, or gold dollar? It is my understanding that in purchasing gold, it is paid for in gold or the free coinage."

1. We cannot answer for the Treasury Department, but believe that the Goverment has no silver certificates outstanding which are not fully protected by a metallic silver reserve in the Treasury vaults, particularly as a large quantity of silver remained from the stocks drawn upon during the Pittman Act. Silver certificates were retired during 1918 and an equivalent amount of silver bullion was issued in exchange.

2. Although there may be considerable temptation to perpetrate fraud upon the United States Government by disposing of foreign silver in introducing it into silver bullion of domestic origin, the authorities insist upon affidavits which will unquestionably indicate the origin, place of smelting, and refining of the metal. A few months ago, as the purchase provisions of the Pittman Act were put into effect, considerable difficulty was experienced by the smelters—particularly the ones smelting foreign ore in conjunction with domestic supplies—in segregating silver as regards origin. However, owing to an admirable spirit of co-operation between the Government officials and smelter operatives, these difficulties were gradually straightened out, chiefly through a modification of the original affidavits required. It is not so easy to palm off foreign silver as may be supposed, and no doubt there are just as stringent penalties covering this especial variety of fraud as any other brand. Besides, it is indirectly possible to obtain a check on the domestic production from past and present performances.

3. As to the form in which payment is made for silver purchased by the Government, we presume the settlement is usually concluded by a check or draft upon the Treasurer of the United States. This in turn can be exchanged into most any form of currency desired, with the great probability that Federal Reserve notes will be the currency ordinarily acquired—or at any rate negotiable paper. But the form at the present time has little if any significance, as the country is in a sound financial condition and all forms ultimately revert to a gold basis, which is the real foundation of settlement. For each ounce of bullion sold to the Government, one dollar in gold, or its equivalent, is paid. When the Government sold its silver at one dollar an ounce it also received payment on the same basis.

An Illogical Mineral Exploitation Agreement

"We have received an inquiry from one of our clients who has found traces of valuable minerals on some land in Tennessee and would like to get in touch with a mining company or promoter who would undertake to sink a shaft and make the necessary investigations to ascertain the value and desirability of extending operations. This work of investigation would have to be done by the company or promoters at their own expense, with the assurance, of course, that they may lease the ground at reasonable terms, should valuable mineral deposits be discovered. We would greatly appreciate your sending us the name or names of any individuals or organizations which you know of that would be likely to undertake work of this nature."

It is our impression that considerable difficulty would be found in obtaining a mining company or promoter to undertake the development of this property under the terms and conditions that you outline. In the first place, you say your client has only discovered traces of valuable minerals on his land. Surely, this alone is not enough to justify the sinking of a shaft and the expenditure of money in the hope that valuable and commercial deposits can be found at depth. Modern mining is not done upon this principle. Furthermore, you say that your client would require the promoting company to assume the expense of sinking the shaft and performing the development work, with the assurance that it may subsequently lease the ground at reasonable terms without specifying the reasonable terms. This is a rather loose and lop-sided proposition, and your client can consider himself fortunate if he secures any one to do this work on such terms, especially considering that no valuable ore has been found. The advertising pages of the *Engineering and Mining Journal* contain the names of companies which develop and exploit mineral deposits.

THE PETROLEUM INDUSTRY

Petroleum in Colombia

Proved Territory Limited to Three Square Miles, But Oil-Bearing Area Is Large—Development Expensive, Though Cheap Transportation of Product Is Possible—Tropical Petroleum Co. the Only Active Producer

BY ARTHUR H. REDFIELD*

THE oil-bearing formations of Colombia extend over about 34,000 square miles, of which only 618 square miles are believed to contain oil in commercial quantity, and only three square miles have been proved by drilling. The region may be divided into two principal districts, the Caribbean and the Pacific. The Caribbean district may be subdivided into the Caribbean fields, the Magdalena-Santander field, and the Tolima field.

Oil is now produced in the Magdalena-Santander field, but it has been found also in the Caribbean field, which, however, has not been commercially developed. The Tolima field and the Pacific district have been explored only.

The petroleum found in Colombia ranges from a heavy asphaltic oil to a light paraffine-base oil of 41 deg. Bé. (sp.gr. 0.8187).

THE CARIBBEAN FIELD

The Caribbean field extends from Hacha River, on the western edge of the Goajira Peninsula, southwestward along the Caribbean coast to the Gulf of Urabá (Darien) and inland to include the Tubará and Turbaco gas pools, up Magdalena River to a point thirty miles south of Chima and Mompos, and up Atrato River for ninety miles. It is about 300 miles long by 50 miles broad. In its 15,000 square miles are probably 300 square miles of productive territory, of which only one square mile has been proved by the drill.

The oil-bearing rocks of the Caribbean field are lower Tertiary (probably Oligocene). They are coal-bearing and consist of dark shales containing sandstones. Oil occurs in the sandstones and in the joints of the shales. The surface formations are either Miocene or Pliocene. The Miocene rocks of the coast are at least 8,000 ft. thick.

The beds in the region are broadly to sharply folded and are at places faulted. Nearly all the surface indications of oil are found in anticlinal areas. Most of the oil seeps occur in shattered fault zones or in the crushed cores of closely folded anticlines.

In weight, the petroleum of the Caribbean district ranges from 16 deg. to 41 deg. Bé. (sp.gr. 0.9587 to 0.8187), most of it being between 20 deg. and 30 deg. Bé. (sp.gr. 0.9333 to 0.9750).

A paraffine-base oil of good quality is found east of Sinu River. Its specific gravity is 0.858, its viscosity 0.98, and its flash point 101 deg. F. On analysis it gives: Naphtha, 2.92 per cent; kerosene, 31; lubricating oils, 30; paraffine, 3; and residuum, 27.08 per cent.

*Excerpt from a paper prepared by the Foreign Minerals Section of the U. S. Geological Survey.

Analyses of Colombian oils from the region of the Gulf of Urabá by the Engler method gave the following results:

ANALYSES OF MINERAL OILS FROM THE GULF OF URABÁ

Fractions	Percentages Arboletes	Pinar del Rio
Up to 150 deg. C. (benzine)	0	6
150 deg. to 300 deg. C. (kerosene)	25	64
Above 300 deg. C. (lubricating oils)	64	24
Carbonized residuum	11	6
	100	100

The oil from Arboletes is thick, reddish-brown by transmitted light, and dark green in reflected light. Its specific gravity is 0.9634; its flash point is 134 deg. C.; its point of combustion 149 deg. C. The residuum contains paraffine and 0.01 per cent of ash. It could be used in making lubricating oils.

The sample from Pinar del Rio is pure red in transmitted light and light green by reflected light. Its residuum contains very little paraffine. This can be used in making gasoline, kerosene, and lubricating oils.

Oil scum of good quality is found on the surface of the Hacha and other small Caribbean rivers. Sulphur springs occur at Usiacari, two miles southwest of Tubará, and seepages of oil are numerous in this region, especially near Tubará and near Arboletes. Indications of oil have been reported near Calamar, on Magdalena River; near Baranoa; south of Salgar, on the Puerto Colombia Ry.; and in the regions of Galera Zamba and Savana Larga. Sir Boverton Redwood reports no less than forty oil springs at places one to three miles from the Gulf of Darien. One seepage ten miles south of Punta Arenas and four miles east of the Gulf of Urabá yields seven barrels a day of a paraffine-base oil of 41 deg. Bé. (sp.gr. 0.8187). This high-grade oil is used in lamps by the natives.

HISTORY OF DEVELOPMENT

The first well drilled in Colombia for petroleum was sunk in 1909 at Tubará, six miles from Puerto Colombia. The Atlantic Oil Co., composed of capitalists from Toronto, Canada, after two unsuccessful tests, struck a high-grade paraffine-base oil at a depth between 700 and 800 ft. This well is still producing about a barrel a day, which is refined on the ground for use as automobile fuel. Gas was encountered in large quantities and at high pressure, and is used on the property as fuel. In 1912 the contract rights were transferred to the Three Seas Petroleum Co., of Chicago, which controls under lease about 400,000 acres in the vicinity and which purposes to continue operations.

Soon after work was begun on the Tubará lands a

well was drilled at Turbaco, ten miles from Cartagena, by Diego Martínez & Co., of Cartagena, to a depth of 2,000 ft. Showings of oil and gas were obtained, but work was not continued in that vicinity. The oil encountered was reported to be high in naphtha.

The same Diego Martinez, after having "denounced" (claimed) certain claims in the Lorica district, on Sinu River, in 1909 or 1910, contracted with the Standard Oil Co. of New York for their exploitation. This company sent down an outfit and began drilling in 1914. Three wells were drilled, in which showings of oil were encountered, but because of mechanical difficulties no oil was produced commercially, and work was abandoned in 1915. Diego Martínez & Co. are now operating in the region of the Gulf of Urabá.

In 1912 or 1913 William Plotz, of California, drilled to a depth of about 2,000 ft. at Baranoa, fifteen miles from Barranquilla, without result.

Magdalena-Santander Field

The Magdalena-Santander field includes the southern part of the Department of Magdalena, the Department of Santander, and the western edge of the Department of Boyacá, extending from Magdalena River to the eastern Cordilleras. It has an area of 10,000 square miles, of which only 200 square miles are believed to contain oil in commercial quantities. Only one square mile near Pamplona, and a similarly small area thirty-five miles from Barranca Bermeja, have been proved by drilling.

The petroleum is found in Cretaceous limestones and sandstone and in coal-bearing lower Tertiary (probably Oligocene) beds. In the Magdalena Valley and the eastern Cordilleras the oil is found in Cretaceous formations. The structural features in this district that are most favorable to the accumulation of petroleum in commercial quantities are long, well-defined anticlines (in places overturned) and fault zones in Cretaceous rocks.

The structure in the lower Magdalena Valley is of the fault-block mountain type, with downthrow on the west. The major structure is complicated by close folds, the axes of which lie parallel to the trend of the Andean ranges, and by more open cross folds. The lands where the petroliferous beds may be tested by the drill are confined to a narrow belt at the foot of the two mountain ranges. In the Department of Santander, on the east slope of the Andes, the structure is that of an asymmetric anticline.

Petroleum seepages occur along Magdalena River as far south as Girardot and along the Magdalena flank to the eastern Cordilleras from a point south of Girardot northward to Bucaramanga, in Santander. The strata are sharply folded and in many places fractured. Indications of oil are reported near Pamplona, on the Venezuelan boundary; near La Gloria, on Magdalena River; at Simiti, in the Department of Bolivar; in the valley of the Cesar River above Lake Zapatosa; in the valley of Lebrija River; near Ocana; on Carare River; near Zapatoca and Sogamosa River; near Bucaramanga; south of Honda; and near Chocontá, Ubaté, Chiquinquirá, and Tunja.

Petroleum is produced in Colombia only in the Magdalena-Santander field, on the celebrated De Mares concession. This concession, as originally granted in 1905, comprised 1,300,000 acres in the Department of Santander. It extended from the mouth of Sogamosa River up Magdalena River to the mouth of Carare River, up Carare River to the foot of the eastern Cordillera, thence along the foot of this range to Sogamosa River, and down that stream to its confluence with the Magdalena. The original concessionaire, Señor Roberto de Mares, enlisted the aid of a group of Pittsburgh capitalists, who organized the Tropical Oil Co., with a capital of $50,000,000, to exploit the concession. This company has drilled three deep wells at Infantas, which are said to produce daily 6,000 to 8,000 bbl. of an asphaltic oil testing from 35.5 deg. to 40 deg. Bé. This quantity is enough to supply all Colombia and leave a surplus for export. A 6-in. pipe line is being built to Barranca Bermeja, where a small refinery is to be erected. It is expected that the river steamers will soon burn native oil instead of wood, their present fuel. A railroad and a tractor road from Barranca Bermeja to the wells are among the projects under way.

It is reported that the International Petroleum Co., a subsidiary of the Imperial Oil Co. (Ltd.), which in turn is controlled by the Standard Oil Co. of New Jersey, has acquired control of the Tropical Oil Co.

Carib Syndicate Concession

The Barco concession, granted in 1905 to a citizen of Colombia, Virgilio Barco, includes 1,300,000 acres adjoining the Venezuelan frontier in the Department of Santander del Norte. The Carib Syndicate, of New York, was organized in 1916 to develop this concession, and formed, with the Cities Service Co., of New York (a subsidiary of H. L. Doherty & Co.), the Colombian Petroleum Co., in which the title to the concession was vested and in which the Carib Syndicate held 25 per cent of the stock and the Doherty interests the remaining 75 per cent. Drilling was started in the fall of 1919 but was necessarily slow, as all supplies had to be brought from the United States by way of Lake Maracaibo and Catatumbo River.

The petroleum of this concession is said to be an amber-colored oil of high grade, which seeps at the rate of 25 bbl. a day. It was reported in March, 1920, that the Carib Syndicate, of New York, had acquired from the Equatorial Oil Co. a block of 250,000 acres in the Honda district, adjoining the holdings of the Tropical Oil Co. The lands acquired lie on both sides of Sogamosa River, extending along that stream for about thirty miles. Practically all this area was acquired in fee simple, the fee including the oil rights subject to nominal tax by the Colombian government.

The Granada Oil Co. (formerly known as the Magdalena River & Coast Co.), of New York, has under long-term lease an area of 125,000 acres on Magdalena River near Ocano.

Tolima Field

The Tolima field consists of the upper basin of the Magdalena, including the departments of Cundinamarca and Tolima and the edge of the Llanos of San Martin and Casanare. Of a total area of 7,000 square miles in this region only 100 square miles are believed to be productive, and no part of it has been proved by the drill. The Tolima field consists principally of an elevated basin around Bogotá, which is surrounded by Carboniferous coal measures except where Magdalena River issues from the upland region.

The structure of the upper Magdalena Valley is of the fault-block mountain type, with the downthrow on the west, and is masked by late Tertiary tuffs or pyroclastics. Seepages of thick black asphaltic oil of 14 deg. Bé. and amber oil of 18 deg. Bé. are found along lines of faulting where black carbonaceous limestones and

shales of the Cretaceous system are brought to or nearly to the surface. Seepages of migratory oil are found in rocks of later age.

Six natural oil springs issue from fissures in sandstone near the village of Purificación, seventy miles south of Honda and three miles from Magdalena River. The oil is rich in lubricants and kerosene. Oil of a gravity of 22 deg. Bé. exudes from sandstones in the Plain of Medina, nine miles from Upia River, at the rate of two bbl. a minute. Seeps are abundant at the edge of the Plains of San Martin and Casanare, on the east side of the Andes. At a point 140 miles north of Nevea samples of an oil from 31 deg. to 38 deg. Bé. (sp.gr. 0.8696 to 0.8333), with a paraffine base, were collected. A seepage was found at Carmen, fourteen miles by road from Girardot, on Magdalena River. Oil taken from seeps in this district is used for lubricating the journals of car wheels on the Sabana railroad and on the railroad from Girardot to Bogotá.

Asphalt Deposits

Asphalt is found south of Ambalema; west and southwest of Honda; west of Magdalena River, especially near Saldama River; and at Natagaima, Yaguará, and Larida, in the Department of Tolima. Asphalt containing 99.5 per cent bitumen has been mined at Chaparral since 1903. Asphalt from Boyacá has been used to pave the streets of Bogotá. Gas has been noted at several places in the elevated plain of Bogotá.

The Pacific District

The Pacific district includes a belt in the Department of Cauca that extends sixty to seventy miles along the Pacific Coast from Buenaventura to Baudó River and thence inland to Atrato River at Quibdo and southward to Cali. It has an area of 1,800 square miles, of which eighteen square miles may be productive. None of this area has been proved.

The petroleum of Baudó River is connected with the "coal series" (lower Tertiary, probably Oligocene), which is perhaps a continuation of the petroliferous formation of the Caribbean coastal belt. The predominant rocks are shales that have been sharply folded. This oil ranges in gravity from 31 deg. to 37 deg. Bé. (sp.gr. between 0.8696 and 0.8383).

Oil has been seen floating on Andagusta River. A heavy petroleum has been found east of Quidbo, where the Quidbo-Medellin trail crosses Tutendnendo River. Other indications of oil occur along Baudó River, twenty miles from Santa Rosa, four miles north of Poree River, and south of Nechi River.

Colombia has certain geographic advantages as an oil-producing country. The Caribbean petroleum district is not more than 200 miles from the Panama Canal, where large quantities of fuel oil may be used. Magdalena River, if dredged and improved, would afford cheap transportation by water for the oil refined at Barranca Bermeja. The oil of Santander del Norte might be shipped on Catatumbo River.

Difficulties of Operation

Mineral oils have not been exploited in Colombia principally for three reasons: (1) Transportation is difficult and has been confined chiefly to the coast and to the immediate basins of the large rivers; (2) the local geology presents peculiar features, which have not all been adequately studied; and (3) certain practical difficulties of operation have not been fully overcome.

The cost of the preliminary work by the geologists in a country where the mode of travel and transportation are still in a primitive state is great. The work of prospecting requires heavy machinery, which is difficult and expensive to transport. Three hundred tons of machinery is required for a single well, and if the well has to be abandoned the machinery will be practically a dead loss, owing to the difficulty and expense of moving it. All experts, whether technologists or skilled workmen, must be brought into the country at high salaries or wages, and much of the food, especially canned goods, needed for the working force must be shipped from the United States. Practically all wood used in constructing buildings or bridges must be imported, for the native woods are unsuitable for this use. For lack of detailed geologic knowledge of the ground, the driller may not be able to determine the type of drill rig, rotary or standard, that is best adapted to the formations; and consequent accidents to the drilling apparatus may cause the loss of the well. Finally, after wells have been drilled, oil may not be found in sufficient quantities to warrant the construction of roads, bridges, pipe lines, tanks, refineries, and pumps. The cost in Colombia of laying a pipe line, which is considered the cheapest method of transporting the oil, was estimated in 1917 at $20,000 to $30,000 a mile.

Companies Participating in Development

The American companies that were working or prospecting in Colombia in the latter part of 1919 included the Tropical Oil Co., of Pittsburgh, exploiters of the De Mares concession and the only active producers of petroleum in Colombia; the Colombian Petroleum Co., of New York (in which the Doherty interests hold 75 per cent of the stock and the Carib Syndicate 25 per cent), owners of the Barco concession; the Three Seas Petroleum Co., of Chicago, which is operating at Tubará, near Puerto Colombia; the Bradford-Colombia Oil Co., of Bradford, Pa.; the South American Gulf Oil Co., of Pittsburgh; the Midco Co., of Tulsa, Okla.; the Island Oil & Transport Co., of New York; Guffey & Gillespie, of Pittsburgh, who have purchased 1,250,000 acres adjoining the De Mares concession; the Ohio Cities Gas Co., of Columbus, Ohio; the Sinclair Gulf Oil Corporation, of New York; the Carter Oil Co.; the Prudential Oil Co.; the International Petroleum Corporation, which is reported to have recently acquired control of the Tropical Oil Co.; the Magdalena Oil Corporation; the Granada Oil Corporation; the Caribbean Petroleum Co. (a subsidiary of the Barber Asphalt Co., of Philadelphia); the Emerald Oil Co., (A. J. Diescher); and the Transcontinental Oil Co., which is under the control of Benedum-Trees interests.

British Capital Also Interested

British capital is represented by the Lobitos Oil Co., of Peru; the Royal Dutch-Shell group; the Anglo-Persian Oil Co.; Balfour, Williamson & Co., of London; the Alvez group, of London; and the Jenks group, of London, all of whom are reported to be active in making contracts but about whose activities little definite information has been obtained.

Colombian capital has indicated its intention of participating in the development of the petroleum resources of the country by the formation of the National Petroleum Co., of Bogotá, announced Feb. 9, 1920. No details of the capitalization or activities of the company have been made public.

NEWS FROM THE OIL FIELDS

26,000-Bbl. Well a Record in Brazoria County, Tex.

From Our Special Correspondent

At West Columbia, Brazoria County, the Texas Co.'s No. 1 Abrams well is still flowing at the rate of 26,000 bbl. daily with the drill stem and bit still in the hole. The previous record producing well in this field is said to have made 1,000,000 bbl. in thirteen months. This record is practically surpassed already, with little if any abatement in flow.

The Texas Co.'s No. 16 Koehler well at Humble, Harris County, was worked over and deepened to 3,178 ft. recently, and it responded by flowing 5,000 bbl. per day.

An opinion has been given to the State Land Commissioner, J. T. Robinson, by the Attorney-General's office that any person leasing state land for oil or gas production purposes must pay the state $2 an acre per year in advance for such leased land.

It is reported that the well of the Capitol Petroleum Co., near Weatherford, Parker County, came in flowing a strong head of gas estimated at 500,000 cu.ft. The gas became ignited.

The test well on the Baggett lease, two miles south of Gunsight, Stephens County, was completed at 3,335 ft. after penetrating a considerable footage of oil-bearing limestone. Nitroglycerine was lowered into the well to shoot it, but when the casing was raised considerable ground caved upon the charge, and the well will not be disturbed for a few days.

Short Supply of Casing Will Limit Wyoming Drilling

From Our Special Correspondent

A meeting was held in Denver on Aug. 19 and 20 by representatives of several of the larger oil-producing companies of Wyoming, particularly those of the Salt Creek field, to discuss the problem of the shortage of casing caused by insufficient transportation facilities. It was resolved that it would be better to limit drilling, if necessary, rather than pay premiums or bonuses for casing or any other supplies above the usual list prices plus freight charges. The Salt Creek operators also agreed to limit the spacing of wells to one per acre, to protect the future production of the field.

A number of large oil-well supply houses have opened or are opening offices in Denver as a result of the extension of the Wyoming oil fields to the southern part of that state, and the large amount of prospecting which is under way or planned in Colorado. James Purcell, formerly with the Texas Co., has been appointed manager of the Denver office of the Continental Supply Co., with offices in the First National Bank Building. The National Supply Co. has opened offices in the Gas and Electric Building, with J. O. Ingram in charge. His supervision still extends over the Laramie, Wyo., district, where he formerly was situated.

Possible Legal Difficulties in Salt Creek Field, Wyoming

From Our Special Correspondent

Wednesday, Aug. 24, was the last day of the six months' period in which claimants to lands within withdrawn areas could relinquish their claims to the Government in order to apply for leases under the oil-land leasing act. The Salt Creek field in Wyoming is particularly affected by this act, as a large acreage is held by the Midwest companies under titles extending many years. Few applications for leases have been filed by the Midwest companies with the receiver of the General Land Office at Douglas, and it is believed an interesting legal battle for title to much of the land will result.

The well of the Trail Canyon Oil Co., recently completed in the Tisdale field, ten miles north and west of Salt Creek, will produce about 25 bbl. daily. The well is said to be 230 ft. deep and in the Dakota sand. About three years ago a test well which was drilled on this structure west of Salt Creek found only water.

Manitoulin Island, Ontario, Now Being Actively Developed

From Our Special Correspondent

Active oil development is in progress in the Manitoulin field by a number of companies and syndicates, and some good results have been obtained. The Standard Oil Co., which early in the century secured a lease of 30,000 acres in the Indian Peninsula and spent considerable money in exploration but afterward withdrew from the field, has resumed operations. An English syndicate headed by Sir Stopford Brunton has leased 25,000 acres. The Kyto Oil Co., of Dayton, Ohio, has brought in three wells at a depth of 456 ft., which have settled down to a steady daily production of 12, 15, and 18 bbl., respectively. Mr. Gordon, of Dayton, is drilling several wells near Manitowaning, and a Toronto syndicate has secured oil rights to a large tract in the southern part of the island. Interest in the Manitoulin field has been greatly stimulated by the work of M. Y. Williams, of the Canadian Geological Survey, which has materially increased the knowledge of its oil-bearing possibilities and has done much to encourage oil companies to develop the island.

Second Big Gas Well Brought in in Barren County, Ky.

From Our Special Correspondent

Another huge gas well is reported to have been brought in on the Smith lease near Temple Hill, Barren County. The first well, brought in two weeks ago, showed a production of 15,000,000 cu.ft. of gas daily, by the mercury test, and the second well is said to be even greater. It blew the tools, weighing 2,000 lb., far out of the hole. Four other wells are being drilled by Merry Brothers, who are responsible for bringing in the first two.

The Twin Lakes Petroleum Co., of St. Louis, brought in a 100-bbl. well on the Brawner lease in Simpson County on Aug. 25. It has a well started on the Ellis lease near Temperance, which will be shot soon. There is 45 ft. of pay sand at a depth of 570 ft. The company also has brought in a good well near the Reeder gusher in east Simpson County at 638 ft.

A 75-bbl. well was drilled in on Aug. 24 on the Davenport lease along the Barren River Pike, Warren County. The well on the T. K. Bohon farm, six miles west of Bowling Green, pumped 250 bbl. in twelve hours when it was brought in recently.

The Beech Bottom well, in Clinton County, eight miles west of Albany, is showing up well at 1,785 ft. The oil is standing 600 ft. in the hole. It probably will be drilled 20 ft. deeper. It will make 200 bbl. a day, according to estimates. This apparently opens a new deep field.

Australian Refinery Proposed—Crude From Papuan Fields?

Arrangements are being made to bring into effect the agreement entered into by the Australian government with the Anglo-Persian Oil Co. in accordance with which an oil refining company will be registered in Australia. The company will have a capital of £500,000 in £1 shares, of which 250,000 shares will be taken by the commonwealth government and 249,996 by the Anglo-Persian Oil Co., and three shares by nominees of that company. The company undertakes to work and equip a modern oil refinery in the commonwealth, and to control the sale and disposal of the products of the refining of mineral oil. Boring and developmental operations in the Papuan oil fields are proceeding, and if successful, the commonwealth will eventually supply 200,000 tons of oil per annum to the new refinery company for the purchase of which it holds an option. Meanwhile the Anglo-Persian Oil Co. will supply oil for the refining purposes up to the amount of approximately 200,000 tons.

ECHOES FROM THE FRATERNITY

Labor Emigration From Europe Checked and Controlled There

America Must Make Special Effort to Win and Hold Immigrants as Loyal Citizens—Few Laborers Coming Here

Frances A. Kellor, vice-chairman of the board of directors of Inter-Racial Council, has just returned from an industrial survey of Europe, and in the following paragraphs summarizes his observations and impressions concerning labor prospects of the near future:

"The time has passed," says Mr. Kellor, "when the American employer may count on an unlimited supply of labor from abroad. Emigration from Europe will be strictly regulated by the respective governments in the near future, and is already being directed in some of the Old World nations, which have begun to realize the value of their workers. The French government has offered Italy six tons of coal per month for each Italian miner induced to go to France, and Italy's Commissioner of Emigration is advising his people to emigrate to France. Greece is offering the inducement of farms to the people, and has passed an act requiring large land owners to surrender two-thirds of their estates to the peasants. Furthermore, emigration from Greece may be prohibited at any time by law. Similar conditions are found in Finland.

"These instances show the attitude of foreign governments toward their nationals. Emigration will be curtailed by many governments to the extent deemed expedient for their own interests. Furthermore, they will advise the emigrant where to go, and in some cases will retain him as a citizen with voting rights, even while living abroad.

"Immigrants who do come here will thus have less tendency to make America their permanent home and become citizens, and we shall have to make greater efforts than in the past to win over and assimilate them.

"Some of the foreign nations are planning to do the things which America should have done long ago: to protect immigrants from fraud, to establish official information bureaus, to take care of their savings through branch banks, and generally to look after their welfare.

"International agreements regarding immigration are being made between Old World countries. Hungary, Poland, Greece, Italy, France, Lithuania, Spain, Portugal, and the Balkan countries have taken the lead in such conferences, but the United States, which has so much at stake in the matter, has shown indifference. If our supply of coal, iron, oil, or cotton were threatened the whole nation would be aroused, but with the imminent curtailment of our labor supply, even at this time of acute labor shortage, the Government and the business men who should be interested are remaining apathetic. These are matters of direct immediate concern to the American business man. When the manifesto of a leader in Russia can react on the workers with greater force than the words of the plant executives —when a stream of literature in foreign languages can counteract utterances in the American press or in plant organs—it becomes essential to the self-interest of the American business man that he know about these things promptly and take adequate action in the light of his information on the facts.

"Meanwhile the tendency of the foreign-born workers to return to their old homes should be checked by every legitimate means. The most powerful inducement to them to remain is, of course, just and humane treatment, with no discrimination in wages, housing, and living and working conditions between them and the native born. Efforts should be made to establish closer relations with the foreign-born workers. If they have legitimate causes for discontent, the grievances should be understood and removed. The same spirit of co-operation that is being secured through enlightened employers and their English-speaking workers should be developed in relation to the foreign-born laborers. This is not 'coddling,' not philanthropy, but labor conservation.

"We should not be deceived by the temporary increase in immigration. The figures that indicate a large number of arrivals at Ellis Island fail to show the fact that the proportion of women, children, professional and clerical workers is so great as to afford little relief to our labor shortage. Of the manual laborers coming in, a large percentage are men who went abroad to fight, and are now only returning to their old jobs. Of new workers to do the essential work of America there is an exceedingly small percentage, and recent correspondence from all parts of the United States indicates serious shortage of labor in almost every section.

"The course of action for the employer is therefore, first, to conserve labor as carefully as he conserves his raw material; and, second, to regard immigration problems with the same interest that he gives to international commerce, realizing that America is no longer isolated and that what happens in the Old World today will be reflected in his own business tomorrow and the day after.

"An international conference on immigration is planned for 1921, in which the United States should play a leading part. Business men who are interested may obtain further details through the Inter-Racial Council, Woolworth Building, New York."

Organizations Invited To Join F. A. E. S.

The joint conference committee has been asked by one of the technical papers concerning the invitation to become a member of the Federated American Engineering Societies.

Pursuant to the request of the governing boards of the four founder societies, of the American Society for Testing Materials, of the United Engineering Society, and of the members of the Engineering Council, contained in the resolution unanimously adopted at their joint meeting on Jan. 23, 1920, the joint conference committee issued the call to the engineering and allied technical organizations of the country to attend the organizing conference in Washington, June 3-4, 1920, which was sent to engineering and allied technical organizations whose chief object is the advancement of the knowledge and practice of engineering and the allied technical arts and which were not organized for commercial purposes.

The organizing conference approved the list of organizations to whom the invitation was extended by the joint conference committee and no other organizations were added to this list by the conference. The joint conference committee is, therefore, extending invitations to these organizations to become members of the Federated American Engineering Societies under the authorization given it by the organizing conference on June 4, 1920. There may be other organizations which are eligible for membership. Such organizations may make application for membership to the American Engineering Council.

Montefiore Foundation Prize

The Association of Graduates in Electrical Engineering of the Montefiore Electrotechnical Institute announces under recent date that April 30, 1921, is the final date for receiving typewritten manuscripts or publications submitted in competition for the prize of 20,000 fr. offered by the George Montefiore Foundation. Memoirs must have been prepared during the three years preceding the meeting of the jury of award, must be in French or English and typed or printed. The award will go to "the best original work on scientific advance and progress in the technical applications of electricity in any field." Works of popularization compilations are barred.

The jury comprises ten electrical engineers, five from Belgium and five from other countries. Further details may be had by addressing L. Calmeau, secretaire général, Association des Ingenieurs Electriciens sortis de l'Institute, Etc., Rue Saint Cilles, 31, Liége, Belgium.

Dangers From Explosives Fumes in Metal Mining

Toxic Gases Always Present—Straight Nitroglycerine Never Permissible—Small Electric Fan-and-Pipe Units Needed

Two recent occurrences in Western metal mines, in each of which three men were killed, due to breathing fumes from explosives, have aroused keen interest among mining men not only as to the exact cause of such accidents, but also as to possible preventive measures. Both the accidents and their possible prevention are discussed as follows under the above title by D. Harrington and B. W. Dyer, engineers of the U. S. Bureau of Mines, in one of its recent reports of investigations:

In sinking the 45 deg. incline Marsh shaft near Burke, Idaho, on May 13, 1920, a round of holes containing about sixty pounds of 40 per cent gelatin explosive was blasted by the night shift on leaving at 11:30 p.m. It was customary for the night shift to leave compressed air blowers open at bottom of shaft until the compressor was shut down, slightly before midnight. Presumably this was not done on the night of the 13th, as the fumes were so heavy in the shaft bottom on the morning of the 14th that at about 8 o'clock, Superintendent Bergen and one of the shaft men, on reaching the shaft bottom, were overcome and fell from the bucket into the sump containing about six feet of water; and when two other men went down in the bucket a few minutes later to investigate, one also fell into the sump and the other was barely able to reach the shaft collar. The three bodies were later on recovered from the sump.

At 4:50 p.m., on June 10, 1920, at the Dominion Mine, Colville, Wash., a round of eleven holes containing about fifteen pounds of 60 per cent nitroglycerine explosive was blasted in a 50 deg. raise about fifty feet above the main tunnel level by the shift going off for the night. In this mine it was the practice not to try to blow out the fumes until just before the shift went to work the next morning. Although no work was being done on the night shift, one of the raise men, curious to ascertain the effect of the shots, about 7:45 p.m., wandered into the mine (which was a tunnel only a few hundred feet in length), and was missed by one of his companions about an hour later. When three men tried to remove the body of the inquisitive miner, two of them were also overcome; ultimately these two and the first man were removed from the point at which all were asphyxiated, which was practically at the foot of the raise.

In this case the explosive was seven-eighths *straight nitroglycerine*, used because the ordinary one-and-one-fourth gelatin was temporarily unobtainable, though the holes were drilled for the larger sized stick. The explosive, too, was about a year old. Though two of the eleven holes missed fire, there was no obtainable evidence of burning of explosive, but later on, after blasting these two missed holes, containing possibly three pounds of the explosive, an air sample taken a few minutes after blasting, and essentially at the point at which the three men had been asphyxiated, gave 0.79 per cent CO, or sufficient to cause death after having been breathed a comparatively few minutes. It was thought locally that the deaths were due to other gases, but analyses indicate strongly that CO was responsible.

These accidents indicate forcibly a danger daily confronting men working in metal mines and especially in small or prospecting mines. In one case, the dangerous fumes were in a shaft, in the other in a raise, the deaths in the latter being, however, practically on the tunnel level. Compressed air constituted the usual method for removal of dangerous gases, and in both cases it failed. In both accidents there is at present no obtainable evidence of defectiveness of explosive or of method of firing.

Dangerous Gases Always Present

Theoretically, there are in existence today explosives with constituents so chemically balanced that with complete detonation there should be no resultant gases of more potential danger than CO_2 which would be diluted to such an extent as to be practically harmless. Nevertheless numerous air samples at blasting faces in metal mines almost invariably reveal the presence of dangerous gases, due, generally, to incomplete combustion, these dangerous gases being usually CO and oxides of nitrogen. Dangerous percentages (upward of 1 per cent) of CO have been obtained at drift faces in metal mines after blasting with explosives of ammonium nitrate as well as gelatine base, detonated with No. 8 as well as with No. 6 caps, fired electrically as well as by fuse, tamped and untamped.

The most dangerous gas found in fumes of explosives is CO, of which quantities up to and over 1 per cent are frequently found in the general air around newly blasted faces in metal mines, and frequently as much as $\frac{1}{10}$ or $\frac{1}{5}$ of 1 per cent in air from muck piles several hours after blasting. This gas gives headache in air with proportions as low as 0.05 per cent; it is dangerous at 0.2 per cent and quickly fatal when over 0.50 per cent is present. Nitrous oxide is sometimes found, and its effect, though serious, is not likely to be so quickly fatal as that of CO. However, when dynamite burns instead of exploding, the nitrous oxide content of surrounding air may be sufficiently high to cause death. Other dangerous gases, such as H_2S and SO_2, may also be found in explosive fumes, but are rarely present in harmful proportions. However, straight nitroglycerine explosive dynamite gives off several times as much CO gas as gelatin or ammonium base explosive, hence *straight nitroglycerine should never be used in the confined places found in mining.* At present no explosive is applicable to metal mining in which there is any guarantee that formation of dangerous gases can be prevented in blasting; hence the one feasible preventive is effective ventilation.

Effective Ventilation Needed

It is significant that in 1919, the great coal mining industry of the United States had but three deaths from suffocation from explosives fumes among over 760,000 men, or about three times as many employees as in our metal mines. Metal mines only too frequently place entire reliance on natural ventilation or on compressed air, and both are likely to be inefficient, dangerous and, in the long run, costly. * * * For dead-end faces of drifts, crosscuts, raises, winzes and shafts, small electrically driven fans direct connected to one-half hp. to ten hp. motors force air through canvas tubing or galvanized pipe, and readily deliver 1,000 to 5,000 or more cubic feet of air per minute, or ten to fifty times as much air as can be obtained from compressed air blowers and at much less cost. These small fan and canvas pipe or galvanized pipe units not only remove explosive fumes from the face, but if operated as blowers will keep a stream of moving air at the point where the machine man or mucker works. In hot mines, especially, the worker's comfort and efficiency are greatly improved thereby and his health and safety assured at least as far as explosives fumes are concerned. Larger metal mines now recognize this and many new mechanical ventilation installations have been made in large metal mines, especially in the West, and the time will soon be at hand when laws will demand efficient ventilation providing circulation of ample currents of fresh air at all places where men work underground.

Dry Jackhammers Prohibited in Rand Mines

At a meeting held early in July in the offices of the Government Mining Engineer of the Union of South Africa, representatives of the Transvaal Chamber of Mines, the Mine Managers' Association, Underground Officials' Association, and of the South African Mine Workers' Union agreed that a new regulation should come into effect after March 31, 1921. This regulation, which is an amendment to No. 101 (1) (3) of "Mines, Works and Machinery Regulations," provides that "No person shall in the drilling of holes use or cause or permit to be used any machine drill in which only air is passed into the hole through the hollow jumper of the drill."

As the *South African Mining and Engineering Journal* says, the effect of this order on the mines remains to be seen. There are considerable numbers of dry jackhammers in use today on the Rand and also held in stock, and these will have to be scrapped or converted by the date mentioned. One estimate placed the cost of conversion at £9 per machine.

Book Reviews

Mica in the Eastern Transvaal—By A. L. Hall. Memoir No. 13, Geological Survey, Department of Mines and Industries, Union of South Africa; pp. 95; 17 plates, 8 text figures, 1 map; 6 x 9½; Johannesburgh, 1920.

As the first really comprehensive report on the Transvaal mica deposits, this memoir is a welcome addition to the literature on mica. The mica belt, approximately 300 square miles in extent, has been worked on a considerable scale since 1909, but until 1912 the nearest railway station was 120 miles distant. The opening in that year of the Selati railway, which crosses the belt, has given a great impetus to the industry. The muscovite occurs in coarse pegmatites in granites associated with basic rocks.

The deposits and workings of the six operating companies are described. An instructive feature of the report is the emphasis placed on the uncertainties of mica mining, and the practical importance of the physical condition of the product. Although some exceptionally large blocks of mica have been uncovered, on the whole the marketable mica is in comparatively small sizes. Data from two of the largest mines indicate that to procure one ton of mica, trimmed and ready for the market, it is necessary to mine from 850 to 1,700 tons of rock. A series of instructive tables are presented, giving prices of South African mica in the London market, dimensions and grades of sheet mica, chemical analyses, dielectric strength and percentage of various grades produced. At present the great waste in the mica fields is practically unused, and the author points out its possible successful utilization as ground mica. Transvaal mica compares favorably with that now used in Europe and America and with growing outside demand there is the prospect of a larger development.

A summary of conclusions condensed to half a page is a useful feature for the busy reader. Although less comprehensive than de Schmid's monograph on the Canadian deposits, the report is clear, instructive, and ranks favorably in the mica bibliography. O. B.

Retraining Canada's Disabled Soldiers.—By Walter E. Segsworth, M.E. Cloth; 7 x 10; pp. 193. Published by the Department of Soldiers' Civil Re-establishment, Ottawa.

Canada may be justly proud of the way she has handled this very human problem. The work was begun in 1915, and by the time the United States had the same problem to solve, our northern neighbors had much to tell us of their very satisfactory system, so well described in this book. Mr. Segsworth, a mining engineer, has been in charge of the work since July, 1917. The work has been centralized, and is perhaps being carried on more effectively in Canada than in any other country. Up to Jan. 1, 1920, over 33,000 returned men had availed themselves of the government's offer of training in a new occupation. Some were physically incapacitated from returning to their former occupations, others sincerely thought they were, and still others were not immediately able to take up the work to which they were accustomed, but might become so later. The government's interest in the men has continued after their graduation from training, so that accurate statistics are available as to the results secured.

This book will be of interest to all who have disabled men to take care of, whether caused by war or industrial accidents. Although devoting little space to mining and metallurgical work, many applicable ideas can be gained.

Technical Papers

Mica—"Mica in 1918" has been issued by the U. S. Geological Survey. Most of this substance comes from India, but the U. S. production in 1918, 822 tons, was the largest since 1913.

Smelting With Enriched Air—F. G. Cottrell and C. A. Meissner discussed the enrichment of air by oxygen, for metallurgical purposes, at the New York meeting of the American Iron and Steel Institute on May 28. The *Iron Trade Review* for July 29 republishes the papers, possibly in abbreviated form. With a cheap source of oxygen the practicability of the process is worthy of consideration, both in ferrous and non-ferrous metallurgy, though it is in its application to iron smelting that the authors are principally interested. Little practical work has been done, the papers being chiefly of suggestive value.

Gasoline—The July issue of *Reports of Investigations* (Department of the Interior, Washington, D. C., Serial Number 2,149) contains a motor gasoline survey. The quality of the gasoline supplied during the summer is ordinarily not as good as that marketed in winter, but that sold this summer seems to be worse than usual. Some samples were found diluted with kerosene. Of the seven cities in which samples were taken, San Francisco was found to have the most satisfactory gasolene, followed in order by New York, Chicago, Pittsburgh, Washington, New Orleans, and Salt Lake City, the poorest.

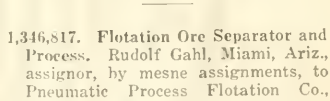
The Taylor System—In the August issue of *Industrial Management* (120 W. 32 St., New York, 35c.) is published the first of a series of articles on the application and practice of the Taylor system of management.

Geological Investigation—The Tennessee Geological Survey has again taken up the study of the Upper Cretaceous Series of West Tennessee, an illustrated report on which occupies fifteen pages in Bulletin 23 of the State Geological Survey (Nashville, Tenn.).

Recent Patents

1,316,817. Flotation Ore Separator and Process. Rudolf Gahl, Miami, Ariz., assignor, by mesne assignments, to Pneumatic Process Flotation Co., New York, N. Y. Filed June 26, 1915.

A flotation ore separator comprising a flotation tank divided into frothing compartments by partitions not reaching completely down to the bottom of



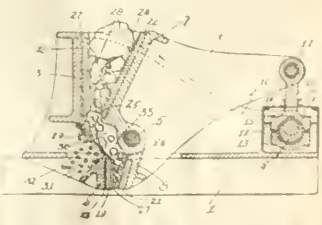
the tank, a concentrates delivery, and a whole-flow tailing discharge extending upwardly from the bottom of the tank beyond a frothing compartment.

1,316,939. Method of Sampling. Robert E. Carmichael, Damon, Tex. Filed Dec. 1, 1919.

A method of raising the cuttings from an earth-boring drill to the surface comprising forcing a stream of flushing liquid downwardly through the drill stem and through channels in the bit to the bottom of the hole, forcing downwardly outside of the drill stem a current of compressed air, forcing the same into the drill stem toward the lower end thereof and causing the air to pass downwardly through the bit to unite with the flushing liquid and lift the cuttings and flushing material to the surface outside said drill and drill stem.

1,316,871. Crusher. Herman P. Andresen, Chicago, Ill. Filed April 30, 1920.

A crusher embodying therein a double-action jaw member mounted for swinging movement, spaced crushing portions thereon, spaced stationary crushing portions with which they



coact, the crushing portions on the swinging jaw member and the stationary crushing portions forming spaced pairs of crushing portions, and a sizing device arranged intermediate said spaced pairs of crushing portions.

MEN YOU SHOULD KNOW ABOUT

G. R. Mansfield is engaged in geologic field work in southeastern Idaho for the Geological Survey.

Samuel W. Cohen, consulting mining engineer, of Montreal, is in Newfoundland on examination work.

Kirby Thomas, mining engineer, of New York City, is investigating kaolin deposits of the Eastern States.

C. M. Heron is examining mining properties in the Lordsburg and old Apache mining districts of New Mexico.

George C. Martin is making geologic surveys in the Kuskokwim region of Alaska for the U. S. Geological Survey.

A. E. Drucker, mining engineer, was visiting mines and reduction plants at Butte, Anaconda, and Great Falls, Mont., at the end of August.

Jack Welch, general manager of the Majuba Silver, Tin & Copper Mines Co., Nevada, has been sick for several months and leaves soon for San Francisco.

Y. Nakayama, a metallurgical engineer on the staff of the Furukawa Mining Co., Marunouchi, Tokyo, Japan, has been visiting some metallurgical plants in the United States.

George Rupp has returned from a two-months' trip to the Hudson Bay country, where he and **Dwight Woodbridge** examined large deposits of iron ore on islands in the bay.

D. Dale Condit and **Robert W. Howell** of Washington, D. C., who were in Singapore April 21, are engaged in geologic field work in southeastern Idaho for S. Pearson & Son, London.

Everett H. Parker, who was graduated from Columbia School of Mines last June, is now looking over mines in England, after visiting the Continent. Mr. Parker expects to return to the United States about Oct. 1, and will then go to Butte, Mont.

J. E. Healey, general manager of the Consolidated Main Reef Mine & Estates, Ltd., Johannesburg, Transvaal, is in Los Angeles, Cal., while visiting America. He will visit San Francisco, Denver and Chicago on his way East and will sail from New York for London about Oct. 15.

Henry M. Payne, assistant to the president of Bertha Coal Co., Pittsburgh, Pa., has resigned to become general manager of the Douglass Barnes Corporation, 53rd St. and 5th Ave., New York City. Mr. Payne, who is a member of several directorates and mining organizations, assumes his new duties Sept. 20.

Rienzi W. Macfarlane, assistant superintendent of the Arizona Copper Mining Co.'s Longfellow group of mines, left Morenci, Ariz., for Parral, Mexico, on Aug. 12, expecting to be absent several weeks. Before the troubles of recent years Mr. Macfarlane was engaged in mining in the Parral region.

C. M. Lazuire, of the mining department of the California State Mining Bureau, has been appointed district engineer in charge of the northern California field division of the bureau with headquarters at Redding, Cal. Mr. Lazuire succeeds **Emil Huguenin**, who has been transferred to the oil and gas department, with headquarters at Taft, Kern county.

OBITUARY

J. GEORGE LEYNER

J. George Leyner, pioneer in the development of rock drilling machinery, inventor of the piston-hammer drill and the water jet-hollow steel system, died at Littleton, Col., Aug. 5. It is not generally known that Mr. Leyner also built the original shredded-wheat machines.

Benjamin Smith Lyman, geologist and mining engineer, died on Aug. 30 at Cheltenham, Pa. He made the first geological survey of Japan and his work there from 1873 to 1879 revealing and surveying valuable coal and mineral deposit won high honors from the Mikado.

Mr. Lyman was born in Northampton, Mass., Dec. 1, 1835, and was graduated from Harvard in 1855, and the Ecole des Mines, Paris, in 1861. He studied at the Royal Academy of Mines, Freiberg, in 1862.

After several years in private geologic work and as a mining engineer, he was employed by the Public Works Department of India surveying oil fields. From 1873 to 1879 he was chief geologist and mining engineer for the Japanese government. From 1887 to 1895 he was assistant geologist of the State of Pennsylvania. He was a Fellow of the American Association for the Advancement of Science and the American Institute of Mining Engineers and an honorary member of the Mining Institute of Japan.

SOCIETY MEETINGS ANNOUNCED

American Society of Mechanical Engineers will hold its 1920 annual meeting in Engineering Societies Building, New York City, on Dec. 7 to 10, inclusive. Sessions will be held on Appraisal and Valuation, and the Application of Engineering to Woodworking. The professional sections on Management, Power, Fuels, Machine Shop, Railroads, and Textiles will also conduct sessions; and a number of valuable papers will be presented at general sessions.

A memorial session for Dr. Brashear is planned as a fitting tribute to his life and work.

The Canadian Institute of Mining and Metallurgy will hold its second annual western meeting in Winnipeg, Man., on Oct. 25, 26 and 27. Headquarters of the meeting will be at the Hotel Fort Garry, Winnipeg. The local secretary, W. W. Berridge, may be addressed at 905 Union Trust Building, Winnipeg, Man.

Institution of Mining & Metallurgy, No. 1, Finsbury Circus, London, E. C. 2, will hold a special general meeting of the members and associates, at the rooms of the Geological Society, on Oct. 21, 1920, at 5:30 p.m., to act on a proposed revision of the conditions of admission and of membership dues in the institution.

The American Society of Civil Engineers, at its regular business meeting at 33 West 39th St., New York City, on Sept. 1, 1920, considered proposed amendments to the society's constitution, and the question whether the society shall join the F. A. E. S. as a charter member. A questionnaire on the latter is being mailed to members.

The Association of Iron and Steel Electrical Engineers will hold its Fourteenth Annual Convention at the Hotel Pennsylvania, New York City, Sept. 20 to 24. The program includes papers on transmission for industrial plants and underground transmission for Sept. 21 morning session, and the report of the electric furnace committee for Sept. 23 afternoon session.

A. I. M. E. Petroleum and Gas Meeting will convene in St. Louis, Mo., Sept. 21 and 22, in conjunction with the American Society for Testing Materials and the Petroleum Fuel Section of A. S. M. E. It is expected that this meeting will crystallize into a petroleum and gas section of the A. I. M. E. An invitation to attend has been sent to the American Association of Petroleum Geologists, and many of its members are expected to be present.

The Institute of Metals, 36 Victoria St., London, S. W. 1, will hold its fall meeting at Barrow-in-Furness, on Sept. 15 and 16.

THE MINING NEWS

LEADING EVENTS

Mining Situation in Mexico Rapidly Improving

August Exports of Copper, Lead and Zinc Show Increase—Demand for Iron Forces Price Up

The beginning of September finds operators in Mexico in a more optimistic mood than for the last four years. Although the price of silver has wobbled a bit, costs of production have been more favorable and the steady demand for lead has been more than encouraging. It is stated that 25 per cent of the railway cars of the Mexican lines are hauling silver and lead ores and that the exports of lead during August were only approached in quantity by those of copper. With the resumption of work on scores of old properties that had been closed down because of bandit activity, the production of lead promises to beat all records for many years. Prices in the local market beginning in September range from 70 to 75c., Mexican, per kilo.

A fresh impetus has been given to zinc, also, during the last sixty days and according to mining department figures thirty-one zinc properties were in full or partial operation on Sept. 1 in the states of Coahuila, Zacatecas, Nuevo Leon, Durango, Chihuahua, Jalisco, Sonora and Tamaulipas. In addition, a number of denouncements were made during August. Zinc mine owners suffered more in proportion than any other class during the revolution, as most of the properties were in the main track of the storm. Quotations run from 80 to 85c. Mexican per kilo. Most of the output is being exported.

Notwithstanding the closing down of the Democrata and some copper properties of minor importance, the total copper output of Mexico is increasing rapidly and the export exceeds that of any other metal, this in spite of unfavorable prices. For the first ten days in August nearly 600,000 kilos of copper were sent to the United States through the port of Naco alone. Heavy shipments also went through Agua-Prieta, Topolobampo and from La Paz, in Lower California. The Boleo Company (French) is expecting to get back to its normal production of 400 tons daily, of which fully 85 per cent goes to the United States. The recent arrangement with Governor Cantu, of Lower California, enables the Federal government here to inaugurate a number of schemes looking to an extensive exploitation and development of the mineral resources of that back-woods section of the republic.

There has been a big jump in the local price of iron because of the demand for rebuilding the sugar plants, railways, mines and innumerable industrial concerns which were put completely out of business. The big iron and steel plant at Monterrey is breaking all records in way of output and the Consolidated and National iron and steel plants of Mexico City are practically taking no new orders. A few small furnaces are being opened throughout the country, but Mexico is depending largely on the United States for its iron.

Operations in antimony are light. Two small shipments arrived late in August from China by the way of Manzanillo. Both China and Japan are trying to break into the Mexican market.

WEEKLY RÉSUMÉ

The new so-called Mississippi Valley experiment station of the U. S. Bureau of Mines is to be established at Rolla, Mo., where work will be done in co-operation with the State School of Mines. The War Minerals Relief Commissioners are reported to have disagreed over the amount to be awarded on the Hanna Minerals Co.'s claim for over half a million dollars.

Steady improvement is reported in the mining situation in Mexico, as reflected in metal exports for August. The Cia de Minerals y Metales has been practically absorbed by the Penoles Mining Co. In Utah, the state public utilities commission has refused to allow the transportation rates on ore and coal to be increased. Hearings have been conducted in the suit of the Lone Pine-Surprise Mining Co. against the Northport Mining & Smelting Co. over extra-lateral rights on the Last Chance Black Tail vein. From Canada it is reported that the Belcher Islands, in Hudson Bay, have been visited by prospectors in an aeroplane.

Belcher Islands, in Hudson Bay, Visited by Prospectors in Airplane

For the first time in the history of northern Ontario airplanes have been used to assist prospectors. Within the past two weeks a large seaplane has taken geologists, prospectors and supplies from the railway to the Belcher Islands in Hudson Bay, where large deposits of iron ores are known to exist. The first leg of the journey was from the railway to Moose Factory on James Bay, and was made in about an hour and a half. This trip usually took about a week by canoe. The second leg was from Moose Factory to the islands and took about three hours. Several trips have been made from the railway base to the bay. Another plane, with a motion-picture outfit, is also operating in the same district. The iron deposits of the Belcher Islands were discussed by E. S. Moore in the *Engineering and Mining Journal* of Aug. 28, pp. 396-400.

Utah Commission Refuses Higher Freight Rates on Coal and Ore

Smelters Announce Increased Charges To Meet Increase on Bullion to Atlantic Seaboard

Increased freight rates as affecting the transportation of coal and ores within the State of Utah have been refused by the state public utilities commission, to which the Utah chapter of the American Mining Congress recently appealed, with especial reference to rates on low-grade ores. The Utah commission takes the ground that, provided state rates are fair and reasonable and proper in themselves, the interstate body has no authority to order them changed.

At present, rates on coal in Utah constitute 20 to 25 per cent of the price to consumers, and in refusing the proposed increase the commission stabilizes the price of coal to that extent. It was feared that higher rates on low-grade ores would cause many mines to close down. The smelters have announced increased charges to meet the increase in freight rates on bullion to the Atlantic seaboard. One notice says:

"We are advised that, effective Aug. 26, there will be an increase of 33⅓ per cent in the freight rates on lead bullion and blister copper to the Atlantic seaboard. In accordance with the clause in our contracts covering this matter, we are obliged to make deductions from the metal quotations to cover this increased cost. Metals received at our plant after this date will not be shipped out in bullion until after the freight advance has become effective, therefore on all ores or concentrates received at our Midvale plant on and after Aug. 26 we will make the following additions to our contract deductions from metal prices: Lead, 0.25c. per pound; silver, 1c. per ounce; copper, 0.25c. per lb. As was true of the previous deductions due to increased freight rates, an attempt at a fair division of the burdens between silver and lead producers has been made. We realize fully the many difficulties confronting the mining industries, difficulties in a like manner faced by the smelting industry, but we believe that these added costs should be absorbed and reflected in the market price of metals resulting from our related industries. An advance in metal prices can reasonably be expected to follow; we think this necessary in order that sufficient production of metals to supply demand may be encouraged. The shipper can be assured that in case freight advances announced should be modified by the railroads our deductions will be changed."

Reopening of Old De Lamar Mine Under Way

Property, Formerly Worked by Hand Methods Only, Now Being Modernly Equipped

By Robert N. Bell

The original De Lamar mine, which formed the basis of Captain De Lamar's fortune, is situated on the west slope of the Owyhee Range, sixty miles south of Boise, Idaho, and twenty-six miles from Murphy, the nearest railway point. It is in the Carson mining district, better known locally as the Silver City district, Silver City being seven miles away. The district is known for its production in the past of bonanza gold-silver ores.

A year and a half ago, the property was taken over by certain oil operators of Fort Worth, Tex., and Tulsa, Okla, who have since reopened the mill tunnel and the long and badly caved No. 8 level, and relaid the track. They have also put in over a mile of air line in these two levels, installed two compressors, and are refitting the mill and putting the property in shape for an aggressive development campaign.

DE LAMAR MINE, MILL AND DUMP AT PORTAL OF TUNNEL, CARSON MINING DISTRICT, SOUTHERN IDAHO

Fully 80 per cent of the $14,000,000 worth of gold and silver produced by the De Lamar mine was derived from a series of closely parallel fissure veins that strike northwest and dip southwest at an angle of 45 deg. All of these are cut off and terminate at what is locally called the Iron dike, which is 10 to 30 ft. thick. This dike is decidedly crooked but has a general east and west strike and low southerly dip and the veins terminating on the under side show a decided drag or bend of 30 or 40 ft. to the west, closely parallel to the fault before diverging on their true northwest course.

This dike was definitely classified by Lindgren as a thick gouge-filled fault plane, its clay filling having practically the same composition as the enclosing soft ryolite wall rocks. It has a flat dip at the surface of about 30 deg., gradually steepening to 40 deg. at the deepest point penetrated on the 8th level. It cuts both the vein system and the ryolite at a sharp angle. In my opinion it is a fault of more recent date than the rich mineralization of the old ore courses and those more recently developed. On the south slope of De Lamar Mountain on the hanging wall side of the fault, several distinct ore-bearing fissures have since been discovered and developed to a limited extent.

The surface on the upper side of the fault is deeply covered with débris, which makes investigation there expensive and unsatisfactory. From the position of the ore found on the hanging wall side of the fault, a horizontal displacement of several hundred feet is indicated.

The latter years of operation were sweetened by the discovery of a series of narrow fissures, also under the fault and 500 ft. west of the original veins and parallel to them. These produced a total yield of fully $1,000,000 of $15 to $30 ore. This was known as the Summercamp group of veins. Three hundred feet west of this system and still under the fault another system of parallel fissures having a different type of gangue was partially developed, and for whose treatment the mill was not adapted on account of the extreme hardness of the gangue and sulphide ore. These newer westerly ore courses offer at present one of the most attractive chances for new ore development.

Due to the easy ground and soft gangue this property was always worked by old fashioned hand tool methods. An air compressor was never employed, even for development purposes, except temporarily for driving the 3,800-ft. crosscut tunnel from the Mill level on Jordan Creek through the hard basalt country rock.

Ten miles north of De Lamar the King, Berg and Rooster Comb mines, opening on steep pitching fissures in the granite formation at comparatively shallow depth, exhibit massive sulphide mixturs of lead, zinc and iron, carrying $20 to $30 in gold and considerable silver. Recent development on the 1,400 level of the Trade Dollar mine, five miles east of De Lamar, has exhibited some interesting specimens of lead-zinc sulphide associated with silver and gold. Also the big quartz-filled fissures of the Demming Mines, 10 miles further southwest, are conspicuously mineralized with arsenical and antimonial sulphides associated with lead, zinc and iron. These conditions of mineralization in the granite point strongly to the probable existence of similar primary ore conditions in the De Lamar.

At the west end of the De Lamar property, 100 to 300 ft. west of the Summercamp stopes, the Idaho vein exhibits an ore shoot over 200 ft. long, stoped 80 ft. deep, with a maximum width of 25 ft., from which a quarter of a million dollars worth of ore was extracted, running $25 per ton, principally in gold. It was so extremely hard, however, and involved so much handling to get it through the mountain to the mill tramway on the north side that it proved unprofitable and very expensive to mine with hand tools. During this development there was discovered between this vein and the Summercamp stopes what is now known as the New silver vein, a distinct fissure, 3 to 15 ft. wide and with a reversed dip filled with very hard, blue silicious breccia carrying silver sulphides and pyrite, averaging 12 to 120 oz. silver and only $1 to $2 gold per ton, forming a new type of gangue. This vein has been opened at several points on the surface and down to the No. 4 level but its most important development is at the No. 8 level through the Summercamp crosscut from the old vein system where it shows its best size and values. It has been drifted on for 80 ft. and the face is still 150 ft. short of the fault. This ground has also proven too hard to work with hand tools. It indicates a reserve of ore aggregating several hundred thousand dollars in value above the 8 level, 400 ft. vertically under the surface.

Another vein on the south side of the fault is developed in the No. 4 Summercamp crosscut tunnel and is known as the "M" vein. It has been stoped for a distance of 100 ft. and has produced a small tonnage of pay ore carrying $15 to $20 in gold. Two hundred feet east of this point, also on the south side of the fault, the Cash vein, a vertical fissure was discovered by panning and trenching the deep surface débris that covers the mountain slope. These shallow developments south of the fault are indicative that the fault is a post-mineral movement.

The production of the Trade Dollar Consolidated Mines on Florida Mountain, five miles east of the De Lamar, came from a series of nearly vertical fissures. The two productive veins outcropped in a thick sheet of altered ryolite, passed through this into basalt and then into the underlying granite. Its orebodies extended for more than 1,000 ft. along the strike and were equally rich in all three formations but faded in the granite at 1,700 ft. At the 1,400-ft. level a parallel vein, known as

the Empire, that was never developed because of too low grade, has recently been picked up by the Florida Mountain Mines Co., now operating the property, and is exhibiting a shoot of high-grade milling ore. This enterprise is also being financed by oil men from Tulsa and Fort Worth and has recently shipped some high-grade concentrates.

Large Russian Iron Ore Deposits Thought To Exist

A large body of magnetic iron ore is reported to have been indicated in the neighborhood of Kursk in the boundary sphere between Russian and Ukraine territory. The discovery is stated to have been made by earth-magnetic observations and calculations. These had been in process, systematically, for the last 24 years, and had been carried out by Dr. Ernst Leyst, professor of geology at Moscow University. Professor Leyst died in 1918, but his papers on the subject, including a number of charts with data on his calculations, etc., have been preserved and sent to Sweden, where they are being examined by Prof. Dr. Valfrid Petersson at the High School of Mines, and H. J. H. Nathorst. Both have come to the conclusion that Leyst's data can scarcely be explained otherwise than that they indicate very large iron ore reserves. Nathorst maintains that they clearly have to do with two parallel bodies of ore striking northwest-southeast, and about 60 kilometers apart.

Melting Down War Scrap Found Dangerous

In the metal scrap shipped to Gäfle, Sweden, from the Baltic provinces during the early part of summer for smelting a quantity of live projectiles were found. After an exhaustive sorting of the scrap by order of the state explosives inspector a couple of thousand live shells were taken out to sea and sunk at a depth of 27 m.

Similar discoveries of live shells in consignments of scrap have been reported at other points in Sweden, in particular Stockholm and Värtan. This scrap is brought over for melting down at various iron works and several explosions have occurred through live grenades being placed in the furnaces.

Iron Mountain Project Deferred

The newly formed Iron Mountain Furnace Co. of Iron Mountain, Mich., on the Menominee Range, has decided to postpone the construction of a pig iron furnace and chemical plant until next spring. Several Michigan lumber concerns are to have an interest in the enterprise, in order to insure a market for part of their product, a great deal of wood being used in charcoal and chemical plants of the sort. The furnace will handle about 400 tons daily.

The new State School of Mines at Miami, Okla., will open on Sept. 13, according to Lloyd B. Drake, president. Classes will be held in the mining exchange building until the school building is completed.

Germany's Industrial Situation As Related to Coal Supply

Iron Ore and Coal Insufficient To Keep Industries Going

From Our Vienna Correspondent

German industry faces a triple problem. It must find work for the industrial population, which is 43 per cent of the total. Germany has lost 70 to 75 per cent of its iron ore supply and expects a delivery of only 6 to 7½ million tons (metric) of ore. This suffices to feed only three-fifths of the former number of smelters making pig iron and steel, and at the best can make but 12 million tons of iron or three-fifths of the amount formerly produced. For this there must be imported at least 12 million tons of high-grade foreign ore. In view of the high cost of getting out ore, however, at present one may count on a production of only 7 to 7½ million tons of pig iron. To work up this amount Germany will need about 2.6 million tons of Lorraine-Luxemburg minette, 2.7 million tons of Swedish, and 1.4 million tons of Spanish ore. With these amounts one can barely satisfy the minimum requirements of 600,000 tons monthly, or 7.2 million tons annually in iron wares. If the iron industry itself must pay for the imported ores then one-eighth to one-sixth of the manufactured product must be exported. Only such surplus as may remain after minimum demand and cost of ore are satisfied can be applied as payment for other imports or for reparation (reconstruction). There will not be available the quantity of iron and steel necessary for an actual reconstruction of Germany—shipyards alone require deliveries of 45,000 tons monthly. Thus the German iron industry will become, in great part, a refining business.

In 1919 the German coal production, including Upper Silesia, amounted to 108 million tons or but 57 per cent of the supply of 1913. This decrease will not be counterbalanced by the slight increase in brown coal from 87 to 94 million tons, since the poor condition of the mines and the inefficient workmen have reduced the quality of the bituminous coal 12 to 15 per cent. The calorific value of the total coal production, bituminous and brown, of Germany, aside from the Saar district, amounted to but 57 per cent of the pre-war value, and would have been but 47 per cent without the supply from Upper Silesia At the same time the mine consumption has risen, as has the amount assigned to the use of the personnel due to the increased number of mine workers.

The 1920 coal production may be estimated at 126 million tons, if no labor disturbances occur. Of this quantity, 70 million tons will be available for family, industrial and agricultural purposes. From October, 1919, to March, 1920, the limited total needs for all kinds of fuel for industry were met by only 57 per cent. Any further increase in coal production will be possible only if it is possible to restore the mines to their former technical level, and if sufferable accommodations are available for the newly employed workers. There is still needed, in all, about 150,000 more workmen.

Minerales y Metales Absorbed by Penoles Company

Former Gets 180,000 Shares of New Stock in Return for Holdings—Certain Oil Properties Not Included

An important operation in mining circles in Mexico is the practical absorption of the Cia. de Minerales y Metales by the Penoles Mining Co. At a specially called meeting of the stockholders of the latter concern at which 90,721 shares out of 129,000 shares were represented it was unanimously voted to increase the capital stock to 9,000,000 pesos, represented by 300,000 shares. Of this increase 180 000 shares were turned over to the Minerales y Metales stockholders in exchange for practically all the assets of the latter concern, with the exception of some oil properties, which remain with the M. & M.

Included in the transfer are the mining properties and smelter at Villadama, mines at Guanacevi, mines at Santa Eulalia and Avalos, mines and smelter at Cerralvo, smelter No. 2 at Monterrey, a large railway equipment and extensive holdings in real estate in various parts of the Republic The transfer also includes a controlling interest in the Paloma & Cabrillas Mining Co., 81 per cent of the stock of the Agujita Coal Co., Coahuila, 83 per cent in the Cia. Metalurgica of Torreon, 40 per cent of the stock of the famous Naica silver mines, and 50 per cent of the La Parrena group of mines. All these properties are in the north, mostly in the states of Chihuahua, Durango, Zacatecas and Coahuila. There will probably be no change in the management and policy of the Penoles, and the active work of development and exploration will be continued as at present.

Would Shut Down Zinc District for Week's Festival

The remarkable proposal that an entire mining district shut down its mines for a week to attend a "fall festival" was made at the Picher meeting of the Tri-state branch of the American Zinc Institute recently. It was argued that the shut down would be a good thing for the operators and a favor to the miners. No action was taken.

The festival is to be held at Baxter Springs, Kan., and will include the annual drilling contest. It has been announced that Carthage limestone will not be used this year for the drillers to work upon, but a special rock constructed of cement and "nigger head" boulders, which is expected to require more skill on the part of the drillers, and more time.

Lone Pine-Surprise Suit Begun in Spokane

Extra-lateral Rights Involved in Action Brought Against Northport M. & S. Company

The suit of the Lone Pine-Surprise Mining Co., of Republic, Wash., which has been brought to recover extra-lateral rights from the Northport M. & S. Co., began at Spokane recently. The plaintiff company is owned by the Day interests, of Wallace, Idaho. The property involved includes one of the prominent gold veins of the Republic camp. It is the contention of the Lone Pine-Surprise company that its Black Tail vein trends about half the length of the Lone Pine claim, then makes a sharp bend to the east and passes through the east side line of the Lone Pine claim into the Last Chance claim, where it is being worked as the Last Chance vein No. 2. The Northport company maintains that the Black Tail vein continues northward and that its vein No. 2 is a cross vein trending approximately at right angles to the Black Tail vein.

John Gray, of Coeur d'Alene, is attorney for the Lone Pine-Surprise company and W. E. Colby, of San Francisco, is handling the case for the Last Chance company. During the first two days of the hearing, Fred J. Searles, Jr., of Nevada City, Cal., and J. C. Ralston, of Spokane, appeared for the Lone Pine-Surprise company and William A. Simpkins, geologist, of San Francisco, for the Last Chance company. E. F. Babb and John Welty, original locators of the Black Tail vein, appeared and testified as to the continuity of that vein.

Recent Production Reports

Kennecott Copper produced 10,656,000 lb. copper in July (including Braden's output), compared with 10,120,000 in June.

Oriental Consolidated, Unsan, Chosen, reports its August cleanup as $75,500. The severe drought that had affected production is reported to be over.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Rolla, Mo., Gets Mississippi Valley Experiment Station

Will Co-operate With Missouri School of Mines in Studying Lead and Zinc Problems

Rolla, Mo., has been selected as the site of the U. S. Bureau of Mines experiment station, which will specialize in lead and zinc problems. The business office of the station will be located in St. Louis. The station will be known as the Mississippi Valley Experiment Station and will be conducted under a co-operative agreement with the Missouri School of Mines and Metallurgy at Rolla.

The exact problems which will be taken up at the new station will not be determined until the views of the lead and zinc operators are ascertained. Bureau officials will meet the zinc and lead interests of the Mississippi Valley in a conference at St. Louis on Oct. 9.

The statutory appropriation of $25,000 will be available for the new station. In addition, the Board of Curators of the University of Missouri will furnish, free, all the necessary office space at Rolla. Employees of the station will be given free use of the University's laboratories and libraries. The curators have agreed to include in their next legislative budget a sum sufficient to construct a new building especially designed to meet the requirements of the work of the station.

New Map of Arizona Offered for Sale

The Bureau of Mines of the University of Arizona at Tucson, in conjunction with the U. S. Geological Survey, has completed and is offering for sale a new map of Arizona. Special attention has been paid to designating the location of the several mining districts in making the map.

Relief Commissioners Disagree on Hanna Minerals Claim

Company Seeks Over Half Million—Pomeroy Would Award $229,603; Other Members Less

The feature of the work of the War Minerals Relief Commission during the week ended Aug. 28 was the disagreement of the Commission on the pyrites claim of the Hanna Minerals Co. This concern submitted a claim for $502,191.37. In the opinion of Commissioners Shaforth and Moore, the company is entitled to $140,397.48. Commissioner Pomeroy, however, considers that the company should have $229,603.21.

The Commission recommended an award of $600 on the $5,728 chrome claim of Gallagher & Grasselly. In addition, revised recommendations were made in several cases. The claim of Moore & Robinson had been disallowed, but on reconsideration, an award of $445 was recommended. This is 13 per cent of the amount claimed. The award of P. H. Bray was increased by $128.88, bringing the total award to $1,532.91, or 15 per cent of the amount claimed. Holbrook & McGuire were awarded $5,905.18 in July on their chrome claim. This has been increased to $7,216.85, or 46 per cent of the amount claimed. In June, a manganese claim by J. J. Cummings & Son was disallowed. On revision, $1,234.80 was allowed. The award was 15 per cent of the amount claimed.

The Commission continues to expect that its work will have been completed by Jan. 1. From present progress, however, it is believed that practically all of the important work will have been done by Dec. 1.

That the Relief Commission is a target for bouquets as well as for brickbats is indicated by the following letter from a claimant:

"As president and general manager of our company, I wish to express to you my thanks for the courteous treatment extended to our attorney and myself upon the several occasions of our meeting with you.

"The outcome of our claim has given relief without which our company would have been in a deplorable condition indeed. The amount received was less than the claim, but the ruling which eliminated the return of capital expended upon purchase of property and purchase of leases left you no alternative but to eliminate the large amount included in our claim. The latter we hope may be taken up at no distant date with the Secretary of the Interior as per his recent expressed willingness to do so.

"You expedited the settlement of our claim with all the speed at your disposal, and your departments throughout were most courteous and satisfactory to us."

Another letter received by the Commission in the last few days says:

"I received the registered letter from you recommending our award. I thank you very much for the recommendation, and even though we were out more than that, I feel that it is a liberal sum—a helping hand in time of need. There will be no objections. I write this as a letter of thanks and acceptance.

"Now, unless there is a certain rule and we must wait the twenty days, please have it sent me as soon as you can. The quicker I get it the more good I can do. I want to show some knockers around here that their Uncle Sam does treat us right, if we help in a pinch."

The Old Hickory powder plant near Nashville, Tenn., is to be sold. It was constructed during the war and is considered to be thoroughly equipped.

Mining Industry Needs More Aid From Government in Research

Knowing that plans are now being made for work during the next fiscal year, industries concerned with research and other functions of the Federal Government are calling attention to their particular needs. One of the insistent demands being made by the mining industry is for additional economic work on metal mining subjects. It is pointed out that the more easily obtained orebodies are being rapidly depleted and that future supplies must come from the poorer grades of ore.

The mines of the country are becoming so large that ventilation is demanding much more attention and, judging from correspondence reaching the capital, there is a very generally held opinion that the Federal Government is in a position to render valuable assistance in that particular.

No data are available on the exact effect of gases on the human system. It is known that the gases from explosives are poisonous but the degrees of poisonousness are not thoroughly understood. It is not even known in what concentration these gases may exist before they become dangerous to human beings. There is a determined demand for non-metals investigations, as well as for an enlargement of the Government's work on petroleum.

Rice Deplores Tendency To Increase State Taxes on Mines

A tendency to increase the state taxes which must be paid by the metal-mining industry is deplored by George S. Rice, chief mining engineer of the U. S. Bureau of Mines, who has just returned from a visit to the principal mining centers of the West. With the rise of agriculture in the metal-mining regions, the influence of that industry at some points has become predominant. As a result, the tendency has been to increase more and more the taxes which must be borne by the mining industry. It is Mr. Rice's opinion that, sooner or later, metal mining must receive every encouragement and the taxes levied should be, broadly, an output tax rather than one on potential reserves. It was Mr. Rice's observation that the gold-mining industry is placing very general reliance upon the passage of the McFadden bill, which provides a premium of $10 per oz. for the producers of newly mined gold.

One of the principal objects of Mr. Rice's trip was to explain the properties of liquid oxygen as a mine explosive. He believes that the metal-mining industry can effect important economies, under certain conditions, by substituting this explosive for dynamite. He calls attention to the observations of Dr. C. L. Parsons, the secretary of the American Chemical Society, who recently looked carefully into the use in Germany of liquid oxygen as an explosive. It is Dr. Parsons' belief that this explosive can be used to great advantage in this country. In Germany, Dr. Parsons found that it is being used successfully on small operations as well as in large mines. The Germans have developed machines for the making of liquid oxygen which can be placed on motor trucks and operated by the truck's engine. Machines of this character are made as small as seven liters an hour capacity.

Mr. Rice is very much impressed with the slime filling operations being used at Butte to extinguish the fire in the Leonard mine. He points with some pride to the fact that these operations are under the immediate direction of H. J. Rahilly, a former Bureau of Mines man. He also calls attention to the fact that the Anaconda company is making very effective use of the cement gun in combatting fire, a procedure recommended to the company by the Bureau of Mines. Mr. Rice predicts the successful outcome of the present campaign against the fire. He says the public does not take into consideration the many great expenditures on the part of the mining industry, of which this is an example. More than 200 men are constantly employed in this fire-fighting activity and the results obtained are considered satisfactory.

NEWS BY MINING DISTRICTS

MEXICO

Commission on Taxation Expected to Report This Month

Mexico City — There has been a marked improvement in mining conditions throughout the Republic during the last fortnight. The almost complete disappearance of brigandage, the advance in silver and the prices of various metals and the normalizing of the labor situation in most of the mining districts has brought a wave of optimism, rare for the last six years.

The increased consumption and advance in price of tin has resulted in the reopening of several properties in Jalisco, San Luis Potosí and Aguascalientes and by the end of the year a considerable export is expected. At the present there is a very slight import from the United States for home consumption.

The commission appointed by President de la Huerta to make a careful study into the mining situation with a view to reducing taxation along certain lines and suggesting minor changes in the mining laws is expected to make a final report early in September. The disposition of the government appears to lean toward any reasonable measures that will facilitate an early rehabilitation of the mining industry throughout the country. Already hundreds of small properties have begun work under the July decree cancelling fines and making special condition for back payments of taxes.

Zacatecas

Unusual Activity Noticeable in Zacatecas Camp

Zacatecas—The old camp of Zacatecas is waking from its Rip Van Winkle sleep and is taking on real activity for the first time in years. It is likely that hydro-electric power will shortly be brought into camp from the falls of Juanacatlan, in Jalisco. Local mine owners have guaranteed sufficient consumption to warrant the transmission and installation and the Federal government is also assisting the project, which means a great deal not only to Zacatecas district but to many intervening camps.

The San Cristobal is in process of reorganization preparatory to remodeling its mill and unwatering and operating its properties, which have been idle for eight years.

The Puerto Rico properties have been optioned and an examination is going on.

The San Andreas Panuco district, a short distance north of Zacatecas, has been sold to foreign interests, who are unwatering and shipping high-grade ore to Torreon.

The Penafiel property, also in the Panuco district, has erected a new hoisting plant and is preparing to work the mine with a large force.

The Providencia and Buena Suerte both erected new hoists and are taking out ore.

San Manuel is shipping high-grade ore to the Minerales y Metales at Torreon.

The old Veta Grande is at work again, mining above water in a strong silver and lead vein and shipping to the A. S. and R. Smelter at Aguascalientes.

The Parroquia mine, belonging to the estate of the late Frederick Palmer, now managed by Captain Barrett, is making a good production. The estate has also acquired the Magistral group and other adjacent properties.

The San Roberto, of which C. A. Bentley is manager and half owner, is making heavy shipments of zinc ore and also sinking a main shaft an additional hundred feet.

A. F. Main, of the Cia. de Inversions de El Oro, has taken an option on Los Campos properties east of the San Rafael and intends to unwater and

examine. Los Campos properties have been idle for over 30 years. Mr. Main has also taken options for his company on the Victoria and San Bernabe, within the city limits.

La Fe is making preparations to move its 300-ton mill about 15 leagues from its present property and has under consideration the erection of a large mill of 2,000-ton daily capacity to exploit their new purchases in that section.

Labor conditions have become practically normal throughout the entire district, and plentiful. There have been no strikes or unrest for several months. Railway facilities continue to be the principal drawback to extensive work and some of the important companies are attempting to acquire rolling stock of their own.

Oaxaca

San Juan Property Down Temporarily

The San Juan, which recently resumed work, has temporarily closed down because of its head frame collapsing.

The Natavidad Company, in the Sierra Juarez, is actively engaged in repairing its plant and expects to be in full blast by the end of October.

Several smaller mine owners in the Tavichi district have returned since the advent of the new government has restored peace and expect to begin operations before the end of the year.

CHILE

Santiago—A powdered-coal-fired reverberatory has recently been installed by Cia. de Minas de Cobre de Gatico. This furnace has a bed 80 ft. long by 18 ft. wide and is operating successfully on Chilean coal. About 200 tons of cold charge, it is said, is being smelted per day. One ton of coal is consumed for five tons of charge smelted.

CANADA

Ontario

Kirkland Lake To Deepen Main Shaft. —Financing the Davidson

Porcupine—The success of the arrangement for financing the Davidson Consolidated in England depends upon the willingness of the shareholders to option 50 per cent of the stock now in their hands to the new English interests. There has been some misapprehension as to the effect of this proposition, some shareholders objecting to the idea of a pool under which they would be unable to take advantage of market fluctuation. President G. C. Crean has issued the following explanation of the proposed transaction.

"The offer which was made by the English interests and which was communicated to the shareholders was as follows: 'The English syndicate would purchase 1,500,000 shares of treasury stock at a price of 75c. per share net to the company, amounting in all to $1,125,000, on condition that they could secure an option on 2,000,000 shares at present in the shareholders' hands; the treasury stock to be paid for on or before March 31, 1921, and the option on the shareholders' stock to remain in force until nine months after the first 500-ton unit of the mill is completed, but in no case to exceed a period of two years.'" President Crean points out that every shareholder will have to option 50 per cent of his holdings, leaving him free to dispose of the remaining 50 per cent should he care to do so. A refusal on the part of the shareholders to option their stock would mean that the offer of the English interests to put money into the company could not be accepted. The company is dependent on the securing of this money, and failing the same would have no other alternative than to assess the shareholders to provide for building the mill and carrying on development.

The **Clifton** will be extensively diamond-drilled in order to ascertain the extent of the continuation of orebodies opened up in the workings.

Kirkland Lake—The Kirkland Lake plans to sink the main shaft situated in the center of the property down to the 700-ft. level, where connections will be made with No. 1 shaft now down 919 ft., making the drift on the 700 ft. level the main haulage way for all ore broken between the two shafts. Raises will be made from the 700 ft. level and ore mined on the upper levels passed down to be trammed to the main shaft. The rock formation at 900 ft. depth is similar to that occurring on the upper levels. Total operating costs have been reduced to $6.21 per ton.

Sesekinika Lake The Height of Land Gold Mining Syndicate has been formed to operate two groups of claims, one block of eight being on an island in Sesekinika Lake and another group of eight claims lying at the corner of Benoit, Melba and Maisonville townships. A force of men has been engaged and camps are being constructed.

Wolfe Lake—The Lakeview has finished the building of camps and done considerable surface work. A mining plant is being brought in and sinking will be undertaken in the hope of striking a continuation of the Murray Mogridge vein.

Gowganda—At the Trethewey a shaft is being sunk on the "office vein" which faulted at a depth of 34 ft. but was picked up by crosscutting and high-grade ore taken out. The main shaft has been carried down to the 150-ft. level where a crosscut has encountered three new veins.

British Columbia

Nelson Remodeled and with more equipment, the California-Athabasca mill, situated on Give Out Creek above Nelson, has started operations after three trial runs. The plant will treat the ore of the California now being developed by the California mining company, of which John Cassin, of Spokane, is head.

Trail—Ore shipments received at the Consolidated smelter during the week ended Aug. 31 were as given in the following table:

Mine	Location	Gross Tons
Bluebell,	Riondel	156
Canada Copper,	Greenwood	11
Iron Mask,	Kamloops	83
Josie,	Rossland	296
Mandy, Le Fas,	Man.	372
McKay & Erickson,	Mayo, Y. T.	3
Monarch,	Field	37
North Star,	Kimberly	251
Sally,	Beaverdell	45
Providence,	Greenwood	72
Skylark,	Greenwood	16
Silver Standard,	New Hazelton.	41
Venus,	Carcross, Y. T.	20
Company mines		9,854
Total		11,257

The gold receipts at the Dominion of Canada assay office, Vancouver, B. C., from January 1 to July 31, 1920, total at $1,073,451.17. From April 1 to July 31, 1920, they aggregated $819,216.72, or about $200,000 per month for the four months of the fiscal year 1920-21.

SMELTER AT CIA DE MINAS DE COBRE DE GATICO, CHILE. NEW COAL-FIRED REVERBERATORY IN FOREGROUND

CALIFORNIA

Lack of Power Hampers Mother Lode Operations—Paxton Discusses Conditions at Engels Copper

Sutter Creek—Mining operations along the Mother Lode are seriously hampered by lack of power. All the companies have been compelled to reduce their power consumption materially. At the Central Eureka mill only twenty stamps of the forty are dropping, and that number for only sixteen hours out of the twenty-four. Other electrically driven machines about the mine have also been put out of commission in whole or in part, until such time as additional power can be obtained. Without early rains this condition may exist for some time, and at those mines which are barely meeting expenses or running on assessments the situation seems serious.

Despite adverse conditions the Central Eureka is continuing development on the 3,900 level. A crosscut west from the shaft located a good orebody and indications are that it has both permanency and value.

Volcano—Work on the debris dam half a mile from this old mining camp, in preparation for extensive hydraulic operations by the H. L. Crocker Co. of San Francisco, is nearing completion. Besides the Elephant deep gravel mine, the company has options on several pieces of property in the district. The dam is being constructed of stone and earth and will be about 30 ft. high and 429 ft. long. The debris will be carried to the dam by a flume about 700 ft. long. A spillway 125 ft. long north of the dam has been completed.

Nevada City—Howard M. Black and associates are engaged in opening up a small gravel mine near the Parsons ranch in the Banner section. A tunnel has been driven and upraises are being put in to intersect the true channel. A form of gravel has been encountered and it is hoped to find the pay channel believed to exist there. Several years ago about $10,000 was taken from a small deposit of gravel discovered on the property.

Marysville—P. F. Roosa, of Washington, D. C., was in Yuba County recently obtaining records of chrome production during the war. When these reports are filed in Washington, action will be taken on reimbursing producers for the chrome ore they were unable to sell after the armistice.

Englemine—General Manager Paxton, of the Engels copper mine, has made the following report concerning operations and developments at the mine: "The Engels copper mine today has enough high-grade ore in one solid block, actually proven, above the 6th level in the Superior mine, to more than pay for, at the present market price, all the company's stock now in the hands of the public. In spite of the labor shortage, which has been acute, we have added half a million tons to our proven ore reserves, since January 1, and should operating conditions not improve, we confidently expect to add another million tons to our blocked out reserves before the end of the year. Development of the Engels is proceeding most successfully. We have sunk a shaft 200 ft. to level No. 7, and are developing the ore in this large body of high grade. It is between No. 6 and No. 7, that we propose to block out the extra 1,000,000 tons before the close of 1920. We have drilled 400 ft. below level No. 7 and have cut considerable orebodies at this depth."

There are now twenty copper mines and prospects being operated along the Plumas copper belt, with the Engels and the Walker as chief shippers.

Portola—The Gruss copper mine now has its mill in operation and developments are being pushed with increased efforts. H. W. Turner has just completed his report on the results of his examinations of the Gruss property, in the interest of local financial men. It runs in part as follows: "In the report no mention is made of the reserves of oxidized gold ore, which were not examined. Attention was given only to the sulphide ores of the underground levels, which are suitable to be treated in the present oil-flotation concentration plant. More recently a new shaft was sunk to the depth of 400 ft. Connection was made with the old 90-ft. shaft (70 ft. down in the new shaft) and levels were run at 200 and 400 ft. In all of this lower ground the ore is largely unoxidized and consists of copper sulphides, bornite, chalcopyrite, and chalcocite with gold and silver. Practically all of this ore is found in the footwall rock, a kind of porphyry, technically called meta-andesite. The main vein is known as the Contact vein, since it lies at the contact of porphyry and clay slate, the porphyry forming the footwall and the clay slate the hanging wall. The strike of this main vein is northwesterly and the dip southwesterly. No attempt was made to sample the mine as a whole, but sample of 400 sacks of mill-feed ore taken from the raise on the 20-ft. level gave the following assay per ton of ore: Copper 2.96 per cent; gold 0.05 oz.; silver 2.85 oz. The superintendent is of the opinion that he can extract sufficient mill-feed of about this grade to keep the mill in continuous operation."

Golden Gate—The Golden Gate mine in Mono County, Cal., nine miles from the Nevada line, has recently been taken over under bond and lease, with the usual cash payment, by Wade Armstrong for the Diamond Peak Mining Co. This is the twelfth time since 1901 that the Golden Gate has been "turned," a substantial cash payment having been made and considerable development done in every case by the intending purchaser, but eleven deals failed of consummation and the property reverted to the owner, Joe Brown. Development to the extent of a mile of tunnels, drifts, crosscuts and shafts have been done on the mine, and it is equipped with a 20-stamp mill. The ore carries gold values and is free milling.

Grass Valley—With the exception of the Empire, all of the mines here will be able to keep virtually their full forces employed, despite the power restriction, providing the period of curtailment is not too long. The North Star and Idaho-Maryland will use the extra labor at work not requiring power. The Empire has laid off about 150 men, but may be able to recall some of them later on. Partial assurances are given that the 20 per cent restriction will not extend beyond one month.

NEVADA

Rochester Plants Expected to Resume Soon—United Comstock Active at Gold Hill

Tonopah—The Tonopah Extension's work of sinking its Victor shaft to the 1,860 level has been delayed for the past several weeks on account of a lack of experienced miners, but work has now been resumed. Crosscutting from the McCane shaft, in the 1,200 level, to the No. 2 shaft workings has been started. About 500 ft. of work will be required and then shaft sinking will be started.

Development for August in the West End totaled about 600 ft. with no new discoveries of importance reported. Crosscutting in the Tonopah "76" ground is being done at the rate of about 120 ft. per month with no change in formation as yet, which is favorable. Profits of the West End for July are announced as $48,803.17 from 4,039 tons of West End mine ore and 526 tons of Jim Butler Lease ore.

In the Tonopah Belmont good ore is being followed in a foot-wall drift under the Belmont vein on the 1,200 level. Normal development work was accomplished on levels from the 700 to the 1,200, with no new discoveries satisfactory results.

The Tonopah Mining Co. shipped 1,450 tons of ore to the Millers mill last week, and 109 ft. of development work was performed last week in the Silver Top and Mizpah ground, mostly in the latter.

Active work is being performed in the California Tonopah, in the southeastern portion of the district, and considerable ore of good grade has been developed above the 700 level in narrow veins. A winze is being sunk from the 700 level and crosscutting will be done from the 900 under favorable conditions.

Divide—Recent developments in the Divide district have stimulated interest in the entire Divide district. Official statements are to the effect that drifting and crosscutting on the 165 level are producing very satisfactory results. The vein has been proven to have a width of 17 ft., with an average value of $25 per ton in these latest workings. The shaft is now 1,000 ft. deep and after sinking an additional 25 ft. or more for sump purposes crosscutting south to the vein is to be begun. The work from this level is of utmost importance to the Tonopah Divide mine and to the Divide district as a whole. With no deterring factors the crosscut should

reach the projected position of the vein, which is practically vertical and was reached at about 150 ft. from the shaft on the upper levels, in about two months. Regular shipments of about 30 tons per day are being made to the MacNamara mill at Tonopah, the ore averaging about $25 per ton.

The Brougher Divide, to the west of the Tonopah Divide, is doing work on the 500 level, and occasional bunches of ore have been encountered.

The Gold Zone, on the southeast extension of the Divide vein, are crosscutting on their 700 level to cut the downward extension of the ore shoot as followed downward in a winze from the 500 level.

Pioneer—The Consolidated Mayflower Mines Co. are sampling the Mayflower and Starlight orebodies with the idea of estimating ore reserves and as a basis for future development.

Gold Hill—The new boarding and bunk houses of the United Comstock Mines Co. are nearly completed. A large force is employed and Gold Hill, which is close to Virginia City on the Comstock lode, is assuming some of the old-time activity. A new headframe has been built and a new compressor house is going up at the Belcher shaft. At the Jacket, the company will house the compressor and is crosscutting from the shaft to the headings for the haulage tunnel. At the Imperial, it is planned to resume shaft sinking. Crosscutting is continuing here.

The Virginia & Truckee R.R. Co. is figuring on cementing the Yellow Jacket tunnel through which the road passes between Gold Hill and Virginia City. If this is decided upon a cement gun will be used, this being the most practicable method.

Ione—Work has been resumed by the Nevada Quicksilver Mines Co. near Ione, 60 miles south of Austin. This property, which has been idle two years, is said to have a production record of 5,000 flasks and to have ore sufficient to keep the 50-ton furnace busy for some time.

Rochester—The Lahontan reservoir is filling and water will soon be available for generating electric power. It is expected that the mines and mills at Rochester and Packard will be able to resume operations soon.

Jean—Important disclosures of vanadium are reported from the Christmas Consolidated mine, nine miles southwest of Jean. It is said that offers have been made both for the ore and for the property.

Eureka—A new orebody has been opened up in the Eureka Holly mine from which shipments at the rate of 200 to 300 tons per month are being made except when there is a shortage of railroad cars.

The Ruby Hill Development Co. has over 800 tons of ore in bins and plans to ship regularly if cars are provided. Unwatering of the Locan shaft is progressing.

Mina—Demonstrating the continuity of the hanging-wall orebody from the 6th to the 7th level in the Simon Silver-Lead mine and indicating that the present ore reserves of approximately 500,000 tons will be almost doubled, the recent strike of high-grade milling ore in that mine in the raise driven from the lowest level has aroused much interest in the district. Engineers estimate that there has now been added more than 150 ft. of backs available for stoping operations. Ore has been followed in the raise for approximately 100 ft. Work is under way on the plans for the new 100-ton flotation mill. The millsite has been surveyed and mapped and engineers are now examining the footwall territory adjacent to the mine with a view to selecting the spot for the new working shaft.

ARIZONA

Arizona Bisbee Offering New Stock—Little Activity in Empire District

Bisbee—The Arizona Bisbee Copper Mining Co. is continuing drifting on its 400 and 600 levels. Both drifts are in a hard blue limestone with occasional stringers of iron oxide. It is expected that the faults toward which these drifts are advancing will soon be cut. About 20,000 additional shares of stock are being offered to the public at 50c. per share. The property is located about two and one-half miles west of the Whitetail Deer country in which several lessees are operating.

The Wolverine & Arizona has temporarily shut down underground operations. Repairs are being made to its hoisting equipment and compressor.

The sulphide ore recently struck by the Boras Leasing Co. is continuing. The width of the ore is about 12 ft. Development work has not gone sufficiently far to determine its length.

Empire District—There is now practically no work going on in the Empire district, which is located in a spur of the Santa Rita Mountains about half way between Benson and Tucson. The Hilton brothers are producing a small amount of lead-silver ore from their property. The Forty-nine mine was closed down four weeks ago. The Total Wreck is the largest mine of the district with a production of about $450,000. It has not been worked for over ten years.

Phoenix—It is claimed locally that the "Lost Dutchman" mine of the Superstition Mountains has been rediscovered. A property thus dubbed has been located around an old shaft that was found covered with mesquite timber, this spread with rock and dirt to obliterate all evidences of mining. At 100 ft. depth, it is claimed, a ledge has been found showing ore worth $400 a ton. The ore, it is said, is to be packed on burros to the Roosevelt road and shipped from Mesa station.

Globe—The El Paso Iron & Bridge Co. is completing construction of a large head frame at the upper shaft of the Arizona Commercial.

New Dominion is said to have financial backing in New York and is to sink its shaft to 1,200 ft. from the present 800-ft. level.

Douglas—The Hilltop mine in the Chiricahuas has developed a large tonnage of shipping ore, but operation is hampered by a labor shortage.

Superior—Magma Copper has further increased its large local holdings by purchasing the Easton and Smock group on the west and the Superior-Safford group on the east.

Jerome—Cores from drillings from the 1,300 level of the Verde Combination at 450 ft. of depth are showing ore well shot with chalcopyrite.

Encouraged by the Shea strike, the directors of the Pittsburgh-Jerome have instructed Charles Arata, the superintendent, to resume diamond drilling. A hole from the lower workings is to be completed and then there will be started a 2,400-ft. hole from the surface.

Miami—At a sheriff's sale, on a single bid of $300,000, the Cactus copper property has been bid in by the Susquehanna Trust Co., which holds a mortgage claim upon it for $390,000. The group of four patented and many unpatented claims lies in the Pinto Creek section, west of Miami. It has had much development, including churn drilling, and it is understood some commercial ore has been found. At one time the stock was quoted at $10.

Gila Bend—The Rowley property on the Gila River northwest of this point, has been closed, pending installation of needed pumping equipment.

NEW MEXICO

Freight Increase Stops Manganese Ore Shipments from Stevens Property

Silver City—Shipments of low-grade manganiferous ores from the Stevens property have been stopped, the increase in freight, which amounted to $2.20 per ton, having absorbed all the profit. An effort will be made to have the old rates re-established. M. W. Porterfield, who has been in charge of operations, is in Chicago in an effort to get relief. Shipments had been running about 350 tons daily to the U. S. Steel Corp. in the Pittsburgh district.

The Silver Spot mine shipped a car of good-grade manganese ore on July 28 making 7 cars shipped in 60 days.

Work of installing the new cyanide mill at the Cora Miller mine in the Mangas Valley is progressing satisfactorily. Milling operations are expected to begin about Oct. 1. Two 60-ton redwood tanks, a number of smaller tanks, engine beds, buildings and residences are completed.

Torbernite ore is reported to have been found in the Lucky Bill mine of the Black Hawk Mines Co. at Bayard Station in the Central district.

Pinos Altos—The Mexarco Mining Co. have leased their Langston property to the Hecla Mining Co. a new organization, not to be confused with a company of the same name owning property in the Lordsburg district. Work will start at once.

Kingston—The Lady Franklin group is being operated by Minor C. Keith and associates of New York, under the direction of W. H. Paul. About 20 men are on development work. Some shipments of silver ore have been made recently to El Paso smelter.

Empire Zinc is working a large force on development work under C. T. Brown. New machinery has been installed recently.

On North Percha Creek, the Moffett Consolidated Mines are continuing their development with encouraging results. An air compressor, drills and 60-hp. gas engine are being installed. The same company owns a group of copper claims 15 miles north of Elephant Butte dam, where work will be started soon. A mill is planned.

Chloride—Silver Mountain Metals Co. claims to have shipped $10,000 silver ore to El Paso smelter recently. Old concentrator on the property has been repaired and will be put in operation soon. John H. McCutcheon is manager.

The old Colossal has been equipped with new machinery by Albuquerque parties who are figuring on a mill at an early date. Both the Midnight and the U. S. Treasury properties are working.

Lordsburg—The Ruby Silver Mining Co. has been reorganized with an authorized capital stock of 500,000 shares of a par value of $1. L. P. McHalffey, a local attorney, is president. The property has been paid for and work will again be pushed under the new management. Development to date consists of three shafts, 220, 150 and 40 ft. deep respectively, all showing some ore.

The main shaft of the C. & A. Mining Co.'s 85 mine is down 960 ft. It is locally reported that good ore has been cut with the diamond drill at 1,700 ft. from the surface. K. I. Mohler is superintendent.

The Octo Mining Co. is working 60 men and pushing the exploration cross cut, which at 70 ft. from the shaft has encountered ore and water. The main shaft is 325 ft. deep. New residence buildings are being erected.

COLORADO

Test Run To Be Made at Pony Express Mine at Ouray—Senorita Mine Sold

Ouray—The Eurades Mining Co. has built a large food cellar and is now doubling the capacity of the bunk house; they plan to carry on the active development work now in progress, throughout the winter, drifting and raising, and expect to employ forty men. Several carloads of food are on the way.

The Senorita mine, north of Ouray, has recently been sold to outside people represented here by Mr. Myers. A contract will be let for continuation of the lower tunnel to develop the main orebody. Meanwhile, the dump has been sampled and tests of a new process of treatment have been made in Denver; these tests are said to have yielded excellent results and it is Mr. Myers' intention to erect a treatment plant on the railroad below the mine in the near future. The new process involves roasting with reagents and cyaniding.

A test run is to be made on the Pony Express mine by C. R. Wilfley for Delta people. A hundred tons of ore is to be mined by hand, hauled to Ouray by wagon, and run through the Gold Crown flotation mill. This, while expensive on a small scale, will determine thoroughly the average value of the large low-grade orebody developed in the Pony Express mine, and at the same time give a fairly good idea of the possibility of treating the ore by flotation. If the test shows good results, a mine plant will be installed and milling undertaken at the Gold Crown mill. A mill will be erected at the mine if this venture proves successful. For the second stage, regular milling at the Gold Crown mill, it is expected that bids will be asked for hauling the ore by auto truck.

The Hidden Treasure mine continues to ship lead-silver ore to town for shipment to the smelters. Considerable ore was accumulated at the mine last winter while the roads were impassable and it was announced that this ore would be shipped rapidly when the roads opened, while plans were also made for erecting a small mill at the mine. Much of the shipping ore remains at the mine and nothing has been done in the way of a mill.

Davis & Hall, working a portion of the Bi-metallist, have opened up some excellent high-grade gold ore. This property yielded $50,000 very quickly and cheaply a few years ago, in high grade gold ore, and has excellent possibilities.

The new freight rates will work a great hardship on this district—in fact, some mines are already seriously considering a shut-down.

UTAH

Ophir Tunnel Face in Mineralized Ground—Silver King Coalition in Promising New Ground

Ophir—The tunnel of the Ophir Silver Mines is in 700 ft. This is being driven to cut at depth the ore-bearing limestone of the district. Silver mineralization is beginning to show as the work approaches the contact. Considerable water is coming in.

Park City—At the Silver King Coalition, exploration in new ground promises a productivity equal to that of the older portions of the property. Developments between the 1,300 and 1,500 levels would appear to indicate that the new shipping ore opened in the O'Brien fissure in the "Blood" drift on the 1,100 level is persistent. The showing in the "quartz" drift on the same level is equally promising, it is said. Ore has also been opened near the Brown raise between the 1,200 and 1,300 levels, which appears to be a continuation of the old "Copper stope" orebody, productive of a large tonnage of specially high grade copper-silver ore in early days.

Eureka—Shipments from the Tintic district for the week ended Aug. 28 amounted to 141 cars as compared with 121 cars the week preceding.

Silver City—The Tintic Milling is preparing to add to its present source of water, which is supplied by the Chief, by taking water from the Ruby Hill shaft of the Tintic drain tunnel also. The new system of sluicing instead of tramming the tailings on to the flat below the plant requires more water than formerly. About 200 gal. per minute is being used.

Alta—The Columbus-Rexall between June 4 and Aug. 31 shipped 44 cars of ore, amounting to about 1,500 tons dry weight. Present shipments amount to three cars a week, and could be considerably increased if more labor were available. The company reports two promising oreshoots opened recently, the development of which, however, is being held back by labor shortage.

MONTANA

Anaconda Adds Lead Stack at Great Falls Plant

Butte—The addition of a lead stack is one of the latest improvements at the Boston & Montana smelting works at Great Falls, one of the old copper reduction works' stacks being remodeled to effect a saving of the lead content had from the residue from the electrolytic zinc plant. The recovery of the lead will be confined to chiefly the company's own ores and will add considerable to the recovery of values from zinc ores, which are running fairly well up in lead, particularly the ores from the Nettie mine, in the western part of the Butte district and from the Hibernia of the Davis-Daly. This will be the first saving of lead in the Montana plants of the Anaconda.

The No. 2 shaft at the Black Rock mine is now well below the 2,300-ft. level and the sump will be completed within a short time. From the 2,300 level a crosscut will be driven to a point under the No. 3 and a raise then driven to connect with the latter, the principal working shaft of the mine. This will bring the No. 3 shaft to the 2,300-ft. level without any interference with the hoisting of ore or the maintenance of tonnage.

Ore is mined by East Butte Copper on practically all levels of the Pittsmont mine at present, with new ore being developed on the 1,800-ft. level in a satisfactory manner. It is expected to push development on this level within a short time, a heavy flow of water from the face of an ore-bearing vein opened some time ago interfering with work to such an extent that it was considered more economical to delay operations and permit it to drain itself. East Butte's Pittsmont smelter for the first seven months of the present year has turned out 10,446,700 lb. of copper as compared with 10,359,260 lb. in the corresponding period in 1919, with production costs reported to be a shade under those for the previous year, when they averaged 16.69c. per pound of metal.

Working force at North Butte's Sarsfield property on the east side is being increased and the showing bad on the 900-ft. level is said to warrant the continuation of development. Cross cut-

ting continues on the 3,600-ft. level of the Granite Mountain mine with the Edith May vein the objective. Completion of repairs to the Speculator shaft has enabled a resumption of development work on the 700-ft. level together with mining operations. The showing of the Adirondack vein on the 2,200-ft. level is proving somewhat of a disappointment, but there appears to be promise of some improvement with drifting. The North Croesus vein is showing an improvement with depth, a wider and higher grade orebody being found on the 2,800-ft. level as compared with the 2,200. Owing to the poor supply of experienced miners and the unsatisfactory condition of the market, work at the Bertha mine has been temporarily suspended.

Jardine District—Fifty stamps are dropping in the Jardine mill, treating daily about 250 tons of sulphide gold ore. This is the largest operating gold mill at the present time in Montana. Jardine is six miles from the north gateway of the Yellowstone National Park.

Cooke City—A fleet of 21 trucks is hauling ore from the Republic company's properties to Gardiner, Mont., where it is loaded on railway cars.

Neihart—An electric hoist has been ordered by the Flohart company. A good ore showing is reported.

Lump Gulch—Ore opened some time ago on the fifth level of the Free Coinage, showing high silver content, is reported to be widening both east and west with drifting operations.

WASHINGTON

Orient—A large oil engine is being installed at the Galena Hill mine to replace the steam equipment now used. A 5-drill compressor is also being added. A raise is being driven at 80 deg. from the 300 level to the surface and when completed will be used as a new central shaft for deeper development work.

ARKANSAS

Big Hurricane Near Pindall To Increase Output—Development To Be Resumed at Lonnie Boy

Rush—The McCargar Mining Co., under the management of D. J. McCargar, has started another opening on a carbonate outcrop on its lease at Rush. The new work is close to the White Eagle line.

Pindall—The Big Hurricane zinc mine near Pindall has been operating steadily this year. J. C. Shepard, the owner, is in charge. Tonnage has been curtailed owing to the low price of ore, but preparations are under way to run at full capacity.

Flippin—Nishwitz Bros. are pushing development work on their property on Bull Mountain, six miles northeast of Flippin, where there is a good face of jack in an open cut. Several thousand tons of mill ore are on the dump. A mill will not be built, however, until development has progressed further.

Rush — Development work at the Lonnie Boy will be resumed at once.

TENNESSEE

Tennessee Copper Experimenting With Underground Mechanical Loaders

Isabella — The Ducktown Sulphur Copper & Iron Co. has almost completed the first 300-ton unit of its new flotation plant at the Mary mine, at which differential flotation is to be used. It is anticipated that, if the grinding mills that have been ordered are received in time, the test run will be made during the autumn.

Copper Hill—The Tennessee Copper & Chemical Corp. has purchased two mechanical loaders for experimental purposes to be used in the Burra Burra mine. One of them, a Myers-Whaley shovel, has already been received and is now at work. The only difficulty noted so far has been that of getting a stope large enough to keep the shovel constantly employed. The other machine is a type O, full-circle-swing Thew shovel with a ¾-cu.yd. dipper. This has not been delivered yet. The existing shortage of labor is responsible for the company taking this step.

JOPLIN-MIAMI DISTRICT

Oklahoma-Missouri-Kansas

Laclede Lead & Zinc Co. Opens Another Lead Cave

Tar River, Okla.—At the Laclede Lead & Zinc Co.'s property north of Tar River, Okla, one of the largest and richest watercourse lead caves ever discovered in the Oklahoma field is now being worked. With only twenty-nine men the company turned out 100 tons of lead during the last week, virtually all of it coming from this cave. From a spectacular standpoint, the cave is not as beautiful as some others that have been discovered in the Oklahoma field, as the ore is quite generally covered with a sediment. But investigation reveals that the sides and roof are almost solid lead ore. The cavity is approximately 40 ft. wide, 70 ft. long, 8 or 10 ft. high.

MINNESOTA

Mesabi Range

Federal Consolidated Resumes at Ajax —Winston-Dear Stops 300-Ton Shovel Until Frost

Hibbing—Clement K. Quinn and associates have taken an option on five forties near Nashwauk and adjoining the Shada No. 2 now controlled by them. The property is understood to be a wash proposition owned by the Landon-Warren interests, of Minneapolis, and exploration is now going forward.

The 300-ton shovel operated by Winston-Dear in the Boeing pit of the Mesaba Cliffs Iron Co. has been forced to cease operations because of a pocket of very treacherous muskeg encountered. The shovel will remain in position and resume operation as soon as the frost has made firm footing.

Chisholm—The Billings mine of the Tod-Stambaugh Co. has reduced forces until but ten gangs are now at work. A small shovel is at work loading out last winter's stockpile.

Biwabik—The Federal Consolidated Mining Co. has started to resume operations at the Ajax mine. The Ajax has shipped 207,000 tons of high-grade non-bessemer ore during its career but has been idle for a number of years. A shipment of 25,000 tons is expected during the present season.

Cuyuna Range

Coates & Tweed Purchase Ida Mae Stockpile—Northland Mine Shut Down

Riverton—John A. Savage & Co. has resumed hydraulic stripping of overburden at its Sagamore mine, a manganiferous iron ore property. Following early experiments with the hydraulic giant on starting stripping operations last year this method was abandoned and a contract let for stripping by dragline shovels. A dragline shovel is now being used in loading ore. The overburden includes a heavy covering of muskeg. Plans are being made for erecting a drying plant to treat all ore from the pit.

Ironton—The Cuyuna-Duluth mine, operated by the American Manganese Manufacturing Co., is shipping 8 to 10 cars per day. Slicing above the 280-ft. level is rapidly being completed and drifting and raising on the new 340-ft. level is well advanced. The pump station has been completed and a triplex electric-driven pump installed. Operators are planning to use electric haulage on the new levels. At the instigation of the county mine inspector, G. A. Swanson, the Bonnie Belle mine, operating on the next forty west, is sinking a winze from its 193-ft. level, from which connection will be made to the Cuyuna-Duluth 280-ft. level, improving air and safety conditions.

It is reported that Coates & Tweed of Duluth have purchased the stockpile of the Cuyuna-Minneapolis Iron Co., at its Ida Mae mine and will ship same at once. There is in stock about 18,000 tons of 15-per cent grade manganiferous iron ore, low in moisture and silica. The property is not operating, having pulled its pumps July 17 after small scale operation last year through the past year.

Cuyuna—The Northern Minnesota Ore Co. has suspended operation at the Northland mine, having bulkheaded the drifts and pulled the pumps. The property, opened up for managanese during the war, has not been operated since last fall. The company has recently purchased a high-grade manganese property near Cushman, Ark., from Walter H. Denison and T. F. Snell, and will devote its efforts for the present to continuing hand mining and exploration with a view to possible larger scale operation of the new property. A. K. Knickerbocker, formerly superintendent at the Northland mine, will have charge of the operation of the Arkansas property.

Nearly all operators on the Cuyuna Range report a small shortage of labor, and several of the open pits are seriously handicapped in keeping up their production average.

THE MARKET REPORT

Daily Prices of Metals in New York

Sept	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
2	18.00@18.35	42.50	45.25@45.50	8.50	8.50@9.00	7.75@7.80
3	18.00@18.35	42.50	45.00@45.50	8.75	8.50@9.00	7.75@7.80
4	18.00@18.35	42.50	45.00@45.50	8.90	8.50@9.00	7.75@7.80
6						
7	18.00@18.35	42.25	45.00@45.25	8.90	8.50@9.00	7.75
8	18.00@18.35	42.00	44.75@45.00	8.90	8.50@9.00	7.75

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price, to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
2	95⅛	96⅜	111	269	276	36½	36⅝	38½	40
3	95¾	97	111	267	274½	36½	36⅜	37¾	39½
4	....	....	....	....	....	....	....	....	....
6	95¼	96¼	111	267	272½	36¼	36¼	38¼	39¾
7	95	96	111	264½	270½	35⅝	35½	38⅛	39¾
8	96¼	97¼	111	266	272¾	36⅛	36	38¾	40⅛

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver			Sept.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
2	356	99½	93½	58½	6	....	....	....	60⅜
3	355	99½	94	59	7	354	99½	94½	59½
4	355	99½	94⅞	60⅛	8	353½	99½	94	59

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Sept. 8, 1920

Unusual quietness is the dominating characteristic of the metal market, all the metals apparently feeling the effect of a holiday week. Price changes from the preceding week have been small, and the unimproved London market is still depressing the metal market here. If any improvement is to be noted it was indicated by a slightly improved buying by the copper trade.

In general the buyers are now having their own way, and producers are unable to pass on the increased cost due to recent freight advances.

Just when conditions will improve is hard to say. By some, buying is expected to pick up considerably this month, whereas others feel that no great improvement can be expected until after the November election.

Copper

Sales during the week were recorded at bargain prices, although not in great volume. A somewhat greater interest was shown by the European market, some American copper being bought by Germany. Large tonnages would be hard to obtain under the 18¾@19c. delivered price of the producers, although some shading of prices is likely. Sales were made at 18@18½c. delivered. It is reported that 5,000 to 6,000 tons of copper shell bands are available in London and were offered here at 18½c. delivered. The sale of such metal in this market would be a depressive influence, which may retard the expected buying movement. The statistical position has not been seriously altered, although August sales were among the smallest of the year.

Lead

Practically all of the lead sold last week, except at our average price, was marketed by the A. S. & R at their contract price of 9c., New York, so that our quoted price, which is based on sales, approaches that figure. The market was exceedingly quiet, and lead could be obtained all week at 8c., New York. In fact, it was slightly weaker than last week. Importations of Tarnowitz and other grades of lead are being made from Germany. Despite the known shortage of supplies in Germany, the country is evidently pursuing the same tactics shown in the silver market several months ago, when large quantities of silver were unloaded upon the market at a time when there was a scarcity of metal.

Producers expect increased production by the gradual return of the miners from the farms, where they gravitated this summer, to the mines. Forward delivery is purely nominal.

Zinc

Prices have shown a slight drop in a dull market and the question of importation of cheaper foreign metal is still an important factor in the situation. The effect of the reduction in price in the American market to meet the lower London prices was to decrease importation. It was reported that only 25 tons of zinc has been imported. An inquiry for 500 tons from France developed during the week, but it was felt that this was merely to "try out" the market, for zinc can be obtained more reasonably in Europe than here.

Tin

The market is "deadly dull," as one consumer has put it. Some buying was recorded at the end of last week, but the decline in London stopped it. Quotations may even vary greatly throughout a single business day, and all out of proportion to the amount of business done. Spot Banca tin has been fairly well cleaned up, and producers of electrolytic report business somewhat better on that account, at fractional discounts over Straits.

Straits tin for future delivery: Sept. 2d, 45.50@46.00c.; 3d, 45.50@46.00c.; 4th, 45.50@46.00c.; 7th, 45.25@45.50c.; 8th, 45.00@45.25c.

Arrivals of tin in long tons: total for August, 5,075; Sept. 1st, London, 25; 2d, London, 25.

Silver

The London market on Sept. 8 declined to 59d., brought about by offerings from the Continent, with limited buying. Cables report sales at a concession under the fixed price of 59d. later in the day. Moderate buying for China, via San Francisco, continues at a small premium over London equivalent. The Mexican government, according to latest advices, continues to purchase silver bullion for coinage at the rate of a million to one and one-half million oz. per month.

Mexican Dollars—Sept. 2d, 71; 3d, 71⅞; 4th, 71⅞; 7th, 71⅞; 8th, 71⅞.

Gold

Gold in London on Sept. 2d, 115s. 1d.; 3d, 115s. 3d.; 6th, 115s. 6d.; 7th, 115s. 6d.; 8th, 115s. 11d.

Foreign Exchange

Foreign money in general declined slightly during the week. Yesterday francs were 6.79c.; lire, 4.29c.; and marks 1.93c. Argentine exchange has depreciated to 85.75c. New York funds in Montreal, 10⅞ per cent discount. Indian exchange has improved during the week, closing yesterday at 33.25c. per rupee. This should be a favorable influence on silver.

Other Metals

Aluminum—Ingot, 99 per cent and purer, 35.1c.; 98@99 per cent, 34.9c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Market continues weak. Spot, 7c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7c. W. C. C. brand, 9@9½c. [1]Chinese needle antimony, lump, firm at 8@9c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350@$400 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.; Monel metal, shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100@$110 per oz.

Platinum—Firm at $115@$120 per oz.; $105 per oz. in 100 oz. lots.

Quicksilver—Market quiet; $75 per 75-lb. flask. San Francisco wires $75. Barely steady.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 70@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c. California production has fallen off, even since May, owing to the low price, which does not permit operation of mines that were worked in 1918 when prices were $1.50 a unit for 50 per cent. The market is strengthening, and should prices rise some abandoned properties will be reopened. There are considerable tonnages of 40 per cent ore at different points in California, which are being held for prices of 50@60c. a unit, f.o.b. cars, California.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55. Congestion at Lake Erie ports due to car shortage has resulted in decreased tonnage. The ore movement is better than at any previous time this season.

Manganese Ore—65@75c. per unit, seaport; chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum ore—85 per cent MoS_2, 75@80c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

[2]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[2]**Zircon**—Washed, iron free, 5c. per lb.

[2]**Zirkite**—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 4.—Zinc blende, per ton, high, $52.90; basis 60 per cent zinc, premium, $48.50@$50; Prime Western, $47.50@$45; fines and slimes, $45@$42.50; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $47@$31; calamine, $38.11; all zinc ores, $47.

Lead, high, $111.35; basis 60 per cent lead, $112.50@$110; average settling prices, all grades of lead, $104.90.

Shipments for the week: Blende, 12,040; calamine, 420; lead, 2,050 tons. Value, all ores the week, $800,580.

Platteville, Wis., Sept. 4—Blende, basis 60 per cent zinc, $52 to $52.50 base for high grade. Lead ore, basis 80 per cent lead, $110. Shipments for the week: Blende, 1,116; calamine, 30; lead, 21; sulphur ore, 32 tons. Shipments for the year: Blende, 48,259; calamine, 2,360; lead, 3,921; sulphur ore, 1,241 tons. Shipped during the week to separating plants, 1,910 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $40.50; ground (off color) $27 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground,

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $25@$30 car lots, f.o.b. Baltimore; ground, $17@$20, f.o.b. North Carolina points; $17@$20 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3¼c. per lb.; Madagascar, 8c.; Ceylon, 4¾@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. The last price quoted for plaster of paris in carload lots was $4.25 per 250-lb. bbl., f.o.b. mill, alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $100@$150 per ton, Philadelphia. Domestic, uncut f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 4@5c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¾-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish, fines, per unit 12c., c.i.f. Atlantic seaport; furnace size, 17½c.; run of mine, 12@14c.; domestic, fines, f.o.b. mines, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $15@$20 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $200, freight allowed; last half, $170; English, $170@$175, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $80@$85, f.o.b. furnace. Conditions are a little better in California, owing to the opening of a ferromanganese plant there. This plant can, of course, afford to pay a higher price for California ore than can Eastern buyers.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22¾@23c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$100@$110 per net ton, carload lots, eastern points.

Chrome Cement—40 to 45 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio, and Kentucky works; second quality, $50@$55. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$110@$120 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110@$120.

Silica Brick—9-in., per 1,000, $56@$61, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $65, Chicago district.

Iron Trade Review

Pittsburgh, Sept. 7, 1920

Pig Iron—There is scarcely any inquiry, even for early deliveries. Furnaces are firm on prices and have well filled order books, at least for the time being. Southern furnaces have held their market to the basis of $42, Birmingham, attained at the end of last April, and thus there is the anomalous condition that, even with the advanced freight rates, Southern iron is cheaper delivered Pittsburgh than Valley iron, the new Birmingham-Pittsburgh rate being $7.60. Valley iron remains quotable at $50 for foundry and malleable and $48.50 for bessemer and basic, the new rate to Pittsburgh being $1.96.

Steel—Standard billets have sold at $60, Pittsburgh, which seems to be an established market. Sheet bars are $67.50@$70, Pittsburgh or Youngstown, both markets being quiet.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

The Unusual Lead Situation

St. Louis Market Ruling Above New York, a Condition Duplicated in 1916—Domestic Production Failing To Increase To Relieve the Lead Shortage—France Developing Her Own Lead Resources

THE present abnormal relation between the St. Louis and New York lead market is due to exceptional circumstances and is a condition that rarely arises. In fact, the only similar occasion in recent years was recorded in the spring of 1916, when the St. Louis lead price ruled higher than the New York quotation. This instance, however, differed radically from the present one, and was due primarily to a very large demand for export lead from the Orient, buyers being willing to pay prices high enough to justify shipments of lead from Omaha and St. Louis to Pacific Coast points. Consequently the St. Louis market was placed on equal terms with New York, and to compete for the Asiatic export trade the New York price necessarily was lowered to allow for the freight differential from New York points to St. Louis.

The Difference Between the 1916 and 1920 Markets

The present situation is in marked contrast to the one prevailing in 1916 and is due to lead coming into the United States—not leaving it—plus an acute domestic shortage of prompt lead supplies. Expressed differently, the combination of demand and supply for spot lead is so strong, and has been for weeks, that domestic producers have been unable to fill requirements and have therefore had to allow foreign lead of Mexican, English, Spanish, and Australian brands to come into the country. This importation would have been unprofitable were it not for the low London metal market quotations by which lead can be laid down in New York, duty paid, from 8.00c. to 8.50c. per lb. to compete with domestic lead. Naturally, if there is a scarcity of lead in the Middle West, imported lead which is used for Western requirements must stand the freight charge to the West, and hence rule correspondingly higher in price, in Western districts.

Protection of the Lead Industry

Of all the major metals pig lead has the greatest tariff protection, with an ad valorem duty of 25 per cent. Raw copper is admitted free, and imported metallic zinc must shoulder a duty of 15 per cent. Yet in spite of the comparatively splendid protection rendered the domestic industry, it is paying importers to buy lead in London, and pay the commission, delivery, insurance, transatlantic freight, lighterage, loss of interest and miscellaneous charges. This condition is most unusual.

There can be no complaint about the price of lead. Compared with a pre-war price of 4.5c., which was considered satisfactory at the time, 9c. lead is highly remunerative, particularly when the price is considered in relation to the deflated prices of other metals.

Why the London Market Has Not Responded

The failure of the London market to rise only slightly to meet that of New York is a singular feature of the situation, and is ascribed to a number of conditions, but principally to the lack of demand in England and on the Continent—a direct contrast to the eagerness with which supplies of lead are utilized in this country. Also a little give-and-take element is introduced in the delivery of American lead to England on old contracts. Furthermore, there is the influx of Spanish lead in England, material which formerly found its way to France. The latter country is evidently trying to become independent of Spanish lead resources, and it is reported that the Escalette works are drawing raw material from Morocco in preference.

It should be noted in connection with the imported lead that about 75 per cent of the lead consumed in the United States is based on average-price and sliding-scale contracts and only the excess requirements are filled by imported lead, or contract requirements which cannot be met because of a shortage of domestic supplies.

Labor's Attitude

The summer and fall seasons are always trying upon the mining operations of the country, as labor has a tendency to migrate to the farms and harvest fields, where the wages are, in these days, better than in the mines and where a more healthful occupation can be followed. Practically all the lead producers are complaining about this attitude on the part of labor, and no doubt could speed up production greatly if they had a representative share of workers. A solution to this pressing problem of mine operation, which recurs yearly in periods of agricultural prosperity, would be most welcome.

The Lead Ore Reserves

In connection with the decreased production in the United States, it is pertinent to consider if there is not some basic reason underlying this broad trend in the industry other than labor and transportation embarrassments, and if it may not be that the domestic resources are smaller than has been assumed and whether a pinch of easily worked reserves is not actually being felt. Glancing at production figures for the last few years, it is noticeable that the great lead-producing centers in the United States, southeastern Missouri, Idaho, Utah, and Colorado, were easily able to meet the intense war demand, and, in fact, have readily responded to conditions in the industry, and give the impression of being highly flexible in productive capacity. It has only been in the last year that production has failed to keep pace with demands placed upon it.

Even though the figures indicate that nothing is inherently wrong with the lead reserves of the country, it is interesting to consider the contrasted position of the large copper deposits, with well-developed reserves, and those of lead. Lead deposits are not gigantic low-grade occurrences, and the success of a lead-mining enterprise often hinges upon a metallurgical ability to separate the closely related metal, zinc, from the ore. Flotation and improvements in the treatment of ores have worked wonders in increasing available lead and zinc reserves throughout the world. Furthermore the lead bonanzas have been worked out, and it is becoming increasingly more costly—leaving aside the question of present high labor and supply cost—to produce lead.

Australian and Spanish Difficulties

The settlement of the Broken Hill strike should soon bring increasing quantities of lead upon the market, but the full effect of Australian production will not be felt for some time.

The low level of the London market is undoubtedly working a hardship upon the producers in Australia and also in Spain, who find it difficult to lay down lead in London at a profit, when quotations around £36 per ton are ruling, especially when the serious labor troubles in these countries are considered. In the United States there is a shortage of lead supplies; in Europe there is more than enough to supply present requirements, and yet the London and New York markets have failed to strike a balance. It is a peculiar world situation.

Illustrating the great consumption of lead that is taking place in other than paint and storage-battery manufacture, it is interesting to note the lead consumption of the Western Electric Co. in telephone apparatus during the year ending June 30, 1920, which amounted to 100,000,000 lb. The Western Electric Co. produces practically 95 per cent of the world's transmission apparatus at one of its plants near Chicago.

COMPANY REPORTS

Consolidated Interstate-Callahan Mining Co. Preparing for Increased Output

Lead-Zinc; Idaho

The report of operations of the Consolidated Interstate-Callahan Mining Co. for the second quarter of 1920 follows:

Net value of shipments	$384,162 64
Miscellaneous receipts	2,234 76
Total income	$386,397 40
Production costs, expenses, taxes	341,650 54
Profits	$44,746 86
Cost of improvements	9 00
Surplus for the period	$44,737 86

The principal features of the mining and milling operations during the quarter were as follows:

Tonnage mined	51,074
Tons of mine ore milled	37,534
Average contents of ore milled:	
Zinc	14 67%
Lead	6 91%
Silver	2 27 oz.

Shipments	Tons	Zinc Assay, per Cent	Lb. Zinc	Lead Assay, per Cent	Lb. Lead
Zinc ore, crude	175	53 81	188,347	2 19	7,682
Zinc concentrates	8,037	52 13	8,379,539	3 36	539,938
Lead ore, crude	70	6 02	8,428	65 46	91,647
Lead concentrates	3,116	13 23	824,261	57 95	3,611,780
	11,398		9,400,575		4,251,047

Total recovery of zinc	38 85%
Total zinc in zinc crude and zinc concentrates shipped	8,567,886 lb
Total lead in lead crude and lead concentrates shipped	3,703,427 lb
Ounces of silver in lead crude and lead concentrates	61,825 oz
Cost of mining, crushing, and sorting, per ton mined	$4 456
Cost of milling and flotation royalties, per ton milled	$2 511

During the second quarter shipments of zinc and lead-silver ore and concentrates were 4,576 dry tons less than the preceding quarter. This falling off is accounted for by the scarcity of miners and by a lack of efficiency on the part of labor in general.

Since the last report, the company has consummated the purchase of a controlling interest in the Chicago-Boston Mining Co. and also in the Killbuck Mining Co., both of which are lead-silver properties; the former owning approximately 280 acres and the latter 100 acres, about 1½ miles from Wallace, in the Coeur d'Alene mining district, Idaho. The work of opening up the orebodies at depth in these properties is being actively prosecuted preparatory to shipments on a large scale. The acquisition of the above properties required a considerable outlay in cash, which has been appropriated from surplus funds, so that no new financing was necessary.

Mount Morgan Gold Mining Co. Reserves, 3,437,687 Tons

Gold; Queensland, Australia

The Mount Morgan Gold Mining Co., Queensland, Australia, raised 147,510 tons of ore during the half-year ended May 30, 1920. Of the total, 52,293 tons was smelting, 93,710 tons concentrating, and 1,507 tons leaching ore. Reserves were depleted by 100,517 tons, leaving the estimate as on May 30 at 3,437,687 tons containing 2.59 per cent copper and 6.11 dwt. of gold per ton. In addition to the ore 3,685 tons of fireclay, 2,410 tons of silica, 794 tons of siliceous ore containing 9.12 dwt. of gold per ton, 25,635 tons of limestone, and 8,594 tons of ironstone were raised by the company for its own use.

The mill treated 91,818 tons of ore, assaying 2.0 per cent Cu and 5.52 dwt. Au per ton, producing 8,522 tons jigged concentrates (2.31 per cent Cu; 4.65 dwt. Au); 19,427 tons table concentrates (2.62 per cent Cu; 8.82 dwt. Au); 7,023 tons flotation concentrates (14.49 per cent Cu; 25.98 dwt. Au); and 1,479 tons of leaching product (2.17 per cent Cu; 5.64 dwt. Au).

At the smelting works, 87,580 tons of ore and concentrates were treated, comprising 53,461 tons crude ore, 8,887 tons jigged concentrates, 21,459 tons table concentrates, 1,560 tons crude ore from Many Peaks, 2,016 tons calcines from Many Peaks, 159 tons purchased ore, and 38 tons of precipitates. From this material 3,130.55 tons copper (3.58 per cent), and 39,387 oz. gold (8.99 dwt. per ton) were recovered. The gold, however, included 181.68 oz. from silica linings, the tonnage of which was not included.

Blister copper sold during the term brought £503,357, and sundry income £1,458. Working expenses totaled £405,255, leaving £99,560 to be carried to profit-and-loss account. Of this, £38,482 remained as net profit after provision for the usual items, and the total available, after adding £153,710, brought forward from previous account, was £192,192. Two dividends absorbed £100,000 and the balance, £92,192, was carried to balance sheet. Liquid assets were £487,933 in excess of liabilities, as against £543,732 at the beginning of the term.

Barnes-King Development Co. Second-Quarter Earnings, $20,219

Gold-Silver; Montana

The records of the Barnes-King Development Co. show the following operating results for the quarter ending June 30, 1920:

Earnings		
Shannon property operations		$16,005 89
Piegan-Gloster property operations		7,901 07
Kendall property operations		699 70
Interest received		775 01
		$25,381 67
Deduct		
Loss on operations at North Moccasin property	$2,985 85	
Miscellaneous expense	1,824 60	
Capital stock tax	346 50	
Black Hawk option	5 00	
		5,161 95
Balance, being net profit on operations for quarter ending June 30, 1920		$20,219 72

The above figures include provisions for depreciation on the various plants of the company on the same basis as has been used heretofore.

Production from the North Moccasin property amounted to 336,469.33 from 3,768 tons of ore, or $9.68 per ton. Development work, 605 ft. The North Moccasin production has been decreasing for some time, owing to unsuccessful search for new orebodies, and the present outlook at this property is discouraging, with operations being continued at a heavy loss.

Production from the Piegan-Gloster property amounted to $35,447.85 from 2,661 tons of ore, or $13.32 per ton. During the latter part of May, a larger flow of water than anticipated from the bottom workings of this property made it necessary to take out the remaining pay ore in the winze as fast as possible and pull the pumps and equipment, or take the chance of drowning them by trying to continue work. The former plan was adopted, which practically closed the mine for the present, and future work has not been decided on.

Production from the Shannon property amounted to $69,084.07 from 7,009 tons of ore, or $9.86 per ton. Development work, 1,048 ft. The Kendall lessees paid in royalties $548.36 during the quarter.

Dividend No. 14, of $20,000, 5c. per share, was payable on Aug. 16, 1920, to stockholders of record July 26, 1920. This disbursement makes total dividend payments $440,000.

MINING STOCKS

Week Ended September 4, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston			*50	
Ahmeek	Boston	57½	57	57	June '20, Q .50
Alaska-B.C.	N. Y. Curb	1 1/16	1 1/16	1	
Allouez	Boston	25	25	25	Mar. '19,
Anaconda	N. Y.	55½	52½	54¾	Aug. '20, Q 1.00
Ariz. Com'l	Boston	10¼	9½	10¼	Oct. '18, .50
Big Ledge	N. Y. Curb	¼	⅛	⅛	
Bingham Mines	Boston	8¼	8¼	8¼	Sept. '19, Q .25
Calumet & Ariz.	Boston	56½	55½	56	June '20, Q 1.00
Calumet & Hecla	Boston	290	281	285	June '20, Q 5.00
Canada Copper	N. Y. Curb	⅛	⅛		
Centennial	Boston	10	9⅜	9¾	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	44	38½	43	June '20, Q 1.00
Chief Consol.	Boston Curb	⅜	⅜	⅜	Feb. '20, Q .10
Chile Copper	N. Y.	15⅜	14	15¼	
Chino	N. Y.	30½	27½	29⅜	June '20, Q .37½
Columbus Rexall	Salt Lake	*39	*37½	*38½	
Con. Ariz	N. Y. Curb			1/16	Dec. '18, Q .05
Con. Copper M.	N. Y. Curb	2⅜	2⅛	2⅛	
Copper Range	Boston	35⅜	34	35½	June '20, Q .50
Crystal Copper	Boston Curb	*40	*35	*36	
Davis-Daly	Boston	7⅛	7	7⅛	Mar. '20, Q .25
East Butte	Boston	11	10⅛	11	Dec '19, A .50
First Nat'l	Boston Curb	*75	*75	*75	Feb '19, SA 15
Franklin	Boston	2⅜	2	2⅛	
Gaiisden Copper	N. Y. Curb			*71	
Granby Consol.	N. Y.	36⅞	34½	36⅛	May '19, Q 1.25
Greene-Cananea	N. Y.	27⅛	25	27⅛	Aug. '20, Q .50
Hancock	Boston	4	4	4	
Houghton	Boston Curb			*40	
Howe Sound	N. Y. Curb	3⅛	3⅛	3⅛	July '20, Q .05
Inspiration Con.	N. Y.	48	45¼	48	July '20, Q 1.00
Iron Cap	Boston Curb	9	9	9	Feb '19, M .25
Isle Royale	Boston	28	27⅛	28	Sept. '19, SA .50
Kennecott	N. Y.	26	23¾	25⅞	June '20, Q .50
Keweenaw	Boston			1⅞	
Lake Copper	Boston	3	3	3	
La Salle	Boston			2½	
Magma Chief	N. Y. Curb			*21	
Magma Copper	N. Y. Curb	27½	27	27½	Jan. '19, Q .50
Majestic	Boston Curb	*13	*13	*13	
Mason Valley	N. Y. Curb			2¼	
Mass. Con	Boston	3	3	3	Nov. '17, Q 1.00
Mayflower-O C.	Boston	6½	5½	6¼	
Miami	N. Y.	20	19⅛	19¾	Aug. '20, Q .50
Michigan	Boston	4	3½	4	
Mohawk	Boston	60	58⅜	60	Aug. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	6	5¼	5⅞	
Nevada Con.	N. Y.	11⅛	10⅝	11⅛	June '20, Q .25
New Arcadian	Boston			2⅝	
New Baltic	Boston Curb			3	
New Cornelia	Boston	18	16¼	17½	Aug. '20, .25
Nixon Nev.	N. Y. Curb			*9	
North Butte	Boston	17	15⅛	16⅜	Oct. '18, Q .25
North Lake	Boston			⅛	
Ohio Copper	N. Y. Curb			1/16	
Oiibway	Boston	1⅛	1⅛	1⅛	
Old Dominion	Boston	24	22	24	Dec. '18, Q 1.00
Osceola	Boston	41	41	41	June '20, Q .50
Phelps Dodge	Open Mar.	†195	†180		July '20, Q 2.50
Quincy	Boston	44½	43⅓	44⅓	Mar. '20, Q 1.00
Ray Con.	N. Y.	16⅜	14⅜	16⅛	June '20, Q .25
Ray Hercules	Boston Curb	*63	*63	*63	
St. Mary's M. L.	Boston	38⅛	38⅛	38⅛	June '20, K 2.00
Seneca	Boston	15⅛	14⅜	15	
Shannon	Boston	1⅜	1⅜	1⅜	Nov. '17, Q .25
Shattuck Ariz.	N. Y.	9	8⅛	9	Jan. '20, † .25
South Lake	Boston			2	
South Utah	Boston			*15	
Superior	Boston	5	4	5	Apr. '17, 1.00
Superior & Boston	Boston	4⅛	3⅛	4⅛	
Tenn. C. & C.	N. Y.	9¼	9⅛	9¼	May '18, I 1.00
Tuolumne	Boston	*60	*55	*58	May '13, .10
United Verde Ex.	Boston Curb	30⅞	30	30⅞	Aug '20, Q .50
Utah Con.	Boston	6⅛	6⅛	6⅛	Sept. '18, .25
Utah Copper	N. Y.	64⅛	61	64	June '20, Q 1.50
Utah M. & T.	Boston	1⅜	1⅛	1⅜	Dec. '17, .50
Victoria	Boston			1⅜	
Winona	Boston	*25	*25	*25	
Wolverine	Boston	13	12⅞	13	Jan. '20, Q .50
LEAD					
Hecla	N. Y. Curb	4⅜	4⅛	4⅛	June '20, QX .20
St. Joseph Lead	N. Y.	17	16⅛	17	June '20, QX .50
Stewart	Boston Curb			*16	Dec. '15, .05
Utah Apex	Boston			1⅜	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	12⅛	11⅛	12⅜	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.			44½	Aug. '20, Q 1.50
Butte C. & Z.	N. Y.	7⅛	6⅞	7⅛	June 18, I .50
Butte & Superior	N. Y.	20⅛	18⅜	20	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	10⅛	9⅞	10⅛	June '20, Q .50
New Jersey Z.	N. Y. Curb	184	176	182½	Aug. '20, Q 4.00
Success	N. Y. Curb	*4½	4	*4	July '16, .03
Yellow Pine	Los Angeles	*95	*95	*95	June '20, Q .03

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. N, includes extra

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	
Alaska Juneau	N. Y.	1⅛	1⅛	1⅛	
Carson Hill	N. Y. Curb			24½	
Cresson Consol. G.	N. Y. Curb	1	¾	¾	June '20, Q .10
Dome Ex.	Toronto	*38⅛	*36⅛	*37⅛	
Dome Mines	N. Y.	11⅛	11⅛	11⅛	July '20, Q .25
Golden Cycle	Colo Sprgs.	‡		*73	May '20, Q .02
Goldfield Con.	N. Y. Curb	*10	*8⅛	*10	Dec '19, .05
Hedley	Boston			4½	June '19, .10
Hollinger Con.	Toronto	5.80	5.74	5.74	Aug. '20, BM .05
Homestake	N. Y.			50	Sept. '19, .50
Kirkland Lake	Toronto	*52½	*52	*52	
Lake Shore	Toronto	1.15	1.13	1.15	Oct. '19, .02½
McIntyre-Porcupine	Toronto	1.98	1.93	1.94	May '20, K .05
Porcupine Crown	Toronto			*26½	July '17, .03
Portland	Colo Sprgs.	‡		*60	July '20, Q .01½
Reorgan. Booth	N. Y. Curb	5	4	4½	May '19, .05
Silver Pick	N. Y. Curb	*7	*5½	*7	
Teck Hughes	Toronto			*8	
Tom Reed	Los Angeles	1.08	1.04	1.07	Dec. '19, .02
United Eastern	N. Y. Curb	2⅛	2⅛	2⅛	Apr. '20, Q .21
Vindicator Consol.	Colo Sprgs	‡		*18	Jan. '20, Q .01
West Dome Consol	Toronto	*6½	*6½	* ½	
White Caps Min.	N. Y. Curb	*8½	*7⅝	*8	
Yukon Gold	Boston Curb			1⅛	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*19	*15	*17	Apr '20, M .03
Beaver Con.	Toronto	*42	*40	*40½	May '20, K .03
Conigas	Toronto			2.55	Aug. '20, Q .12½
Crown Reserve	Toronto			24½	Jan. '17, .05
Kerr Lake	Boston	3	3	3	Sept. '19, 1.00
La Rose	Toronto	*33½	*33½	*33½	Apr '18, .02
McKinley-Dar	N. Y. Curb			*55	July '20, Q .05
Mining Corp.	Toronto	1.75	1.70	1.70	June '20, Q .12½
Nipissing	N. Y. Curb	10	9½	9⅝	July '20, Q .25
Ontario Silver	N. Y. Curb	5½	5	5	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅜	⅜	3/16	Jan. '12, .10
Peterson Lake	Toronto			*13½	Jan. '17, .01½
Temiskaming	Toronto	*33	*33	*35	Jan. '20, K .04
Trethewey	Toronto	*27	*25	*25	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2	*1½	*2	
Barnes-King	Butte	‡		1.11	Aug. '20, Q .05
Bost & Mont.	Boston			*63	
Cashboy	N. Y. Curb	*7½	*7	*7½	
El Salvador	N. Y. Curb	1⅝	1⅜	1⅝	
Jim Butler	N. Y. Curb	*15	*13	*14½	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*5½	*4½	*5	June '16, .05
Louisiana Con	N. Y. Curb	⅛	1/16	1/16	
MacNamara M.	N. Y. Curb	⅛	1/16	⅛	
N.Y. Hond. Rosar	Open Mar.	†1	†10½		July '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	1⅛	1¼	
Tonopah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	July '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '19, SA .15
West End Con.	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*21	*19	*20	July, '20, M .01
Consol. M. & S.	Montreal	25½	25	25	July '20, Q .62½
Daly Mining	Salt Lake			2 50	July '20, Q .10
Daly-West	Boston	4½	4⅛	4⅛	July '20, Q .25
Eagle & Blue Bell	Boston Curb			2⅛	Apr. '20, Q .10
Electric Point	Spokane	*30	*29	*30	May '20, SA .03
Fed. M. & S.	N. Y.			10	Jan. '09, 1.50
Fed. M. & S. pf.	N. Y.	33	32½	32½	June, '20, Q 1.75
Florence Silver	Spokane	*35	*35	*35	Apr. '19, .01½
Grand Central	Salt Lake			*37½	June '20, K .03
Iron Blossom	N. Y. Curb	⅛	⅛	⅛	Apr. '20, Q .02½
Judge M. & S.	Salt Lake			3.97½	July '20, Q .12½
Marsh Mines	N. Y. Curb	*17	*14	*16	
Prince Consol.	N. Y. Curb	3/16	1/16	1/16	Nov. '17, .02½
Rambler-Cariboo	Spokane	*13	*13	*13	Feb. '19, .01
Rex Con.	N. Y. Curb	*6	*5	*6	
South Heela	Salt Lake	*96	*95	*95	Sept. '19, K 1.5
Stand. S. L.	N. Y. Curb	¼	1/16	⅛	Oct. '17, .05
Tamarack-Custer	Spokane	2.35	2.25	2.35	Dec. '19, K .05
Tintic Standard	Salt Lake	3.45	3.32½	3.32½	June '20, Q .10
Wilbert	N. Y. Curb	*4	*3	*3½	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	20¼	19¼	19¼	Mar. '19, .50
Internat'l Nick.pf	N. Y.			80¼	Aug '20, Q 1.50
QUICKSILVER					
New Idria	Boston			5	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Bostn Curb	*10	*10	*10	
VANADIUM					
Vanadium Corp.	N. Y.	70½	66½	70	July '20, Q 1.50
ASBESTOS					
Asbestos Corp	Montreal	86	85	85½	July '20, Q 1.50
Asbestos Corp. pf.	Montreal	97	94	94	July '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	61	55½	60	June '20, Q 1.00
Am. S. & R.pf	N. Y.	90½	90½	90½	June '20, Q 1.75
Am. Sm pf.A	N. Y.	73½	72	73½	July '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	57	53½	57	July '20, Q 1.50
U.S.S.R.& M. pf.	Boston	44	43½	44	July '20, Q .87½

INDUSTRIAL NEWS

International Minerals & Metals Corporation is the new name under which Beer, Sondheimer & Co. Inc., 61 Broadway, N. Y., have recently incorporated. The management and relationship to affiliations and subsidiaries have not been affected and will continue as heretofore.

Pennsylvania Pump & Compressor Co., Easton, Pa., has opened additional sales offices at 788 Potomac Ave., Buffalo, N. Y.; 232 St. Clair Ave., N. E., Cleveland, Ohio; 1956 N. Broadway, St. Louis Mo.; 423 Fifth St., S., Minneapolis, Minn.; and 804 First Nat. Bank Building, Omaha, Neb.

W. A. Olen, president, with **D. J. Rohrer** and **C. F. Folkman**, members of the board of directors of the Four Wheel Drive Auto Co., Clintonville, Wis., sailed for England on Aug. 14. They will study the truck situation with a view to improving present facilities of the company for handling its increasing export trade.

Technical Advertising Service, 1133 Broadway, New York, announces the election of Raymond Hawley as vice-president. Mr. Hawley, who has had much experience as advertising, sales and production manager, was last with Keystone Motor Truck Corporation, of Philadelphia, Pa.

Uehling Instrument Co., 71 Broadway, New York, manufacturers of fuel economy equipment, announces that its New England States representative is the Smith Engineering & Supply Co., 89 State St., Boston, Mass.

H. K. Lidstone and **G. H. Van Dorp**, mining and metallurgical engineers, have opened an office at Texas and Yankie Sts., Silver City, N. M. Their postoffice address is Box 216.

The General Briquetting Co., 25 Broad Street, New York City, announces the appointment of Thomas F. Kelly, formerly with the Lackawanna Steel Co., as Sales Engineer in its flue dust, ore and byproducts department.

Worthington Pump & Machinery Corporation, 115 Broadway, New York City, announces that it is ready to furnish improved waterpower machinery of all capacities for low, medium, and high head service.

A. B. Way, recently secretary and general manager of Bridgeport Chain Co., has become New England District Sales Manager for Chain Products Co., of Cleveland, Ohio. His headquarters will be 150-152 Chambers St., New York City.

Julius Janes, former president of Standard Steel Castings Co., is sales representative of Farrell-Cheek Steel Foundry Co., Sandusky, in Cleveland and Cuyahoga County, Ohio.

Blaw-Knox Co., steel products, Pittsburgh, Pa., announces that DeWitt Clinton Grove, formerly in charge of the advertising for an Ingersoll-Rand subsidiary and past vice-president of the Technical Publicity Association, has become its advertising manager, vice George Land, resigned.

Industrial Information Bureau for China

Of interest to those who do, or desire to do, business in China is the announcement that beginning with February, 1921, the Government Institute of Technology at Shanghai, China, will open a bureau of information for alumni. The school is under Chinese government support and turns out engineer and railway administration men with a technical education equivalent to that of an American engineering school. These men often are situated away from the port cities, and find it difficult to obtain desired information regarding equipment. To meet this need the school is about to open this bureau. Manufacturers who are interested are invited to send catalogs, specifications, designing data, approximate costs, samples, or models. In case samples are sent an attempt will be made to place same in running order. No sales will be made nor attempted. Impartial information alone will be offered. A member of the faculty is now in America on leave, and he will be glad to communicate further with any who desire information regarding the China field. Address H. A. Vanderbeek, 5 Cammann Place, Somerville, N. J., until Dec. 1, 1920, and Box 951 United States Post Office, Shanghai, China, after that date.

American Welding Society Organizes a Chicago Section

At a meeting of members of the welding trade in Chicago, held in the rooms of the Western Society of Engineers, on Tuesday, Aug. 3, a Chicago Section of the American Welding Society was organized. About seventy-five were in attendance, representating many railroads terminating in Chicago and also many of the larger local industries. The following officers and directors were elected: Chairman, M. B. Osburn, assistant superintendent, Pullman Car Works; vice-chairman, O. T. Nelson, president, General Boilers Co.; secretary-treasurer, L. B. Mackenzie, president, *The Welding Engineer;* directors: three years, E. Wanamaker, H. B. Bently, Andrew Oliver, W. M. B. Brady; two years, Harold Cook, W. A. Slack, K. R. Hare, J. M. Jardine; one year, W. H. Bleecker, Jr., Oliver Mitchell, W. L. Senhert, Don B. McCloud.

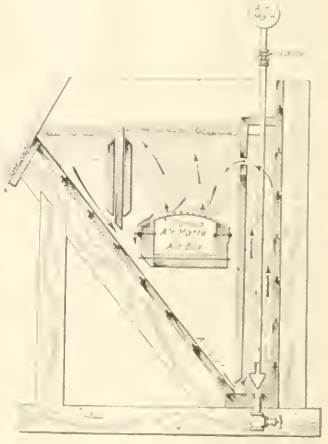
Meetings will be held on the second Tuesday of each month in the rooms of the Western Society of Engineers, and those interested in the subject of autogenous welding, by all methods, are invited to attend. The address of the secretary-treasurer is 608 South Dearborn St., Chicago.

The Simpson Flotation Cell

Has No Mechanical Parts—May Be Safely Shut Down Under Full Load —Will Not Clog

BY S. FORD EATON

The Standard pneumatic flotation cell, invented and manufactured by Gerald R. Simpson, of Kingman, Ariz., operates entirely on the pneumatic principle. Air lifts are employed to circulate the pulp, continually feeding it to an agitation compartment where compressed air, admitted through a porous medium or spray, is employed to produce the froth. The froth is under positive control by the adjustment of the volume and pressure of air admitted to the agitation compartment, and by adjustment of the baffle board. By means of these adjustments, a deep or a shallow froth can be carried, as may be desired. After passing over the



STANDARD PNEUMATIC FLOTATION CELL INVENTED BY G. R. SIMPSON

baffle board, the froth must cross a spitzkasten of quiet water before being discharged over the overflow lip into the concentrate launder, and thus much of the gangue matter which has been mechanically entangled in the froth is given an opportunity to settle, thereby securing a cleaner concentrate than otherwise. The control which is thus exercised over the depth and the rapidity of discharge, or overflow, of the froth, results in a high percentage of recovery and a high-grade concentrate.

By means of a series of vertical and inclined partitions, the bottom of the cell is converted into a number of hoppers, whose walls converge to a central point at the bottom of the air lifts. The pulp is thus conveyed progressively from one air lift to another, being submitted by each to the agitating compartment. The floating particles are thus given a number of opportunities to engage with an air bubble and be carried into the froth before reaching the discharge compartment.

Commercial machines of from 50 to 100 tons daily capacity are equipped with six to eight air lifts, each of which treats the entire pulp twice before it is discharged.

Clogging, which has been a serious drawback to other air machines, has been entirely eliminated by means of an improved air injector at the bottom of the air lift and the conical shape, or converging walls, of the respective hoppers or compartments. The machines may be closed down while containing a full charge of pulp for twenty-four hours or longer, and again placed in operation merely by turning on the air. From 2 to 3-lb. pressure is sufficient for the operation of these machines.

The discharging device, when once set, is automatic, and, working in conjunction with an overflow weir, maintains the water at a constant point, which is determined by the adjustable position of the weir.

The Standard pneumatic cell was developed at the property of the Standard Minerals Co., near Kingman, Ariz., where a molybdenite ore was being treated.

An interesting problem has also been solved at the Diamond Joe Silver mine, near Yucca, Ariz., by the use of Mr. Simpson's invention. A silver chloride and bromide ore containing some lead sulphide is being sulphidized and floated. Satisfactory extraction is being secured with concentrates carrying 500 oz. of silver and from 30 to 45 per cent of lead. The principal tailing loss occurs in the slime and can be somewhat reduced under more favorable grinding and sulphidizing conditions.

Mr. Simpson's invention was prompted by his desire to get away from the expensive shutdowns experienced at his mill on account of some of the parts of the mechanically-agitated machine that he was using becoming out of order. In departing from mechanical agitation entirely, he eliminated this difficulty, as the only part of his machine which could possibly cause a shutdown is the porous air mat. This seldom requires adjustment, but in any event can be changed in ten minutes.

Shop Workers Get Leave With Pay

Four thousand shop employees of the Western Electric Co. will receive a vacation with pay this summer for the first time in the history of the company. The board of directors has promulgated an order extending the vacation privilege to every department. Previously, factory workers did not receive the same benefit as the members of the sales, clerical, technical and executive branches, and any time off during the summer months was taken at their own expense. The fact that they received pay on an hourly basis with extra rewards for overtime always counted against granting them the same privileges as the weekly salaried body, the members of which get no remuneration for additional labor. The new ruling is a radical change in factory practice.

An American Gold Dredge for New Zealand Fields

An example of the far-reaching activities of American industry is to be found in a gold dredge that has been designed and constructed in New York State for the purpose of operating in New Zealand gold fields. This dredge is being built by the New York Engineering Co. and is along the type of dredge constructed for operations in Alaskan fields. The hull is 115 ft. 6 in. over all, beam 50 ft., depth 11 ft., and is built of kaurice pine. Power for dredging, pumping, and shifting position is furnished by Westinghouse electric motors. Twelve men, four men to a shift, constitute the crew. A winch motor is used to change the position of the dredge.

The digging ladder carrying the buckets is 100 ft. long and weighs 110,000 lb. There are 73 buckets, each bucket weighing 3,000 lb. empty and with a load capacity of about 10½ cwt. When in operation, dredging is at the rate of 18 buckets per minute, and a linear speed of 54 ft. per minute is obtained from a 200 hp. slip-ring motor with a magnetic controller for reversing and 50 per cent speed reduction.

The screen is 40 ft. long and 7 ft. in diameter and weighs approximately 6,500 lb. A 50-hp. slip-ring motor operates this screen at seven revolutions per minute.

About 8,000 gal. of water per minute are used in washing, and the three pumps (the high pressure, low pressure, and nozzle pump) are driven by Westinghouse squirrel-cage motors of 125, 60 and 25 hp., respectively.

The conveyor belt transferring dirt from the screen to the stacker is 42 in. wide and 130 ft. long, and the stacker is operated by a 40-hp. slip-ring motor. Winch drive is furnished by a 25-hp. slip-ring motor, and a 10-kw. transformer is used for lighting purposes. All motors are of the three-phase, 60-cycle, 2,200-volt alternating-current type, and have special impregnated windings to protect them from moisture.

Power will be furnished by a hydro-electric plant, and feeders are run along the ground to the dredge. As alternating current is used the dredge can be operated a considerable distance from the plant. Dredges of this type have operated on a cost basis of 6½c. per cu.yd., and in one instance where records are available 418,745 cu.yd. have been dug in a period of two years.

The General Engineering Co., Salt Lake City, Utah, is retained by the Utah Consolidated Mining Co. to design and erect the 1,000-ton flotation plant which the mining company is building at Tooele, Utah.

The Henry E. Wood Ore Testing Co. has removed its assay office and chemical laboratory to 1750 Arapahoe St., Denver, Col. A necessary increase in the rate of charges is also announced but the new rates continue moderate.

TRADE CATALOGS

Wire. — The Hazard Manufacturing Co., Wilkes-Barre, Pa., has issued an interesting booklet, "Rubber-Insulated Wire," which traces the story of the manufacture of rubber-insulated wire from the winning of the crude rubber to the finished lead or cloth incased cables of insulated wire used for aërial, submarine or underground transmission lines. The Hazard company produces standard brands of insulated wire for all conceivable purposes.

Carbon Dioxide Indicators—Uehling Instrument Co., 71 Broadway, New York City, has just issued their Bulletin 111, describing their Style U CO_2 equipment. This is a new design, built to serve any number of steam boilers simultaneously, up to six. Among the notable features of the new machine are speedy action, absence of chemical solutions, greater simplicity, and an auxiliary boiler front CO_2 indicator which guides the fireman, while the CO_2 recorder installed elsewhere makes a continuous record of all changes in boiler-adjustments.

Pipe Welding—The Metal & Thermit Corporation, New York, N. Y., has just issued and will distribute on request the third edition of its Thermit Pipe Welding Pamphlet No. 16. In this new edition the subject of Thermit pipe welding has been revised and brought up to date.

Drills—The Chicago Pneumatic Tool Co., 6 East 44th St., New York, announces that Bulletin 504, describing its Slogger Rock Drill, is now available, upon request, from its New York office or branches.

Melting Pots—"Metal Melting Pots" is the title of a new two-page 8½ x 11 illustrated leaflet descriptive of The Cutler-Hammer Manufacturing Co.'s melting pots, both portable and bench types. These heating pots are specially serviceable for melting lead, tin, solder, babbitt, and similar metals, and maintaining these metals at the proper temperature. The heat may be controlled by means of a rotary snap switch or an automatic control device which maintains the temperature at the desired point. The leaflet, known as Publication 826, may be had on application to the company at Milwaukee, Wis.

Crucibles—A new edition of the illustrated twenty-one-page catalog of its goods has been issued by the Ross-Tacony Crucible Co., Tacony, Pa. The pages illustrate the dimensions of the different types of general and special crucibles, retorts and accessories supplied by this company, and the pamphlet closes with two pages of hints on the proper handling of a crucible which will be appreciated by all users of this make.

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 110 New York, September 18, 1920 *Number* 12

The Divining Rod

THE visions of the Middle Ages are with us still. We dream of transmuting base metal into gold, and of finding by some mystic power the ores from which the metals are extracted. The belief in the divining rod dates back to dim and obscure times, and will doubtless yet endure in some form for ages. Most prevalent is the belief in its ability to find water; but also the metals. From this in specific instances we progress to buried treasure; and a recent correspondent writes in of his ability to locate not only all these, but "animal bodies," and concealed whisky as well. A private still would have to be very still and private indeed to elude him, as he claims.

It would be a bold man who nowadays proclaims the impossible. We hesitate to begin, because we do not know where to stop. It may be possible some day for a man to jump to the moon, to see to the center of the earth; but we do not believe these things will ever happen. Similarly, we hesitate to proclaim the impossibility of locating water or ore by some hitherto undiscovered delicate process; but (speaking editorially) we do not believe that such a power or process exists.

The operator of the divining rod cuts a forked twig of willow, and grasps the two ends in his hands, with the point of juncture upward. As he walks over the ground at a certain place the stick turns over and its point designates the earth; and he cannot prevent its doing so, no matter how much strength he expends.

We once saw a demonstration of a similar rod for finding minerals, except that the rod was of metal, with a little box in each handle into which different metals might be slipped, according to the mineral to be detected. If gold was to be discovered, gold was slipped into the handles, and then the instrument pointed out the gold ore, in the manner indicated above. If nickel was the object, or petroleum, the insertion of the corresponding metal or mineral in the handles tuned the rod for a corresponding discovery. Armed with this instrument, the operator walked over a pasture, in Delaware, disturbing the peaceful cows, and located and plotted a broad gold lode; at right angles to this, and traversing it, a wide vein of nickel; and running in various other directions, tin, copper, and "petroleum" lodes. The operator was in earnest, and there is no question that his intensest efforts failed to hold the rod when it started to turn. Of course, the net result was humbug. There was nothing in the field. For others, the instrument failed to perform—it would not perform for the son of the operator. Plainly it would work for only certain personalities, who possessed the mysterious sensibility (which, the operator confided, had to do with the ultra-violet rays). And herein lies, in our opinion, the secret of the phenomenon. As for the rod, there is nothing whatever in it. It might as well be a rabbit's foot or a ball of crystal.

The manifestations noted are exclusively psychological, and analogous to those of the ouija writer, and they deal with natural but little understood nervous or mental laws. The writing on the ouija board, and the manipulation of the divining rod, are due to the subconscious impulses of the operator, which control and direct the muscles far more powerfully than can the relaxed conscious mentality. In the familiar phenomena of hypnotism, the hypnotist tells the subject that he cannot rise from his chair, and, exert himself as he will, he cannot do so—not because of the power of the hypnotist, but because of the dominant inhibition imposed by his own subconscious self. No hypnotist is necessary to induce this state.

An incident was related to us recently of a Mexican boy who was accustomed to light dynamite sticks and throw them for amusement. One day he could not let go his lighted stick; and could only push his hand as far away from his body as possible before the explosion which blew off his hand. Many further illustrations of this state, when the will is unable to combat the suggestions or fears of the subconscious mentality, might be cited. The subconscious mentality is ordinarily an indispensable part of our equipment: invisible to ourselves and without a speaking acquaintanceship with our conscious mentality, it does much of our mental work for us. Does a name escape you? Do not worry about it. Forget it, and presently the faithful subconscious mind will hunt it out among the archives of your memory and fetch it to you. Is a problem perplexing? Do not decide it tonight. Sleep on it, and in the night your subconscious mind will rake over and sift out the problem, and have the best solution ready for you when you wake in the morning.

It is this subconscious mind that directs the muscles of the divining-rod performer, the ouija writer, and the sleep walker. It is a reasonable and logical-appearing part of our mentality, and its messages often appear intelligent and hence surprising, since they come from a source unknown and ignored by most; but it is really hardly, if any, wiser than the rest of us; indeed, by itself alone it becomes unhealthy. A man dominated unduly by his subconscious cerebration may become to all degrees unbalanced mentally: the nerve-taxing nature of divining-rod operation, ouija writing, sleep walking, psychic trance and other phenonoma of this state are well known. And in the end the subject can tell little or nothing that is not known before. The subconscious mind of an illiterate ouija operator will spell as badly as the conscious mentality; the spirit of the Indian maiden who takes possession of the New York medium will use Bowery idioms; and the subconscious mind of the divining-rod operator is controlled by his own delusion. In the case of the operator of the alleged wonder-working device cited above the delusion had been nursed by an unscrupulous assayer.

Community Problems In Mining Camps

IT IS surprising indeed how community problems have forced their attention on mine managements. In the case of the isolated mining community which had to be developed literally from the grassroots in order to provide living conditions, that the mine might be continuously operated, these problems have been presented to engineers and managers in such a form that they had to be solved. Throughout the history of mining operations there have been a goodly number of such cases. Fortunate is the mine which is so favorably situated that it can call upon a community already organized to supply its labor during the development stages and then during the larger-scale operation when greater numbers of workers are required. Even in such cases community conditions have sometimes reached a pass such that only by the strong and intelligent leadership of the mine management can conditions be righted. Beginning with a cook house and a few tents, there are all degrees of the mining camp up to a village of several hundred houses, with a school, hotel, and accompanying stores. As an example of a substantial and well-ordered kind we may mention Hammonton, Cal.

The extremes of opinion on the subject appear to be that, on the one hand, the mining company has no other obligations than those of affording employment under safe and hygienic conditions, and, on the other, that, in addition to these conditions, it must exercise a paternalistic oversight over all of the community, providing amusement, sanitation, and housing, and initiating and even paying for all of the inevitable charities and sociological activities that may be necessary.

We are not disposed to debate these extremes of opinion. Nor do we believe that any well-balanced formula can be worked out that will serve for all cases and be a guide for the harassed mine management. We do hold the view, however, that a mine management cannot afford not to be a part of whatever activity there is in a community looking toward better housing, better sanitation, better living, and more wholesome amusement. This is an obligation which rests upon every individual in the community as well as upon the individual manager and the various members of his executive staff.

Looking back over two decades of mining progress, anyone familiar with the facts will conclude that there has been a great improvement not only in working and safety conditions about mines and reduction plants but about mining communities as well. One has only to spend a few days in Grass Valley, Cal., or Kellogg, Idaho, or some other camp which has become established upon a producing basis, to realize that "times have changed," and for the better.

As in so many other things, it is organized effort intelligently directed which accomplishes most for the mining community. Just how far this effort can go or is willing to go is of considerable interest. A recent example comes from South Africa. A company embracing the head office of the principal mining companies and affiliated organizations, employees and others, to the number of 800, has been organized as the Rand Co-operative Stores, Ltd., for the purpose, primarily, of reducing living costs. The co-operative trading organization is not new; it has been tried out successfully in England. With good leadership and wise restraint upon the part of the members, success should attend its efforts.

In a statement of objectives of the company, the following paragraph is worth noting:

> To form and establish pension funds for employees and to promote and establish institutions, clubs, or societies, and to erect, lay out, plant, and maintain buildings, grounds, fences, and ornamental gardens with the object of providing pensions for employees, recreation, and means of social intercourse for members of the company, their families and their relations, and the furnishing of any such institutions, clubs, societies, buildings, or grounds with furniture, fixtures, games, billiard tables, libraries, books, or any other matters or things conducive to the recreation and the social requirements or benefit of members.

This is a novel addenda to the co-operative trading plan. Its inclusion is a distinct expression of the need for such things in the average mining community, and of correcting the haphazard lack of method often characteristic of the mining camp or town.

We doubt whether conditions in many of our mining communities will admit of extensive introduction of co-operative trading, although experiments have been started in Tonopah, Nev., and Grass Valley, Cal., on modifications of this plan; but many of the purposes given in the interesting paragraph quoted are possible of attainment. Mining engineers and managers can serve a useful end, apart from their company duties, by stimulating initiative along similar lines in every mining camp.

Our 40 Per Cent Gold Cover Dollars

PROFESSOR WILLIAM E. CHANCELLOR, writing in *The Annalist*, discusses the danger in our Federal Reserve currency, which is secured by only 40 per cent of gold, and the rest by nothing tangible. As to the interchangeability of this currency and gold, he remarks aptly:

"I submit as certain that no ordinary bank depositor and customer would consider it judicious to ask his local bankers regularly to honor his checks in gold. He knows that were he to do so he would soon cease to enjoy banking credit. He would be considered erratic and annoying. Any banker would assume that such a customer was engaged in trying to build up a private gold hoard. Of course, an occasional request for a small amount of gold is granted at this time, though it was not granted a few weeks ago by ordinary banks.

"Now, this raises a very important question—whether or not we are even upon the gold standard in fact, whatever may be the case technically. Is this present currency anything more than a convenient counter? Have we not, without recognizing the fact, given up the gold basis and adopted the paper currency that the radicals have long been arguing for? And is not a large measure of our present social disturbance due essentially to the fact that we are trying to accustom ourselves to something as money that in fact is not money, but a mere concrete computing system?"

He concludes that,

"Money is a medium of circulation, and a system of storage units of value. Paper, even 40 per cent gold cover paper, whose gold we never see, is not money. A currency consisting entirely of the shoddy part of a wool-and-shoddy financial clothing cannot retain the confidence of any people long. Out in the open country, far from the centers of banking, most of the millions of Americans live; and these millions do in fact control the Government and the nation. Most of these millions know nothing of the Federal Reserve System beyond seeing this new and relatively powerless paper money. They are taking the two as synonymous, knowing

nothing and understanding nothing of the larger values of the system in delaying and perhaps ending panics, in moving crops, and in harmoniously co-ordinating the entire industrial, commerical, and other business life of the country."

According to Professor Chancellor's opinion, the remedy for the popular discontent over paper money is contained in the following suggestions:

"First. The replacement upon the counters of all banks, of gold to be taken at sight by bona fide depositors, as of old. Otherwise, the hoarding of gold by the great banks will start the hoarding of free gold as fast as possible by every citizen who can get and keep his hands on it; and America will become another India or China, with an insatiable appetite for real money, to be hidden.

"Second. The restoration to ordinary circulation of gold certificates.

"Third. The substitution for the small issues of Federal Reserve banknotes, of similar silver certificate issues in which the people have more confidence.

"Fourth. More candid and more frequent publicity through the Treasury Department respecting the exact amounts of all kinds of currency in actual circulation.

"Fifth. Deflation until we are so far away from 40 per cent gold cover and so near to the 100 per cent gold cover as to reassure the minds of all citizens."

It will be noted that the gist of this writer's pertinent recommendations is the restoration of gold as real money; and, moreover, leaning heavily, as an auxiliary support, on silver as real money; for he truly says that people have more confidence in silver certificates than in Federal Reserve notes, which, as we have previously stated, are 40 per cent gold value and 60 per cent I O U's.

Our financiers and bankers must not forget the fundamental fact that money is metal, under the century-tried system of the world; and that there is no other real and valuable money. Even the most stable government fails to sustain the fictitious stamped value of its paper money unless this really represents accessible metal. The protection and encouragement of the gold industry, then, becomes clearly a matter of great material importance; and it is clearly the duty of Congress to assist this by passing the McFadden bill. Furthermore, it is necessary to intensify the conception of silver as true money, and for this a fixed ratio of value with gold should be established in all countries, by a world-wide agreement, as it has been fixed temporarily in the United States by the Pittman Act. The passing of India to a so-called gold basis has resulted in hoarding of gold there, as well as silver, and further limits the basis of real money on which the world is doing its enormous paper business, and going bankrupt on its "easy-money" system.

Vocational Training for Injured Workers

LITTLE note apparently has been taken of the bill providing for the vocational rehabilitation of workers injured in industry, which became law on June 2, when it received the President's signature. The seeming lack of public interest in it probably is because its purpose has been confounded with vocational training of disabled soldiers. By the provisions of this new bill, the expense of restoring to vocational usefulness those injured in industry or any legitimate pursuit is to be divided between the state and Federal governments.

This marks a new step forward. Workmen's compensation legislation is not sufficient. It compensates, to greater or less extent, the injured worker for his injury, but it may leave him incapable of producing further at his regular occupation. The necessary funds for the work have been provided. An appropriation of $750,000 for the current fiscal year, and of $1,000,000 for each of the three succeeding years, is to be divided among the states on a basis of population, no one state to receive less than $5,000 per year. Each state must contribute an amount equal to that which it receives and must submit its plans, its courses of study, and the qualifications of teachers and other officers employed, to the Federal Board for Vocational Education for the latter's approval. It must also report how its money is expended. Civil employees of the Federal Government disabled in the course of duty are to enjoy the benefit of the act.

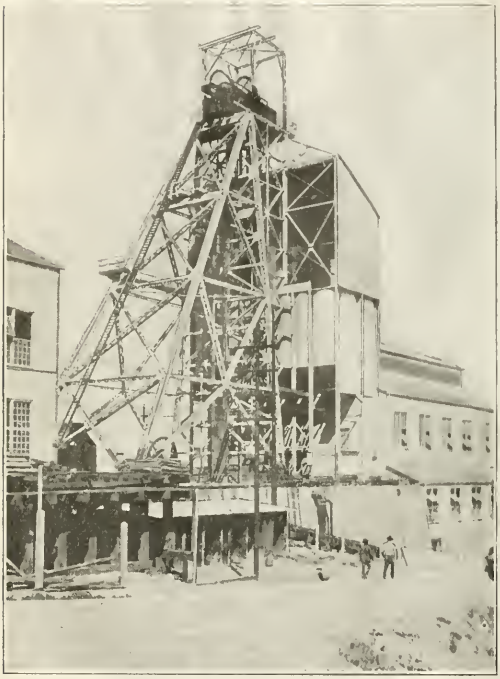
The workman is told to produce and keep on producing; that thus only can reconstruction be achieved. It is not strange, then, though some will say it is paternal, that the Government should seek to render the incapacitated workman productive. Instead, it is quite logical. The principle is sound and thoroughly up to date. But the saying "Once stung, twice shy" is apt. "Vocational training" has recently come to have a disreputable significance through the maladministration of the work among injured soldiers. It will take time for the public to forget this. The popularity of the new statute will depend largely on the manner in which the work is conducted.

The Housing Shortage

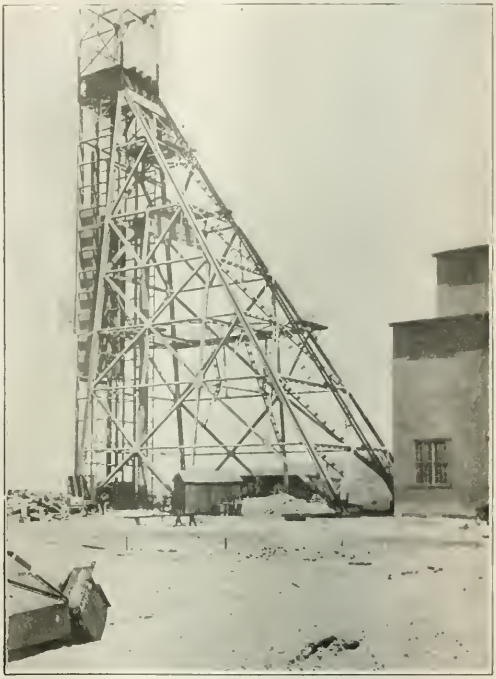
THOSE who live in mining communities have one advantage over the populace of our cities, especially over those unfortunates who do not own their own homes. Most mining towns have at least enough houses to go around, even though they are not always everything that might be desired in luxuriousness. In many company towns, particularly, suitable and sufficient houses have been provided. Furthermore, the rents charged are often nominal, and in practically all cases considerably less than profiteering landlords are exacting in more populous centers. They are also fairly constant and permanent, and the lessee need not fear an advance whenever the owner feels that the time is ripe; or that he may be evicted on the fatal first of October. Often, electric power is supplied at a nominal figure and sometimes other benefits are derived which are not included in the ordinary lease.

The housing situation is acute in almost all of our cities, so that residents of mining communities would be wise to consider this fact before deciding to move. If one wishes to buy, the price asked is about three times the pre-war cost and the risk of a rapidly depreciating investment must be assumed. To rent or lease is almost impossible. Only last week a friend wrote us that he had rented the last house in Detroit. Here in New York we recently heard this story: After trying in vain for months to get a house, Brown wandered to the river, possibly with the thought of ending it all. Suddenly he heard a splash and saw his friend Green struggling hopelessly in the water. Without attempting to save him, he rushed off to his house agent. "Quick!" he gasped; "Green has fallen in the river. Can I have his house?" "Sorry," said the agent, "I've already let it to the man who pushed him in."

Miami Copper Plant, Miami, Ariz.



HEADFRAME AT PRESENT WORKING SHAFT



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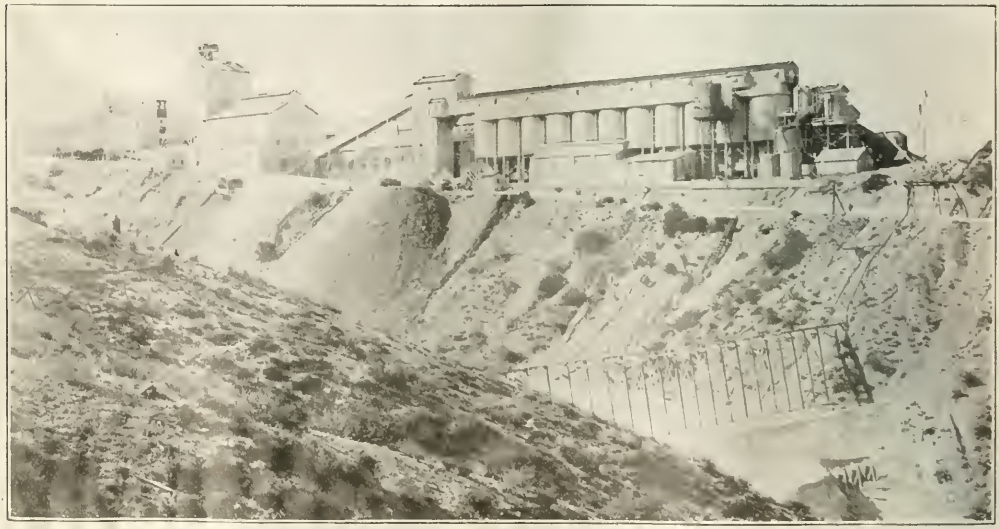


MINE AND MILLING PLANT OF MIAMI COPPER CO.

NEW CONSTRUCTION BY MIAMI COPPER CO. FOUNDATIONS FOR ORE CRUSHER PLANT AT NEW SHAFT TAILING PILES ARE SHOWN IN BACKGROUND

VIEW OF MIAMI, ARIZ.

The Ophir Mining District, Utah

An Attempt To Correlate Ophir Sedimentaries With Those of Tintic District—Great Anticline, In Which Chief Ore Deposits Occur, and Ophir Fault Principal Geological Features—Locality a Steady Producer Since 1870

By F. M. Wichman
Mining Engineer, Salt Lake City, Utah
Written for *Engineering and Mining Journal*

THE history of the mining industry of Utah dates from 1863. From 1863 to 1869, activity was confined principally to the location of claims. Several small smelters were erected near Stockton, but these were not successful. The railroad entered Utah in 1869, and with it came the first real stimulus to mining. Branch lines were soon constructed from Salt Lake City, one south through the Salt Lake and Utah valleys and one west and southwest into Tooele Valley. The latter reached the Stockton district and immediately encouraged active development of the mines of Stockton and Ophir.

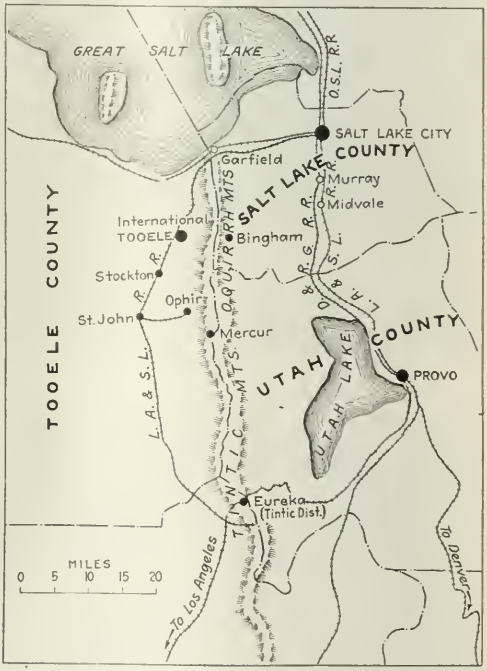
The Ophir mining district is situated on the west slope of the Oquirrh Mountains in Tooele County, eighteen miles south of Tooele City, the county seat, and fifty-seven miles by highway in a southwesterly direction from Salt Lake City. The first claim located in the district was the Silveropolis in 1870. As Ophir is but six miles from Stockton, it naturally followed that its rich outcrops of silver ores should receive early attention from the prospectors. The first shipment of forty tons of ore from this claim is said to have netted $24,000. The silver was in the form of chloride or hornsilver, and the surface ores are reported to have carried as high as 6,000 oz. to the ton. A stamp mill was erected in Ophir Canyon in 1871, and this was followed by several others as the mining industry progressed.

From 1870 to the present Ophir has been a steady producer. The rich surface ores were soon exhausted, but systematic development by organized mining companies soon brought to view rich carbonates and sulphide of lead accompanied by a high silver content and a small quantity of gold. In later years other metals have been profitably mined, copper, zinc, and manganese, but the lead-silver ores have always been the main source of revenue.

The district is credited with a gross production of from $35,000,000 to $50,000,000. Accurate records are not available, however, and it is probable that the lower figure is nearer correct. One mine alone, the Ophir Hill Consolidated, reported to the State Board of Equalization gross proceeds for 1918 of $840,668. This property, owned principally by Senator W. A. Clark, of Montana, has been a steady producer for a quarter of a century, and its claims under individual ownership yielded much rich silver ore in the earlier days. Among other mines in the district which have been highly productive are the Montana-Ophir, Hidden Treasure, Buckhorn, Lion Hill, Chloride Point, Northern Light, Buffalo, Jim Fisk, Kearsage, Eureka-Ophir, and Queen of the Hills. During recent years, consolidations have taken place, and the active mines at present are the Ophir Hill Consolidated, Montana-Ophir, Ophir Metals, and Hidden Treasure, together with a few of the older mines under lease.

With regard to smelters, Ophir is favorably situated. The International Smelting Co.'s lead and copper plant is only twenty-five miles by rail from Ophir; the Garfield smelter of the American Smelting & Refining Co. is forty miles distant. The American Smelting & Refining Co.'s Murray plant and the U. S. Smelting Co.'s Midvale plant are but sixty-five and seventy miles, by rail. A fair freight rate permits the mining of comparatively low-grade ore.

The Oquirrh Mountains form the most easterly of the series of north and south ridges lying in the Great



MAP SHOWING RELATIVE LOCATION OF OPHIR DISTRICT, UTAH, WITH RESPECT TO SALT LAKE VALLEY

Basin area between the Wasatch and the Sierra-Nevada ranges. They are separated from the Wasatch, about twenty miles distant, by the Salt Lake and Utah valleys. The Oquirrh Range extends from the south end of Great Salt Lake southerly for a distance of thirty miles. Here it is separated from the Tintic Range to the south by a broad pass. If the two ranges are considered as sections of a single range, which in reality they are, they will have a total length of seventy miles. The Oquirrh Range proper has a width of five to ten miles and its highest peaks reach an elevation of 11,000 ft.,

only 1,000 ft. less than the highest peaks in the Wasatch Mountains.

The Ophir district, unlike the Bingham district fifteen miles north, has developed practically no underground water. The mines are almost dry even to a vertical depth of 1,000 ft. As no development has taken place immediately under the floor of the canyon, it remains to be seen whether or not this area will develop water, but it is noteworthy that in diamond drilling to a vertical depth of over 1,200 ft., the holes appeared to be dry throughout and even the water that was pumped into the holes seldom reappeared at the surface.

Ophir Canyon is on the west side of the Oquirrh Range about six miles from its southern extremity. The general course of the canyon is southwest. Its floor is narrow, in some places scarcely the width of the wagon road and railroad track combined; in other places it is several hundred feet wide.

Ophir Hill rises on the north side of the canyon to a height of 2,500 ft. above the town. The south slope of this hill has the form of a great amphitheater with a semi-circular rim near the top of almost vertical cliffs. On the south side of the canyon Lion Hill rises as a great dome, nearly 2,000 ft. high. The north face of

LION HILL, OPHIR, UTAH

Lion Hill is very steep, owing to a series of vertical limestone cliffs 30 to 100 ft. high.

The Oquirrh Range is composed of Paleozoic quartzites, shales, and limestone, cut by stocks, dikes, and sills of various igneous rocks. The sedimentary rock has been subjected to intense folding and faulting. The average dip is northerly, but there are all variations from this, and it is difficult to follow any particular bed, even from one canyon to another. The limestones in some localities, notably in the Bingham district, have been considerably metamorphosed by contact with great masses of monzonite porphyry. In other localities, Ophir for example, much of the limestone is very pure. Other strata are either carbonaceous or dolomitic.

The rocks of the Ophir district consist almost entirely of limestone. The exceptions are two comparatively small exposures of Cambrian or pre-Cambrian quartzite on the south side of Ophir Canyon, several beds of shale at different horizons in the limestone, and a few intrusive dikes. The limestone consists of many varieties, ranging in color from white to black, in texture from very fine grain to very coarse grain; massive varieties, and thinly bedded varieties, beds of nearly pure calcium carbonate, and others running high in magnesium carbonate, but all differing materially in their paleontological character.

Unlike the Bingham district, Ophir exhibits only a scanty amount of igneous rock. Several narrow dikes, one of them outcropping prominently near the top of Ophir Hill, of a persilicic rock resembling rhyolite porphyry, and one narrow dike of subsilicic rock probably diabase, are the only intrusive rocks visible on Ophir Hill. The former stands nearly vertical and strikes north. It has no apparent genetic relationship to the orebodies. The basic dike follows one of the prominent northeast fissures and exhibits a small amount of ore along its walls. Owing to lack of development of this dike beyond a few shallow prospect holes, no conclusions can be reached as to the genetic relationship between the dike and the ore adjacent to it. Near the summit of Lion Hill, a broad dike accompanied by an intrusive sheet of porphyritic rock has caused a local silicification of the inclosing limestone. Some of the orebodies on Lion Hill are in this silicified zone, but they are likewise associated with northeast fissures. The basic dike noted on Ophir Hill crosses the canyon and is also found on Lion Hill.

The most striking geological feature of Ophir is the great anticlinal fold, which, on Lion Hill especially, is most remarkably developed. The axis of the anticline strikes N. 40 deg. W., and the two limbs dip to the northeast and southeast, respectively, in great sweeping curves. On Ophir Hill, the anticlinal axis dips at an average angle of 18 deg. to the northwest; on Lion Hill it is level for a short distance from the canyon, then gradually dips to the southeast. Thus, within an area two miles square, one may find dips in every direction, producing the structural feature called a quaquaversal fold. It is a noteworthy fact that nearly all the important mines of the Ophir district are on or close to the anticlinal axis. Folding has naturally caused considerable fracturing where the strain was greatest, but, as far as known, there are no deep-seated mineralized fissures conforming with the course of the axis; therefore, it is reasonable to conclude that the anticlinal axis, by virtue of its fractured and weakened condition, acted as a favorable receptacle for the deposition of ore brought to that region through other channels.

Only two unconformities of any importance exist in Ophir stratigraphy. One is at the contact of the quartzite and the overlying lime-shales and the other occurs at the top of the dolomite series. The former is the more interesting, inasmuch as it indicates that a long period of erosion occurred between the deposition of the quartzite and that of the shales. Before the latter were deposited, the quartzite had attained a very uneven surface. In some localities, the floors of the valleys were at least 300 ft. lower than the ridges. Consequently, as the shales were deposited, the valleys filled first, and some of the higher ridges still remained uncovered when the period of shale deposition gave place to that of the next higher formation. Owing to this uneven floor, there is a considerable variation in the thickness of the ore-bearing lime-shales.

Second in structural importance to the anticline is

the Ophir fault. This fault shows plainly near the base of Ophir Hill, and is the direct cause of the upthrow of that hill, exposing the Cambrian quartzite at the axis of the anticline. The fault strikes about N. 70 deg. E., and dips southerly at 65 to 70 deg. It is accompanied by several important and numerous unimportant sympathetic faults paralleling the main fault in a zone a thousand feet or more in width on either side. Until recently, it was thought that the displacement between Lion Hill and Ophir Hill was due to a single fault on which the displacement, represented by the difference in elevation between corresponding formations on the two hills, was 900 ft. However, recent diamond-drilling operations have proved the existence of other faults, and have shown that the maximum vertical displacement is nearer 1,700 ft., the most deeply faulted block being a narrow one, the top of which is completely covered by the gravel in the canyon. The fault can be traced for two miles in a westerly direction and nearly a mile to the east, but its point of maximum effect appears to be at the axis of the anticline.

Faulting Followed Ore Deposition

The consensus of opinion is that the entire fault system is post-mineral. The fault is unaccompanied by mineralization except in the vicinity of orebodies, and there it is much in the nature of drag ore. Diamond drilling by the Ophir Central Mines Co. on the south side of the canyon has proved the existence of ore deposits in the most deeply faulted block of ground in a lime-shale formation similar to that carrying ore on Ophir Hill, indicating that a continuity probably existed in the ore deposits under Ophir Hill and Lion Hill before the period of faulting.

The Ophir district is traversed by many northeast fissures. They strike from N. 20 deg. E. to N. 60 deg. E., and, with few exceptions, dip steeply west. A few of the important ones have yielded rich silver-lead ores, but in profitable quantity only where they cut certain limestone beds which have been more susceptible to replacement than other beds. These fissures are found at all depths, and are evidently the channels through which the metal-bearing solutions ascended. The typical gangue is calcite, although one prominent fissure has a quartz gangue. The fissures vary in width from a fraction of an inch in the hard formations to four or five feet in the softer ones. Faulting of considerable importance, in one case 200 ft., accompanies several of the fissures, though others show none whatever. In many places the gangue and ore of the fissures have been removed by the circulation of vadose waters, leaving open-air courses hundreds of feet in depth. Ore-bearing solutions passed from the fissures into the more "soluble" limestone beds, thus forming the bedded deposits which have been the source of 90 per cent of all the ore mined in this district.

Geology of District Given Scant Attention

The geological features of the Ophir district seem to have received scant attention from the U. S. Geological Survey. J. E. Spurr, in his valuable paper on the "Economic Geology of the Mercur Mining District," which appeared in the Sixteenth Annual Report of the U. S. Geological Survey, refers to the general geological features of the Ophir district. The Fortieth Parallel Survey, by Clarence King, also furnished some valuable information, but neither of these reports went into detail with regard to the various limestone formations. In recent years, greater importance has been attached to this phase of the subject in other mining districts, and the estimable report on the Tintic district by Lindgren and Loughlin, published a year ago, goes into great detail in this respect. These geologists have established a definite nomenclature to the more important formation represented in the Tintic district, comprising in the aggregate nearly 7,000 ft. of sedimentary rock.

In Ophir, however, no definite nomenclature has been established. The productive lime beds have been named after various mines and claims, but there seems to be

SURFACE WORKINGS IN OPHIR FORMATION. OPHIR, UTAH

a difference of opinion, even among local mining men, as to which is which. The "Henrietta limestone," for instance, is a name applied to a mass of limestone and shale having a stratigraphic thickness of 1,200 ft., and comprising several very distinct formations.

A geologist engaged in the study of the various sedimentary beds exposed in the mountain ranges of the Great Basin area is constantly impressed with the importance of having an established nomenclature with which to work. Of course, one would not expect to find every formation that is represented in one district also represented in another district 100 miles away, but if, as a basis of nomenclature, the various horizons in one locality, where the stratigraphic column is complete and definitely fixed, were accepted, investigators would be materially aided in their work elsewhere.

For my own convenience, I have attempted to correlate the Ophir sedimentaries with those in Tintic, applying the same names to similar formations. On close examination, a striking similarity appears. However, in the mineralized district of Ophir, that is, on Ophir Hill and Lion Hill and in the adjacent canyons, only 3,000 ft. of the Tintic sedimentaries above the quartzite are represented.

The oldest formation represented in Ophir is what I shall call the Tintic quartzite, about 400 ft. of which is exposed on the foot-wall side of the Ophir fault near the base of Ophir Hill. It has been correlated as a Cambrian formation by some geologists, and by others pre-Cambrian. Metamorphism has destroyed all fossils that the original sands may have contained. The quartzite has been brought to the surface by faulting and is exposed in only two places; namely, in two gulches located approximately in the axis of the anticline.

Lying unconformably upon the quartzite is the Ophir formation, consisting of an alternating series of shale

and limestone beds. The lower shale members are quite siliceous, whereas those near the top grade into an argillaceous limestone. The shale has a greenish tint on fresh fracture, due to the development by dynamic metamorphism of epidote and other aluminum silicates. The thickness of this formation varies widely from the narrowest trace to 300 ft.

Five Ore Horizons in Ophir Formation

The Ophir formation has furnished the bulk of the ore which has come from this district. It contains five ore horizons, which have been mined to a depth, on the incline, of nearly 2,000 ft. The ore is associated with northeast fissures cutting the formation. The superficial ores were rich in silver, but in depth they are principally in the form of argentiferous galena associated with sphalerite, chalcopyrite, and pyrite. The ratio of silver to lead varies from one-half to one to one to one. Copper sulphide ore, largely chalcopyrite, of excellent grade, is also mined in one horizon. Secondary enrichment is not particularly noticeable below the surface. It is probably the secondary zone that now shows at the surface, erosion having removed the original leached zone. Both chalcopyrite and galena, apparently in primary form, are found close to the surface.

There is no clear line of demarcation between the Ophir formation and the Teutonic Limestone. In a section taken at the anticlinal axis, the Teutonic has a thickness of 665 ft. It is bluish-gray, fine grained, thinly bedded argillaceous limestone. It is not known to be ore-bearing, but is a very distinct formation and is persistent in many localities in western Utah.

The Dagmar limestone rests conformably upon the Teutonic. In the section above referred to, it has a thickness of 125 ft. It can be distinguished readily from all other formations by its oölitic beds, of which there are several, varying from 3 to 8 ft. in thickness. They alternate with beds of an argillaceous limestone.

The Herkimer limestone which overlies the Dagmar includes at its base about 12 to 18 ft. of shale. The bulk of the formation, however, is a thin-bedded argillaceous limestone. The shale contains secondary silicates, and in a few localities a little pyrite and chalcopyrite. It is an excellent horizon marker. The Herkimer has a total thickness of 268 ft.

The next higher formation is the Blue Bird dolomite. One can never fail to identify this rock, as it is entirely different from anything else appearing in Ophir. The characteristic rock is of a dark gray, medium-grained crystalline texture, but interbedded with it are several layers of nearly pure white dolomite, having a sugar-like texture. A section of the Blue Bird dolomite on the anticlinal axis exhibits a total thickness of 690 ft., about 160 ft. of which is the aggregate thickness of three white dolomite beds occurring in the upper half of the formation. The Cole Canyon dolomite of the Tintic district is not represented in Ophir.

Above the Blue Bird there is a bed, 200 ft. thick, of gray, crystalline dolomite, above which lies a bed, 90 ft. thick, of dolomite similar in texture but darker in color. It resembles the lower part of the Opex dolomite in Tintic, but lacks the shale members of that formation.

A slight unconformity exists at the top of the dolomite series. It is more noticeable on Lion Hill, especially when viewed from a distance, than on Ophir Hill. None of the dolomites has been found ore-bearing.

Overlying the dolomites at Ophir is an important limestone bed which is apparently not represented in Tintic. It is locally called the Buckhorn. It is a fine to medium-grained rock, is nearly pure limestone, and has been the source of considerable ore. The average thickness is 30 ft.

Above the Buckhorn in Ophir appears the lowest of the cherty limestones. In Tintic the lowest of this type is called the Ajax, but aside from the cherty inclusions there is no similarity between them. I am inclined to place this formation in Ophir much higher in the series, correlating it with the Gardner dolomite of Tintic. In the southern part of the Ophir district, there occur siliceous beds at the base of this formation quite comparable to the Victoria quartzite which underlies the Gardner in Tintic. The lower part of the Gardner on Ophir Hill consists of a bed of magnesian limestone, 90 to 100 ft. thick, dark bluish-gray when fresh, but weathering a dirty brown. Higher in the Gardner formation the limestone becomes more massive. Fossils, including large brachiopods, are common at some horizons. The total thickness of the Gardner in Ophir is somewhat over 500 ft.

Overlying the Gardner, but with no distinct boundary separating them, lies what is called in Ophir the Hidden Treasure limestone. It might be considered as the upper part of the Gardner, but, on account of its value as an ore-bearing medium, it is advisable to give it a distinct name. It forms the summit of Ophir Hill, and several beds within the formation have been very productive of high-grade ore. It is a coarsely crystalline, rather soft, light gray to brownish limestone. The formation contains interbedded layers of thin dark-colored limestone similar to that in the Gardner and at least one bed of dense carbonaceous shale. The last is usually considered to be the hanging wall of the ore-bodies. Fossils of Mississippian age are abundant. Of this formation, 75 to 150 ft. is all that remains at the top of Ophir Hill.

Ophir and Tintic Columns Compared

The comparison of the Tintic column in the Lindgren and Loughlin memoir and the Ophir column from the author's notes shows a remarkable similarity for the first 2,300 ft. above the quartzite. Above that horizon, however, the Tintic column contains over 2,300 ft. of sedimentaries which are not represented in the Ophir column. The missing strata would indicate that there was either no deposition at Ophir between Upper Cambrian and Lower Carboniferous or else a long period of erosion preceded the sediments of the Lower Carboniferous.

The Ophir formation offers the greatest field for future development, but the upper productive limestones are of too great importance to be overlooked. It is possible that other ore zones will be found to the east of the developed anticlinal zone, just as in Tintic ore has been developed in depth several miles to the east of the synclinal trough. In fact, the existence of at least one mine, the old Jim Fisk, which produced very rich silver ore in the early days, is indicative of the fact that orebodies occur on the east limb of the anticline, nearly a mile from its axis. The ore in this mine occurred in fissures where they traversed one of the Hidden Treasure beds, and typifies how important certain limestone horizons are in the deposition of ore. Development work in this mine shows that where the same fissures passed into the underlying stratum they are insignificant.

Tin a Much-Maligned Metal

Some Elementary Facts for the Man Who Does Not Know What a "Tin Can" or a "Tin Lizzie" Is Made Of

By E. D. Ward
Written for *Engineering and Mining Journal*

OWING to the extremely loose use of the word there is probably no metal of which less is known by the man in the street than tin. Any metal container of food is referred to as a "tin" can, but the amount of actual tin in, say, "a tin" of sardines is about equal to a quarter of a dollar in weight. The "tin" popularly so-called is in reality made of thin sheet-iron coated with a solution of tin to prevent rust. "Tin" dishes and "tin" roofs are made of galvanized iron. Even the "tin" soldiers of our youth are made of lead. As a consequence of this mistaken nomenclature the word "tinny" has even been coined to signify a somewhat meretricious metal article.

Why tin should be maligned to this extent is difficult to understand: a "tin" can does not even closely resemble the metal whose name it has appropriated. Popular prejudice is admittedly a difficult matter to tilt against, but it is certainly due to a valuable and miscalled metal to give some account of its production and uses.

The chief tin-producing countries of the world are the Federated Malay States and the nearby Island of Banca, which annually export about one-half of the world's tin supply. Next in order come Bolivia and China, and among the smaller producing countries may be mentioned Siam, Nigeria, Australia and Great Britain. In the Federated Malay States tin is found as an ore in gravel, and all the workings are alluvial, with the exception of a few deep-cast mines. There are no underground workings. When the gravel has been washed thoroughly the resultant ore contains about 70 per cent pure tin, and the same percentage is, on the average, extracted when the ore is smelted, though exceptionally good lots may give 75 per cent or even higher.

Until comparatively recently the actual mining operations in the Federated Malay States were in the hands of the Chinese, the European merely acting as buyer of the ore. The primitive methods of washing adopted by the Chinaman naturally were wasteful. The mines are now gradually coming under British management, and are being worked and developed by more modern and scientific methods. In many places the old washings, or "tailings," as they are called, are being retreated for the recovery of the metal contained, with satisfactory results.

The actual mining of alluvial tin ore is simplicity itself. The ore-bearing gravel is mixed with water and led down a series of wooden troughs. In the bottom of these troughs are nailed slats of wood about an inch high. The ore, being heavier than the gravel, keeps to the bottom of the trough and is trapped by the slats, while the gravel is carried off by the water. The ore is then dried, placed in bags and sent off to be smelted. In some mines, particularly the more modern ones, the labor of digging the gravel is dispensed with by playing a powerful jet of water on to the face of the working, and guiding the wash thus obtained directly into the troughs.

Other minerals occur in tin ore, but rarely in sufficient quantities to be of commercial value: in fact, rather the reverse, for in that event the ore requires special treatment, such as roasting, to dispose of them. In this connection an illuminating story is told of a well-known smelting firm which before the war accidentally came into possession of a large quantity of wolfram ore. The firm reported the find to the British government and offered to sell at the market price of the day. The authorities loftily replied that they did not do business privately in that way and suggested that the ore be put up for public tender. It was, and was bought by a German firm at twice the market price!

At the smelting works the ore is mixed with anthracite and crushed slag and put through the furnaces. It is not possible to extract the full percentage of tin in one smelting, hence the addition of the slag—the residue of a previous smelting. When ready, the molten metal is run off into rough ingots, which are again smelted down in a refinery and ladled out into moulds for shipment, each block weighing about 130 lb.

If the metal containers of foodstuffs really were made of pure tin there would be reason indeed to complain of high prices. At present tin sells for about £269 per long ton; sheet iron for about £40. Tin plays a small but very important part in the composition of "tin" cans. It possesses the valuable property of being absolutely rustless and is therefore used as a barrier between the iron of which the container is made and the contents. When one thinks of the hundreds of millions of "tins" of bully beef, jam, pork and beans, M. & V. rations, and other necessaries and delicacies that were produced during the recent war it will be realized that tin "did its bit."

In the unenlightened past, before national economy became so essential, it was customary in Great Britain to throw away empty "tins," and special ships were employed to take large quantities out into the North Sea and dump them. Shortly before the war the Germans set up large foundries in England for dealing with this waste material. They perfected a process for recovering the actual tin, they melted off the solder and they pressed the iron into blocks, and then exported the whole lot to Germany! British enterprise is now at work, and the empty "tin" so carelessly thrown into the dustbin has by no means finished its usefulness.

Tin is also largely used in alloys. Stereos and type are composed of an alloy of tin, lead, and antimony. Pewter is an alloy of tin and lead, and most "white" metals usually have some proportion of tin in their composition.

As previously mentioned, tin is found in the British Isles, chiefly in Wales and Cornwall, but rarely in a free state, and its production is never likely to be a big commercial success in those districts, on account of the heavy working expenses. In the Federated Malay States, on the other hand, the industry has not yet been developed to anything like the fullest extent. In many places, particularly in the State of Perak, tin mining is superseding rubber planting. Labor is plentiful and cheap, the Chinaman is a good worker, water is abundant, and the smelting works are thoroughly up to date. In short, the industry has an assured and prosperous future.

The Cost of Mining as Influenced By Poor Development

Ultimate Expense Per Ton Increased by Hit-or-Miss Methods of Laying Out Workings — Money And Time Loss Through Unnecessary Footage of Drifts and Crosscuts Illustrated by a Concrete Example

BY A. G. WOLF

Written for *Engineering and Mining Journal*

MANY mines have been developed from small prospects into large properties, by the simple process of extending their workings in a hit-or-miss manner from the original discovery shaft or adit, resulting in a set of mine excavations that resemble in plan the labyrinthine openings of a big limestone cave. In some operations this is unavoidable, but where prospecting work and preliminary development have exposed the mineralized zone and the probable limits within which oreshoots are to be expected, the careful planning of development with the future operation of the mine in view may result in greatly increased profit. The best way to illustrate this is to give a concrete example.

In the mine used as an illustration, the ore had been formed by contact metamorphism. The oreshoots were of various sizes and irregularly spaced throughout a zone of fairly regular strike and dip. The strike of the zone was well marked on the surface, and, after certain preliminary development work and the completion of the main lower haulage tunnel, the dip was known. The major portion of the mine is now worked out, and produced say, 250,000 tons of ore during a period of thirty months. A study of the mine maps shows that instead of the winding, twisting and branching set of drifts and crosscuts that were driven, uniformly spaced parallel drifts along the zone and crosscuts at a certain regular interval would have exposed every pound of ore ultimately stoped, with a saving of 1,500 ft. in drifts and crosscuts.

The cost of this unnecessary development work applied to the tonnage of ore extracted amounted to about $0.065 per ton; not so serious taken alone, but many other factors affecting ultimate cost were involved. These are tabulated as follows:

FACTORS IN DEVELOPMENT AFFECTING ULTIMATE COST PER TON

1. Cost of extra footage driven.
2. Cost of extra equipment.
3. Cost of delay in supplying ore to reduction plant.

FACTORS IN ORE EXTRACTION AFFECTING ULTIMATE COST PER TON

4. Cost of straightening drifts and rounding turns.
5. Extra cost of inefficient tramming: Less tons per man-shift due to longer trams; interference; more wrecks; bad grades; more wear and tear on equipment; more lubrication.
6. Time lost by new men learning their way about crooked workings.
7. Cost of extra mine repairs.
8. Cost of lower efficiency due to poorer ventilation.
9. Extra overhead mine cost due to longer time to work out mine.
10. Extra overhead reduction-plant cost due to longer time to work out mine.

The factors listed above are discussed in detail as follows:

1. The cost of 1,500 ft. of excess drifts and crosscuts was estimated at $10 per ft., or $15,000. This included labor, general mine expense, and supplies except track, pipe, and lighting equipment.

2. The cost of equipment for extra footage is given in the following table:

COST OF EQUIPPING EXTRA DEVELOPMENT FOOTAGE

1,000 yd. 16-lb. tee rail at $3 per 100 lb	$480
1,500 ft. 2-in. air line at 20c. per ft.	300
1,500 ft. 1-in. water line at 10c. per ft.	150
750 ties at 12c.	90
Spikes, bolts, fishplates	50
Lighting equipment	30
Total	$1,100

3. As to delay in supplying ore to reduction plant, no loss of time in operation resulted in this particular instance, chargeable to the extra time required to do the unnecessary development work, because the reduction plant drew its ore supply from several mines. It can readily be seen, however, that any delay in operating the reduction plant would have increased greatly the interest, depreciation, and overhead charges, and hence the cost per ton of ore extracted and treated.

4. After the development work was done many drifts had to be strightened and sharp turns rounded to permit motor haulage and to make hand tramming reasonably efficient. No actual figures of the cost of this work are now at hand, but a conservative estimate based on intimate acquaintance with the mine operations is $1,000.

5. The actual cost of hand tramming is known. This could have been materially reduced by planning the drifts and crosscuts in the first place. The drifts should have been reasonably straight and the crosscuts parallel to each other and at such an angle with the drifts that an easy turn could have been made in going in one direction from the crosscuts into the drifts. This would have resulted in greater tonnage per trammer-shift, owing to shorter trams, less interference of cars going in opposite directions, better grades, fewer wrecks on account of fewer curves, frogs, and switches, and lower cost of materials, as there would have been less wear and tear on the cars and less lubrication would have been needed. There must also be taken into account an indefinite but important factor, namely, the difference in spirit with which a man works when he has an easy tram and when he has a hard one. What the total saving under this heading would have been can only be estimated. After a careful consideration of the various factors, it is my belief that 25 per cent could have been cut from the cost of hand tramming. The total cost of this operation from the stopes alone was $42,750; hence at least $10,687 would have been saved.

6. The labor turnover was high, machinemen, machinemen helpers, trammers, and shovelers having to be replaced about once a month. The average time lost or "killed" by new men in finding the working places in the crooked mine openings was easily one-half shift per man per month more than it would have been if the plan of the mine had looked less like a labyrinth of

classic antiquity. The total payroll represented by such labor, taking into account heading No. 5, was $138,370. There was incurred, then, a loss of one-sixtieth of $138,370 or $2,306.

7. The actual cost of mine repairs is known, and in this particular operation was quite low, especially as little timber was required. It is conservative to estimate, however, that $2 per day could have been cut from these repairs during the working time. As the tonnage under consideration was extracted in thirty months, there is an indicated saving of $1,800.

8. As all ventilation was by natural draft, aside from the blowing out of workings with compressed air from the drilling lines, no direct comparison of costs can be made, but it is certain that ventilation was poorer in the irregularly developed mine than it would have been had the mine been opened along the lines suggested. One set of drifts and raises could have been used for direct air courses and another set for return air courses. Poorer ventilation meant loss of efficiency, which actually influenced the cost of mining, although it cannot be shown here in dollars and cents.

9. To arrive at definite figures regarding the extra cost per ton of ore mined owing to slower operations, an assumption must first be made as to the percentage of the whole period of ore extraction that could have been saved by properly planned development work. After taking all factors into consideration, and knowing the mine, I believe that 10 per cent of the total time consumed in ore extraction could have been saved. There was, therefore, a loss amounting to 10 per cent of the overhead mine charges during this thirty-month period. Those monthly charges not already considered are given in the following table:

OVERHEAD MINE CHARGES PER MONTH

Superintendence	$250
Shift bossing	450
Engineering and clerical	300
Compressor operation	325
Tool sharpening and blacksmithing	440
Watching	90
Rock crushing	225
Nipping	90
Aerial tramway operation	900
Power	300
Total	$3,370

The 10 per cent loss, then, for the thirty-month period, expressed in dollars, was $10,110.

10. As to increased overhead cost of the reduction plant, it has already been stated that in this instance the plant did not depend upon this mine alone for its ore supply, so that no extra treatment charge per ton of ore would be made against the mine on account of the daily tonnage being smaller than that which could have been shipped. However, if the mine had been the only source of supply, this greater overhead charge at the reduction plant would have been serious.

The total extra cost of mining caused by the poorly planned development work follows:

TOTAL EXTRA COST OF MINING DUE TO POOR PLANNING

Extra development	$15,000
Extra equipment	1,100
Delay in supply of ore to plant	Nil
Straightening drifts	1,000
Cost of tramming	10,687
Time lost by new men	2,306
Extra mine repairs	1,800
Loss of efficiency due to poor ventilation	Not estimated
Greater mine overhead charges	10,110
Greater plant overhead charges	Nil
Total	$42,003

This is equivalent to $0.168 per ton, assuming the tonnage mined and treated to have been 250,000 during the thirty-month period.

It is realized that the above example is not applicable to the majority of mines, but there are many to which it will apply. With a present labor cost 50 per cent greater than that noted, and with a charge included for extra mill overhead costs due to slower production, the extra cost per ton of ore mined and treated as shown above might easily be doubled. A moderate exercise of foresight in planning mine development and in computing the overhead costs of administration and practical operation may be worth thousands of dollars. The success of the property may depend upon it.

Geology and Ore Deposits of Jerome District, Arizona*

Arizona stands pre-eminent as a copper-producing state. In 1918, it produced four-tenths of the total amount produced in the United States. The production of the Jerome district gives it the sixth place among the copper-producing camps of the United States and third among those of Arizona, being surpassed by Bisbee and Globe-Miami. Two mines furnish the entire output of the district—the United Verde and United Verde Extension. The United Verde is 2,500 ft. deep and has blocked out a large reserve of massive sulphides. The United Verde possesses one of the largest known bodies of high-grade chalcocite ore.

The oldest known rocks of the Jerome district are a series of pre-Cambrian volcanics, with later sedimentary beds. Subsequent to the formation of these rocks, they were squeezed into close folds, with strikes from east to north-northeast, and this deformation was followed by the intrusion of masses of quartz-porphyry. This porphyry was subsequently rendered schistose in limited zones; and masses of diorite were afterward intruded. Still later came the ore-deposition. In the later part of the mineralization diorite dikes were intruded along east-west lines.

All these events were pre-Cambrian, according to Dr. Reber. Later came Cambrian sandstone (100 ft.); then Devonian limestones, (300 to 500 ft.), Carboniferous limestones (300 to 500 ft.) and Permian red shale and sandstone (0 to 500 ft.). There was no further rock formation till the late Tertiary, when basaltic lavas were poured out. Still later came a period of profound normal faulting.

All the orebodies are highly pyritic, and pyrite predominates. Chalcopyrite and pyrite seems to have been the chief primary copper mineral. The primary sulphides carry also gold and silver. The orebodies have formed by replacement of schist. Among the other primary minerals are bornite, tetrahedrite, sphalerite, galena, and specularite; also calcite and dolomite, and quartz, especially of a jaspery variety.

Structurally, the United Verde mineralization has been determined by a steeply pitching inverted trough of relatively impervious rocks, indicating ascending solutions, which are assumed to be of magmatic origin. The igneous body most closely related to the mineralizing solutions is believed to be the Bradshaw granite, with which are associated similar schist-replacement copper orebodies south of Jerome. All the other pre-Cambrian intrusions mentioned, together with the Bradshaw granite, may be regarded as related to a single period of batholithic intrusion.

*Abstract of paper by Dr. L. E. Reber, Jr., presented at Lake Superior meeting of the A. I. M. E., August, 1920. Abstract by J. E. Spurr.

Ball-Mill Tests on Missouri Lead Ore*

Variations in Speed and Ball Load Found To Be of Comparatively Minor Importance — Open-Discharge Cylindrical Mill With Large Balls Found Best Adapted for Securing a Product With Minimum of Slime

SOME interesting crushing tests were made in the Bonne Terre mill of the St. Joseph Lead Co. in 1916. The ore occurs as widely scattered deposits of galena disseminated through limestone. For the tests, material through 9-mm. and on 2-mm. round hole screens was used, an average screen analysis being about as follows: On 3 mesh, 3 per cent; on 4 m., 12; on 6 m., 17; on 8 m., 26; on 10 m., 25; on 14-m., 12; and through 14 mesh, 4 per cent. The mills used were a 6-ft. x 22-in. Hardinge mill, and a 6 x 4-ft. Allis-Chalmers ball granulator, both with and without grates.

The capacity of the ball mills and the nature of the product were considered to be governed chiefly by the following factors: Speed of rotation, weight of ball charge, nature and size of balls, moisture in feed, and rate of feed. Slime in the product was not desired.

Speed and Ball Load

The speed and ball load directly determine the power consumed. Within certain limits, variations in speed did not give a marked difference in the work done, but the tests in this direction were not extensive, nor the results conclusive. Apparently, not much variation was experienced between the limits of 420 to 490 ft. per min. peripheral speed for the cylindrical mill, and between 450 and 550 ft. per min., for the Hardinge.

Variations in the ball load also were found to be of comparatively minor importance. A heavy ball load consumed more power, but gave higher capacity, up to the point where the balls discharged through the trunnion, and the amount of crushing done per horsepower remained practically the same. Table I shows the combinations of speed and ball load that were found to give the best results.

TABLE I. SPEEDS AND BALL CHARGES

	6 ft. by 22 in. Hardinge Mill	6 by 4 ft. Allis-Chalmers Peripheral-Discharge	6 by 4 ft. Allis-Chalmers, Open Trunnion
Speed, revolutions per minute	28	23	26
Weight of balls, pounds	10,000	12,000	12,000
Horsepower	51 6	62 5	69 0

Size of Balls

The size of balls is important in determining the nature of the product. Balls of 5-in. diameter are necessary to crush the coarse ore. Small balls increase the slime in the product. During the earlier tests, when cast-iron balls were used, considerable trouble was experienced by the breaking up of the balls, until the charge consisted largely of very small pieces of 1-in. diameter or less. Samples taken from day to day during this period showed a gradual increase of oversize and in the amount of slime. The cast-iron balls were therefore replaced by steel balls from 5 to 2 in. in diameter. Various combinations of these sizes were used, and the highest capacity and lowest slime were obtained with a charge containing a large proportion of 5-in. balls. The charge now used is calculated to give an equal area in each size, a 12,000-lb. charge being made up of 5,460 lb. 5-in. balls, 4,040 lb. 4-in. balls, and 2,500 lb. of 2½-in. balls. New balls to make up for normal consumption are added weekly in the same ratio of sizes as the original charge; this practice has given satisfactory results.

Moisture Content

The moisture content of the material crushed affected the results mainly in the very fine sizes. A low moisture content increased largely the amount of slime in the product, without materially decreasing the amount of 10-mesh oversize. In the case of the peripheral-discharge mill, the difference is not so marked, but in all cases it has been found better to sacrifice a little capacity in order to obtain a product with low slime content. An average of 60 per cent moisture is, therefore, maintained in regular operation.

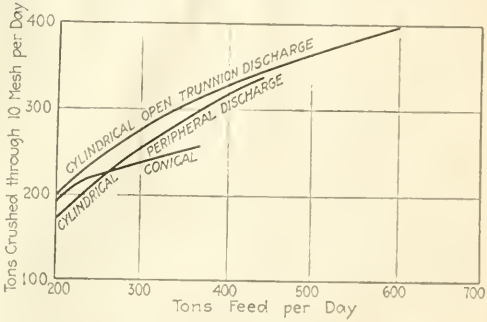


FIG. 1. EFFECT OF RATE OF FEED ON CAPACITY

TABLE II. MOISTURE TESTS ON HARDINGE MILL

	Test 1	Test 2
Tons feed per day	240 0	190 0
Per cent moisture	65 8	48 1
Horsepower	51 6	51 6
Capacity: Tons through 10 mesh	216 0	181 0
Tons through 10-mesh per hp.	4 18	3 51
Per cent slime in 10-mesh undersize	23 8	57 7

Rate of Feed

The effect of rate of feed is shown in Figs. 1 and 2, where the capacity and per cent of slime are plotted against the tons of feed per day, the moisture remaining constant at 60 per cent. The limits of the curves in each case represent the greatest tonnage that could be forced through the mills and maintained for any length of time. In the case of the peripheral-discharge mill, the tonnage was limited by the fact that when the 10-mesh oversize amounted to more than 25 per cent of the total, the mill began to fill and finally choked. With the open-end mills, a higher rate of feed was possible, giving a much greater capacity. This was one of the main factors that led to the adoption of the open-discharge cylindrical mill. Fig. 1 shows that the maximum capacity of this mill is 390 tons crushed to pass through a 10-mesh screen, against 340 tons for the peripheral-discharge mill, and 255 tons for the conical mill. By passing a very heavy tonnage through the mill,

*From a paper written for the Lake Superior meeting of the A. I. M. E., Aug. 23-28, 1920, "Application of Ball Mills in Southeast Missouri," by Lewis A. Delano and Harold Rabling.

the relative amount of slime is decreased considerably, as shown in Fig. 2; therefore, it is considered best to crowd the mill with a heavy tonnage having a high moisture content and to pass this through the mill rapidly, returning a large amount of oversize. This method of operation also decreases the ball and liner consumption by preventing undue wear of metal on metal.

Table III shows a comparison of the three types of ball mills, with the conditions under which best results were obtained, and the maximum capacity of each mill. The results shown were obtained under closer supervi-

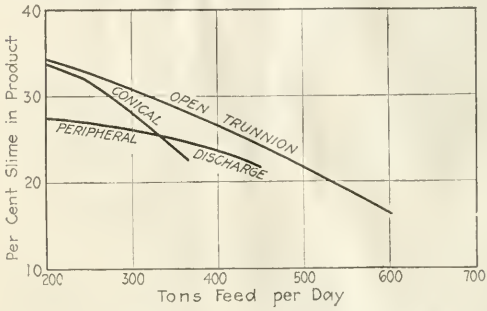


FIG. 2. EFFECT OF RATE OF FEED ON SLIME

sion than is possible in regular operation and which could not normally be maintained. In Table IV is shown an average condition at a normal operating rate, one that gives a product containing from 20 to 25 per cent of 10-mesh oversize for each mill, and has been found

TABLE III. OPERATING CONDITIONS AND MAXIMUM CAPACITY OF BALL MILLS

	Hardinge Mill	Allis-Chalmers Peripheral-Discharge Mill	Allis-Chalmers Open Trunnion Mill
Speed, revolutions per minute	28	23	26
Weight of balls, lb.	10,000	12,000	12,000
Size of balls, in.	4-2½	5-4-2½	5-4-2½
Material of balls	Steel	Steel	Steel
Tons of feed per day	320.0	450.0	600.0
Per cent moisture	59.3	59.5	60.0
Horsepower consumed	51.6	62.5	69.0
Delays, per cent time	1.41(*a*)	6.44	0.70(*b*)
Capacity, tons through 10 mesh	2.55	3.40	3.90
Tons through 10 mesh per hp.	4.93	5.45	5.65
Per cent slime in product	22.7	21.88	17.0

(*a*) Percentage delay on account of feeders breaking off, 1.35; other causes, 0.06.
(*b*) Percentage delay on account of gears, shafts, and countershaft bearings, 0.55; other causes, 0.15.

to be most satisfactory in every way. Under these conditions, the Allis-Chalmers open-discharge mill has the highest capacity, and shows the best ratio of tons crushed per horsepower. Examination of the products of each mill shows that the Hardinge mill produces more slime lead than the cylindrical type, and that the peripheral-discharge type gives a good product containing a larger amount of granular galena than either of

TABLE IV. NORMAL CAPACITY OF BALL MILLS

	Hardinge Mill	Allis-Chalmers Peripheral-Discharge Mill	Allis-Chalmers Open Trunnion Mill
Tons of feed per day	300.0	375.0	450.0
Per cent moisture	60.0	60.0	60.0
Horsepower	51.6	62.5	69.0
Capacity, tons through 10-mesh	237.0	305.0	345.0
Tons through 10-mesh per h.p.	4.60	4.88	5.00
Per cent slime in product	28.2	24.2	24.1

the others. However, mechanical troubles and delays were so great and the capacity was so limited by the grates that it was considered better to use the open-trunnion mills, which were installed in all sections of the Bonne Terre mill.

Krupp Mills vs. Rolls for 10-Mesh Grinding

Tests in Bolivia Showed Latter With Newaygo Screens To Be Preferred Equipment—Rolls Cut Costs But Product Not as Fine

FINE grinding is ordinarily done in the presence of water, but occasionally metallurgists are confronted with the problem of grinding to approximately 10-mesh in the dry condition. For this purpose, rolls or ball mills of the Krupp type are commonly used. In a paper prepared for the Lake Superior meeting of the A. I. M. E., entitled "Roasting and Chloridizing Bolivian Silver-Tin Ores," M. G. F. Söhnlein describes how the ore was ground for the chloridizing roast. Originally, Mr. Söhnlein says, No. 4 Krupp ball mills were used, but they were replaced by two pairs of 36 x 12-in. rolls. The rolls did the work for less than one-third of the cost of the ball mills, but gave a distinctly coarser product, which decreased the furnace capacity considerably. Therefore, a Toncap wire cloth of only 0.85-mm. opening was used on the finishing screen instead of one with 1.2-mm. opening on the ball mills, to obtain a product that was suitable for the furnaces. The first rolls were set with a ¾-in. opening, and their product went to a trommel with ⅜-in. openings, the oversize being returned to the coarse rolls and the undersize going to the finishing trommel, which was 42 in. in diameter and 12 ft. long. The last trommel was operated in closed circuit with the finishing roll.

Afterward, a ring-roll mill was installed to do the work of the fine rolls and a 6 x 8-ft. Newaygo screen was used instead of the trommel. Although with this arrangement the product was as fine as that from the ball mills and the capacity higher than from the roll plant, it was not found economical, on account of the high power and steel consumption of the ring-roll mill, which also showed other weak points in construction after having been used for some time. Now the rolls are again used, but with a Newaygo screen instead of the finishing trommel. Although the product is not quite as fine as that from either ball mills or ring-roll mill, it is sufficiently fine for the purpose. The cloth on the Newaygo screen, which is a No. 8 with 0.078-in. opening, lasts over two months, and the screw conveyor which distributes the ore evenly over the screen surface has a life of about seventy-five days. Power consumption is 11.8 hp.-hr. per ton ground from 2 in. maximum size to about 1 mm., and steel consumption is 0.38 lb. per ton.

SCREEN TESTS OF BALL-MILL AND ROLL PRODUCTS

Mesh	Krupp Ball Mill 1.2-Mm. Toncap Wire Cloth, per Cent	Rolls with 0.85-Mm. Trommel, per Cent	Rolls with Newaygo Separator, No. 8 Cloth, 1.9-Mm. Opening, Per Cent	Roughing Rolls and Ring-Roll Mill with Newaygo Separator No. 6 Cloth, 3.0-Mm. Opening, per Cent
On 10	3.0	0.0	1.5	4.0
On 20	17.0	19.0	16.0	24.5
On 40	24.0	31.5	19.5	20.0
On 60	8.5	11.0	23.0	5.5
On 80	7.0	10.0	8.0	4.0
On 100	5.0	5.5	5.5	6.5
On 150	3.5	4.5	4.5	9.0
Through 150	32.0	18.5	22.0	26.5
	100.0	100.0	100.0	100.0

The table shows how the sizes of product compared, under the different methods of grinding which were used.

Selecting a Slag and Apportioning Slag Losses

Detailed Method of Calculating Slag and Matte Composition From a Given Charge—Various Means of Charging for the Copper Loss—Advantages of Basing It on Iron Contents of Slag

By C. A. Grabill*
Written for *Engineering and Mining Journal*

THREE general conditions may exist in a given smelting works: That condition or circumstance in which the available ore will produce approximately an ideal slag, and under which, consequently, no fluxes will be required; that in which an excess of bases is present; and that in which there is an excess of siliceous ores, lime and iron fluxes being required. The last of these three is the most common, and as a schedule can be based on only one condition at a time, a definite example of that kind will be taken to make the method of cost calculation clear.

Assume that the materials available are: *A*, an oxidized siliceous ore from the smelting company's mine, forming the basis of operations; *B*, a sulphide flux available in the market at $9 per ton delivered at the smelter; *C*, limestone from a neighboring quarry costing $2 per ton delivered; *D*, an iron ore from a small near-by mine; and, *E*, a custom ore available if required.

The coke will be assumed as average quality with 20 per cent ash, the analysis of which is given below. Costs will be assumed to be as follows: Coke, $10 per ton; smelting, 10 per cent coke, $1; fixed expense, including overhead, $1; variable expense, $1; semi-variable expense, $1; total, $4. These figures are of course arbitrary.

The marketing expense of copper will be taken as 2.5c., made up of freight, 0.5c.; converting, 0.5c.; refining, 1.25c.; and selling commission and overhead, 0.25c. The market price will be assumed at 22.5c., leaving the works value 20c. per lb. of copper. The market price of silver will be assumed to be $1.26 per oz., with a marketing expense of 1c. per oz.

Obviously, no roasting or sintering will be required, and it is also assumed that all ores and fluxes will take the same treatment, so that the above smelting expense is applicable to all components of the charge in accordance with their tonnage.

The assumed analyses are as follows:

Ore	Silver, Oz. per Ton	Copper, per Cent	SiO_2, per Cent	Fe, per Cent	CaO, per Cent	Zn, per Cent	Al_2O_3, per Cent	S, per Cent
A	20 0	3 0	50 0	10 0	18 0	1 0	4 0	1 0
B	1.0	1 0	4 0	48 0		2 0		44 0
C			2 0		54 0		1 0	
D			4 0	65 0			2 0	
E	80.0		80 0	5 0		1 0	2 0	6 0
Coke ash			50 0	15 0	2 0		25 0	

To simplify calculations, gold assays have been omitted.

Because most of the smelters operating with excess silica use a slag containing about 42 per cent SiO_2, and find 36 per cent Cu in the matte a fairly satisfactory amount, it will be assumed that the copper losses will follow the curve in Fig. 4,[1] and 42 per cent SiO_2 will be taken for the standard slag. There is no particular reason for this, other than that it is convenient, and 41 or 43 would do just as well.

Slags do not vary by steps, as the theory of type slags would require, but gradually. Similarly, 36 per cent matte works well in the converters, is high enough to retain its collecting power, and low enough to prevent excessive losses. A slight variation each way does not make much difference, because of the compensating action of its diversified effects.

TABLE I. CALCULATION OF CHARGE

Material	Amount	Ag		Cu		SiO_2	Fe		CaO		Al_2O_3		S	
	Lb	Assay	Oz.	%	Lb.	%	Lb.	%	Lb.	%	Lb.	%	Lb.	%	Lb.
A	620	20.0	6.20	3.0	18 6	50.0	310.0	10 0	62 0	18 0	111.6	4 0	24 8	1 0	6 2
B	180	1.0	0.09	1.0	1.8	4.0	7.2	48 0	86.4					44 0	79 2
C	200					2.0	4 0			54 0	108 0	1 0	2 0		
Coke	(100)					10.0	10.0	3 0	3 0	0 4	0 4	5 0	5 0		
Total	1,000		6.29		20 4		331.2		151.4		220 0		31 8		85 4

85.4 × 0.15 ÷ 0.25 = 51.24 = Wt. of Matte
20.4 − 2.10 = 18.30 = Wt. of Cu in Matte
18.30 ÷ 51.24 = 35.6 = % of Cu in Matte
51.24 × 0.34 = 17.4 = Wt. of Fe in Matte
151.4 − 17.4 = 134.0 = Wt. of Fe in Slag
134.0 × 1.287 = 172.3 = Equivalent FeO

Slag Content:	Lb.	%
SiO_2	331.2	42.1
FeO	172.3	21.9
CaO	220.0	27.95
Al_2O_3	31.8	4.05
Miscellaneous	31.7	4.00
Total	787.0	100.00

20.4 − 18.3 = 2.1 lb. Cu in slag = 0.267%
Or, Cu in slag (from Fig. 2) = 0.267%
From Fig. 3, Ag in slag = 0.82 oz. per ton and Ag in matte = 2.33 oz. per ton

Slag loss: Ag, 5.1%; Cu, 10.3%
Cu loss per ton of charge, 4.2 lb.
Cu loss per ton of slag, 5.34 lb.
Cu loss per lb. FeO in slag, 0.01218 lb.
Cu loss per lb. Fe in slag, 0.01567 lb.
Cu loss per unit of Fe in slag, 0.3135 lb.
1 lb. Cu in matte requires 0.95 lb. Fe

Slag Ratios

$$\frac{FeO}{SiO_2} = 0.52 \qquad \frac{Fe}{SiO_2} = 0.4046$$

$$\frac{CaO}{SiO_2} = 0.664 \qquad \frac{FeO + CaO}{SiO_2} = 1.185$$

$$\frac{S \text{ in charge}}{Cu \text{ in matte}} = 4.66$$

Method of Calculating Furnace Products

The results of the calculation on this basis are shown in Table I. The procedure is to set down the weights of the proposed components of the charge and their constituents, and add up the total of each element as indicated. The total weight of sulphur is then multiplied by 0.15 (the assumed recovery of sulphur) and divided by 0.25 (the amount of sulphur in the ordinary

*The second of a series of three articles on the calculation of copper blast-furnace charges and costs. The first article was published in the Sept. 11, 1920, issue of *Engineering and Mining Journal*.

[1]See p. 512 in the Sept. 11, 1920, issue of *Engineering and Mining Journal*.

matte), and the result is the weight of matte that will be produced by the charge. Knowing this, and the amount of copper on the charge, it is easy to make a guess at the grade of matte and the slag loss. Deducting the copper lost in the slag from the copper charged, and dividing the result by the number of pounds of matte made, gives the grade of matte. Knowing this, the iron in the matte is calculated easily.

In this instance the sulphur, iron, and copper contents of the matte are assumed to total 95 per cent. In practice the iron would be determined from a plot showing the iron contents of average mattes of different grades under the works conditions, or else allowances would be made for the zinc and lead contents, if required.

The iron in the matte is deducted from the total iron charged and the remainder calculated to FeO. The silica plus FeO plus CaO plus Al_2O_3 are assumed to be 96 per cent of the total slag, or whatever experience dictates. If present in sufficient quantities, zinc, barium,

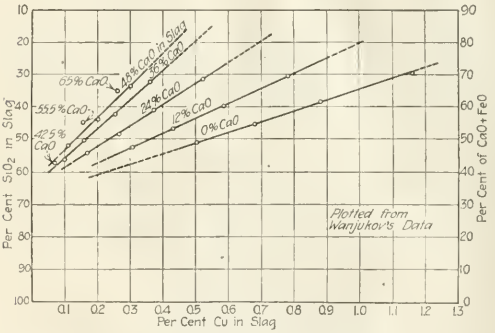


FIG. 7. RELATION BETWEEN SLAG COMPOSITION AND COPPER ASSAY OF SLAG FOR 30 PER CENT Cu MATTE

and magnesia would be included and suitable totals taken. These figures give the total weight of slag, and referring to Fig. 4 for the copper assay corresponding to the grade of matte, the slag loss is calculated. If the guesses have been good, nothing remains to be done, but if the results do not check, the calculation must be repeated. The second result should be correct. The silica, iron, and lime percentage is calculated; the silver loss, using Curve *A* of Fig. 5*, and all the other data are shown in the table.

For furnace work, many of these refinements would be omitted, because changes in ore and furnace conditions outweigh them. The course of procedure in 75 per cent of the charges put in the furnace is to look at the slag reports, the matte assays, the stockpile, and the furnaces, and, if necessary, add 10 kilos of sulphide flux and cut the limestone 20, or whatever seems to be required. But in working out the principles on which these short-cuts are based, the long elaborate procedure is usually strictly necessary, and all the refinements available should be considered, whether used or not.

The slag calculated is a little high in lime, and therefore its use is supposed to be somewhat dangerous. But it is similar to one I once used for several months, and, from the assumption, iron flux is expensive, and so the slag will be taken as a basis for the other calculations. In actual operation, the slag losses in both copper and silver did not conform to the curves in Fig. 4 and *A* of Fig. 5, owing to certain local conditions.

With this slag as a starting point it becomes possible to ascertain the value of its component fluxes and to calculate the cost of fluxing and smelting an ore of any given analysis, provided that this grade of matte, and a slag with this silica content, are used.

Because the capacity of the plant does not enter into the question at this point, the cost of smelting a ton of neutral ore will be assumed to be the total cost, that is, $4 per ton. The simplest method of calculating the cost of smelting a ton of ore *A* will be, taking the data from Table I:

Smelting 620 lb. ore *A* at $4 per ton	$1.24
200 lb. limestone, at $2 per ton	.20
180 lb. sulphide flux at $9 (less credit for 20 lb. Cu per ton at 20c., and 95 per cent of 1 oz. of Ag	.34
Smelting 380 lb. flux at $4	.76
Copper loss, 2.1 lb. at 20c	.42
Total for smelting and fluxing 620 lb.	$2 96
Cost of smelting and fluxing one ton	$9 55

This is entirely correct, so far as it goes, but it does not go far enough and will not enable one to calculate the cost of the ore, if the silica changes, without recasting the whole charge sheet. Neither does it permit of ready valuation of a new ore, or supply the basis of a tariff to guide the mine superintendent.

Apparently the cheapest source of flux is the limestone; so the first thing is to ascertain the cost of a unit of CaO.

Limestone, one ton	$2 00
Smelting, one ton	4.00
2 units of SiO_2 require 0.81 unit Fe at 24.39c.	.20
Fluxing coke ash (10 per cent coke, 20 per cent ash)	12
54 units CaO less 1.33 for the 2 per cent SiO_2 cost	$6 32
1 unit CaO costs	12.00c.

The use of iron for fluxing the SiO_2 in the limestone is assumed because the slag in this case is so high in lime that it would not be advisable to increase it; therefore, all silica must be charged with the corresponding amount of iron for fluxing.

The cost of the iron and fluxing the coke ash must be estimated until determined. If the guess is wrong, correction must be made. In practice, the cost of fluxing the coke ash would be charged to the cost of coke.

The cost of a unit of iron is determined in the same manner:

Cost of one ton of sulphide flux	$9 00	
Smelting one ton	4.00	
Fluxing coke ash for one ton	.12	
4 units of SiO_2 require 2.66 units CaO at 12	.32	
Copper loss of 0.3135 lb. per unit of Fe. 48 units Fe = 15.05 lb. (Cu at 20c.)	3.01	
Credit for 1 unit = 20 lb. (Cu at 20c.)		$4.00
Credit for 1 oz. silver, 95 per cent, at 1.25		1.19
Iron required for matte for 4.95 lb. Cu recovered at 24.39c. per unit Fe	.06	
Credit for overcharge for copper loss in last item		.01
	$16 51	$5 20
	5 20	
48 units Fe less 1.62 for 4 per cent of SiO_2 cost	$11 31	
1 unit of Fe costs	24 39c.	

The silver loss has been taken up in the conventional way, at 5 per cent, but this is not correct, as will be shown.

No credit has been allowed for sulphur, because its computation is a rather complicated matter and is generally considered separately. However, this value will be determined later and it will be shown that it has a big effect on the iron value, and that the method of calculating here indicated is correct only in instances where an oxidized iron ore is required for flux; it is,

*See page 513 of the Sept. 11, 1920, issue of *Engineering and Mining Journal*.

therefore, not correct in this instance. However, it would be correct if the sulphur were in ore *A* and not in *B*. I have used the method as shown so as to give an example in which sulphur does not enter the question, and then to show the big difference to be noted when it must be considered. If, in this case, the sulphur were in the ore *A* and not in *B*, still *B* would have to be used as a source of iron, and the above calculation would be correct. Therefore that assumption will be made for the present.

Methods of Charging for Copper Loss

The method used of charging for the copper loss is unusual, but is the nearest approach to accuracy that is practicable. Several methods may be suggested, but, if the results do not agree, not more than one can be correct; it is of importance to know which to use. The most obvious method is to consider all the copper in the slag as derived from the principal ore, and this would be reasonable in some instances; but suppose there are two principal ores, one silver-bearing without copper, and the other copper without silver? Another method is to apportion the loss, calculating it in pounds per ton of charge and distributing the loss to all ores and fluxes in accordance with their weight. This is a simple method, both in practice and thinking. (See *B*, Table II.)

Suppose that the company bought an old slag dump, and that the regular ore was a mixture of gypsum, hydrated ferrous carbonate, and silicates with combined water. In the first case a ton of charge would make a ton of slag, and in the other, a ton of charge might make less than half a ton of slag. I have before me the analysis of an ore containing only about 46 per cent of slag-forming elements. Nor is this question purely hypothetical. If the smelter slag contains 0.45 per cent Cu, which is not uncommon, the loss will be, at the present price of copper, about $1.80 per ton of slag, and it may be a question of getting or losing a contract whether the ore is charged with half or all of this, or the difference averaged.

Another method would be to apportion the losses on the percentage basis. (See *C*, Table II.) This does not allow for the effect of the ore on the slag losses. Or, the losses may be charged in proportion to the slag-forming constituents. The objection is that one ore might be a self-fluxing ferrous silicate which would have a very foul slag, and the other ore might be a garnet ore, high in lime, giving a clean slag. The use of silica as a base for the apportionment is open to the same objection. (See *D*, Table II.)

The method which I have adopted is to base the losses on the iron contents of the slag. This has its objections also, but they are less than those incident to the others, and the principle is of much broader application. (See *A*, Table II.) For example: It is common in smelter practice to keep the silica constant and to vary the proportions of iron and lime. There are many reasons for this. Reference to Fig. 1 will show that a great difference exists between the amounts of copper dissolved in iron slags and in lime slags; practice bears this out. The last method allows for this effect in calculating losses, not only qualitatively but quantitatively, with a fair degree of accuracy, at least within the range of ordinary smelting practice. The curves in Figs. 7 and 8 show this. Fig. 7 is plotted directly from the data given by Wanjukov. Fig. 8 is plotted from Fig. 7 by interpolation on the curves drawn to connect the points located by Wanjukov's data. The effect of the iron on the copper loss may seem to vary too much to use a fixed ratio, but if the line *AB* is drawn on Fig. 8, the composition of the slags lying below it will be found not practicable for actual use.

The amount of Cu loss per pound Fe is determined by dividing the copper loss as shown in Table I by the

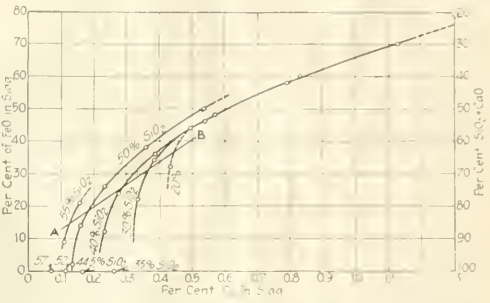


FIG. 8. INTERPOLATED CURVES FROM FIG. 7 SHOWING RELATION OF SLAG COMPOSITION TO COPPER CONTENT

Fe contents of the slag. Multiplying the result by 20 gives the loss per unit of Fe. Of course, this applies only within the definite limits.

Having determined the cost of the iron and lime the cost of fluxing a unit of silica is easily found.

1 unit of SiO_2 requires 0.664 unit CaO at 12.0c.	7 97c
1 unit of SiO_2 requires 0.4046 unit Fe at 24.39c	9 87c
Cost of fluxing 1 unit of SiO_2	17 84c

The cost of smelting a ton of pure quartz would be:

Cost of fluxing 1 ton of SiO_2 (100 units)	$17 84
Cost of smelting 1 ton	4 00
Fluxing ash in coke	12
Total	$21 96

The cost of fluxing the coke ash can also be determined:

50 units of SiO_2 at 17.84c	$8 92	
Copper loss due to Fe; 15 units at 0.3135 lb. per unit = 4.7 lb Cu at 20c	94	
Credit for 15 units of Fe at 24.39c		$3 66
Credit for 2 units of CaO at 12.0c		24
	$9 86	$3 90
	3 90	
Cost of fluxing 1 ton of ash	$5 96	

The cost per one ton of charge would be 20 per cent of 10 per cent of the $5.96, or 12c. The cost of smelting the ore would be:

Smelting 1 ton	$4 00	
Fluxing coke ash for one ton	12	
50 units of SiO_2 at 17.84c	8 92	
Cu loss due to 10 units of Fe at 0.3135 lb. = 3.135 lb. at 20c	63	
Credit for 10 units Fe at 24.39c		$2 44
Credit for 18 units CaO at 12c		2 16
Iron for the matte: 56.85 lb. Cu = 2.7 units Fe at 24.39c	66	
Credit for overcharge for copper loss in the Fe going into the matte		17
Total	$14 33	$4 77
	4 77	
Cost of smelting and fluxing 1 ton ore	$9 56	

That the importance of the correct apportionment of the losses be thoroughly understood, I have calculated the cost of silica, iron, and lime by the methods mentioned above and compared them in Table II.

TABLE II. COST BY DIFFERENT METHODS OF CALCULATION

Cost of	*A*	*B*	*C*	*D*
1 ton limestone	$6 32	$7 04	$6 27	$6 32
1 unit of CaO	12 0c	13 36c	11 90c	12 0c
1 ton of silicate flux	$11 31	$9 24	$8 83	$8 51
1 unit of Fe	24 39c	19 92	19 03c	18 83c
Fluxing 1 unit of SiO_2	17 84c	16 95c	15 61c	17 81
Smelting 1 ton of pure SiO_2	$21 96	$21 07	$19 73	$21 93

Method *A* is the method recommended above, charging the copper losses against the iron in the slag.

Method *B* is based on a uniform distribution of the loss in proportion to the tonnage, 4.2 lb. per ton in this case.

Method *C* proportions the copper loss on the percentage basis. In this case it is 10.4 per cent of the copper in the ore.

Method *D* is based on the distribution in accordance with the silica contents of the material charged, 12.68 lb. of copper per ton of silica.

The amounts are all taken from Table I.

It is obvious that something is wrong. A smelter operating on a profit of $1 per ton of ore would have a difficult time if the metallurgist could not calculate the costs within $2.80 per ton. A little consideration will aid in discarding the bad methods.

Substitution of Iron Ore for Limestone

Take method *B* first: So far the sulphur contents of these ores have been assumed to lie in ore *A*, not in the flux *B*. This can be done without throwing things out of balance. Assume, also, that the sulphide flux contains enough silver to make the cost of a unit of FeO equal to that of a unit of CaO. It is then clear that for fluxing purposes the iron ore may be substituted completely for the limestone without throwing the metal losses out of balance if method *B* be used. Doing this would produce an irony slag with much less lime and it would consequently be a fouler slag. The first method allows for this. The same reasoning would apply for the other two methods if the iron flux contained no copper. Method *A* covers the point in all cases.

A method which would be correct for every condition that may arise is, of course, impossible of conception or contrivance. Data are lacking, and the formula would be too cumbersome for general use. The best course is to follow medical practice and "diagnose by exclusion," until a method suited to the case is found, but it must constantly be borne in mind that all conclusions should be carefully tested. The lead pencil is a wonderful little instrument, but will lie like Ananias if not closely watched.

Exports of Mineral Products from Burma

The exports of minerals from Burma during the last three years were as follows:

Articles	1917 Tons	1918 Tons	1919 Tons
Wolfram:			
Foreign	4,542	4,744	4,799
Tin:			
Foreign	214	300	371
India	15	116	190
Pig lead:			
Foreign	10,351	10,569	9,223
India	2,813	5,824	8,708
Zinc:			
Foreign	3,198	2	.....
India	33	14	.....
Silver:			
India	(a)	(b) 1,653,000	(b) 1,973,00

a No statistics before 1917 18. b Ounces.

There was an increase in the quantity of nearly every kind of mineral exported, but the fall in the price of some minerals has prevented a corresponding increase in value. Since the close of the period covered by this report the price of wolfram has taken a great drop, and exports of this metal will undoubtedly be considerably smaller, both in quantity and in value, in the following year.

Phosphate Rock in the United States*

The principal deposits of phosphate rock in the United States are in Florida, South Carolina, Tennessee, Kentucky, Arkansas, Montana, Idaho, Wyoming, and Utah. Although by far the largest deposits are in the Western states, those deposits yield less than 1 per cent of the whole, because of the lack of a large near-by market and high freight rates on the crude rock. It is not a matter of common knowledge, but it is, nevertheless, a fact, that the Western rock-phosphate deposits are so extensive as to be practically inexhaustible, even if the entire world were dependent on them for its supply of phosphate.

The Florida phosphate deposits, which are the most extensively developed in the United States, comprise three classes of phosphate—hard rock, land pebble, and river pebble. The first is highest grade, the second is produced in largest quantity, and the third is not mined at present. The hard-rock deposits lie in a narrow strip along the western part of the Florida peninsula from Suwanee County to Pasco County, a distance of approximately 100 miles. The land-pebble phosphate area, just east of Tampa, is about 30 miles long and 10 miles wide. Sales of Florida phosphate declined tremendously after 1913 through the restriction on exports by the war. In 1913 the sales were 2,500,000 tons, valued at $9,500,000, and in 1915 the production was 1,350,000 tons, valued at $3,700,000.

South Carolina produces land-rock phosphate in the vicinity of Charleston. River-pebble phosphate occurs in the same area, but is not mined. Some of the South Carolina output has been exported annually. Sales decreased from 169,000 tons in 1911 to 83,000 in 1915, and the value in the same years decreased from $673,000 to $311,000.

RESERVES OF PHOSPHATE ROCK IN THE UNITED STATES

	Long Tons
Florida	227,000,000
Tennessee	88,000,000
South Carolina	9,000,000
Kentucky	1,000,000
Arkansas	20,000,000
	345,000,000
Western States:	
Montana, Idaho Utah and Wyoming	5,367,082,000
Total	5,712,082,000

Tennessee deposits of rock phosphate are in the west-central part and extreme northeast corner of the state. The latter have not been mined. Three types are recognized and known by their colors as brown, blue, and white rock. The last has not been mined recently. The brown rock is sold under guarantee of 70 to 80 per cent tricalcium phosphate. The blue rock varies considerably in its phosphatic content. Sales of Tennessee phosphate in 1914 were 483,000 tons, valued at $1,823,000; by 1915 they had fallen to 390,000, valued at $1,328,000.

Kentucky has been an insignificant producer of phosphate rock in recent years. Arkansas phosphate deposits are in the north-central part of the state. The output is small.

Four Western states possess enormous deposits of high-grade rock phosphate, but their output is as yet insignificant, being only 3,000 to 5,000 tons a year. The producing states are Idaho, Utah, and Wyoming. Montana is not a producer, although it contains extensive deposits easy of access and close to rail transportation.

*R. W. Stone in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

A Picturesque Mining Experience—IV

The Bear Facts

By CHARLES HALEY
Written for *Engineering and Mining Journal*

IN THE summer of 1916, Charles Janin, assisted by me, made a placer examination in the Little Delta region, in Alaska. The trip itself was mainly interesting on the Fairbanks end, so there is where my story begins.

After a delay of a tiresome week in Fairbanks, our deputed guide and conductor—who will have to be nameless, because most of the names we had for him would not look well in print—said that a car would be waiting for us in the morning. As matters turned out, he was wrong—we were waiting for it. About 10 o'clock it finally flivvered up on three lungs in front of the hotel. Besides the driver, there were four and a half of us in the car, one member of the party weighing over three hundred.

It had rained the night before, and the road was improbable before we were a mile out; beyond that it rapidly became impossible; and before we arrived at Eighteen Mile House it was beyond belief. We squattered past a team about two miles out; and later had to get it to pull us through. The flivver itself was a tribute to the great pacifist who designed it; like him, it was shy on power, but willing to take an awful lot of knocks. Whenever it stuck its nose in the road and refused to budge, we would pile out, hunt up a pole and a root for a fulcrum and our heavyweight friend with one foot would pry it up to a normal position. You could tell by the noise of the three operating cylinders when it was ready to die, and forestall the final agony most every time: "I think I can; I think—I can; I—think—I can; I—know—I—can't."

Anyway, we arrived at Eighteen Mile roadhouse about 3 o'clock and had lunch. From there on, the road was better, and we made Munson's roadhouse, on the Salchaket, in time for dinner, with Fairbanks forty miles away. We stopped and fought mosquitoes for about twelve hours, after which period of rest and refreshment we snorted forth again.

Arriving at the turn-off of the winter trail, the car gave up the ghost, and we had to pack our belongings to Martin's roadhouse, about two miles and two hundred million mosquitoes away. This roadhouse is on the wrong side of the Tanana, and we had to be ferried across by Archie. He, with the possible exception of our chaperon, was the most unusual institution of the entire trip. Before he made the landing, we were impressed by the fluency and weight of his verbiage; and as we stayed for nearly three days, we had a magnificent chance for observation. Two of his leading observations, "The cur-r-rse of Cain rest on yez all," and "be the bald-headed mother of Judas," were used as a foundation for a most startling structure of cusswords. When he locked horns over a small matter with our local Fremont, and woke us up at 3 o'clock in the morning to tell us about it, we thought him little short of sublime; it was worth being wakened for.

We finally managed to make our getaway to the property. The original idea, too original, as it proved, was to take a team and wagon all the way up the Delta River to the property, supposed to be a distance of about thirty miles. As it worked out, the trip was made by pack animal; but not until we had wasted the first day in attempting to cut through about half the stunted firs and young birch and alder growth in central Alaska. Our team unfortunately was not arboreal of habit, so we gave up the attempt after the first day and returned to Martin's with our faith in our self-appointed Nestor sadly shaken by this and other breaks too numerous to mention.

We managed to pick up a real guide—henceforth known as Frank—and decided to make the trip with what animals we had. This meant that one horse had to carry a pack, while the other was divided between us for riding purposes. A little providential inspection of the grub supply prevented us from setting forth with half a case of condensed milk and half a pound of bacon on what afterward proved to be a three-day journey; and, much to the disgruntlement of our pathfinder, we insisted on a few more of the luxuries of life. As the trip turned out to be about fifty miles, with very little trail and some 30 per cent grades to negotiate, our respect for his judgment was not enhanced from day to day.

We saw quite a bit of game—three moose, a caribou, and a black bear—on the way up, and were quite disgusted that none of them would pose for his picture. Arriving at Portage Creek on the morning of the third day, in the midst of a driving rain, our eyes were cheered by a collection of canvas doghouses wherein we lived until the examination was completed. This operation concluded, we decided to return under Frank's care, leaving our cicerone on the claim. He had the only gun of the party, so we set out weaponless.

About four or five miles on the homeward trail, we saw a bunch of mountain sheep; too far away to shoot even if we had had a weapon. And then came the main excitement, in fact, it might be called the big tent show of the entire trip. It was nearly lunch time, and we had both been discussing how hungry we were. We were traveling along the edge of a basin which we were due to cross within a couple of miles and into which the ground sloped precipitously off from the bluff on which we were. On the other side was a long gentle slope into a series of gullies at the head of Iowa Creek. Down one of these gullies we saw three animals which we at first took for caribou at the distance—about a mile.

Going over a little closer, with the idea of sizing them up for a picture, they caught sight of us. They immediately began running, not away, but toward us, with real speed, and we saw that they were either glacier bear or silvertip grizzly. We did not stop to ascertain which, but beat it for all we were worth. Clumsy and lumbering as they were, and bigger than all outdoors, they were gaining on us about four for one, and we knew pretty well what it meant if they ever caught up with us. We had one short knife and an axe in the pack, and those bear meant business. We forgot all about taking pictures and being hungry, and ran for our lives. Fortunately the horses did not see them, or they would have bolted.

The ground favored us; for while the bear were charging up the middle of the gully, we went out of sight over the top of the next draw. Coming to the top of the draw where we had been, they saw us again, and turned after us. By this time we had come to the top of the next bridge, and dropped down out of sight. Soon we came to where our trail went down into the basin, and we kept behind a ridge which hid us from them. We didn't stop for lunch until nearly 4 o'clock, and then we didn't feel so awfully hungry.

With the good start we had, we concluded to keep on going to Martin's, and we traveled the better part of the night, arriving early in the morning. After a couple of hours' sleep and a good breakfast, Archie ferried us across the river again. His usual string of objurgations was intensified, as the Tanana was rather high, and neither his rowlocks nor his steersman—who happened to be myself—was working to his fancy.

Followed two mosquito-ridden miles to Birch Lake roadhouse. Here we caught the stage in for Fairbanks, and bumped our beatific way toward civilization and the Arcade restaurant.

Copper a Hundred Years Ago

Price Range at That Time Not Essentially Different From That Obtaining Now—No American Market for Ore

RECENTLY we were asked as to the price of copper 100 years ago. This did not seem an unreasonable query, but the oldest member of our staff could not remember, and we were unable to find the information in any of the reference books to which we customarily resort in such cases. The inquirer has, however, rooted out the information, and we are publishing it as a matter of record. Our own copper production did not reach 100 tons yearly until 1845, so British prices for this period are standard.

PRICE OF COPPER IN ENGLAND FROM 1800 TO 1831*

Years	Average Standard Price per Long Ton £	s.	d.	Equivalent Cents per Lb. (£1 = $4.86)
1800	133	3	6	29
1801	117	5	0	25
1802	110	18	0	24
1803	122	0	0	26
1804	138	5	0	30
1805	169	16	0	37
1806	138	5	0	30
1807	120	0	0	26
1808	100	7	0	22
1809	143	12	0	31
1810	132	5	0	29
1811	120	12	0	26
1812	111	0	0	24
1813	115	7	0	25
1814	130	12	0	28
1815	117	16	0	26
1816	98	13	0	21
1817	108	10	0	23
1818	134	15	0	29
1819	127	10	0	28
1820	113	15	0	25
1821	103	0	0	22
1822	104	0	0	23
1823	109	18	0	24
1824	110	0	0	24
1825	124	4	0	27
1826	123	3	0	27
1827	106	1	0	23
1828	112	7	0	24
1829	109	14	0	24
1830	106	5	0	23
1831	100	0	0	22

The price in those days, it will be observed, was not much different from what it is now, although we presume that a dozen eggs could have been purchased for 5d; so copper probably seemed high. The mines in Cornwall gradually increased their ore production from about 56,000 long tons in 1800 to 144,000 in 1831. The ore was rich, too—7 to 10 per cent copper.

Some other statistics taken from "History of Money and Prices," 1896, by J. Schoenhof, go even further back:

PRICES OF IRON AND OTHER METALS FROM THE CLOSE OF THE SEVENTEENTH CENTURY

(In English Shillings)

	1693 to 1702	1784 to 1790	1791 to 1803	1804 to 1819	1821 to 1838	1848 to 1852
English pig iron, per long ton.	240	70 @ 120	103 @ 157	140 @ 180	114 @ 120	41 ...
Finished iron (in bond), per long ton.....	....	268	364	298 @ 380	308 @ 380	119 ....
Copper per 112 lb.....	99	80	93	143	91	87

More recent statistics covering copper prices from 1860 to 1912 were published in the *Engineering and Mining Journal* of Dec. 6, 1913.

Although saying little about prices, the following letter may prove of interest while our thoughts are in the dim and distant past:

Manchester, Eng. June 4th, 1788.

Dear Cousin John:—

We received your letter of inquiry about the mine north of Rockey Hill, N. J., U. S. A. We opened this mine in the year 1748. We worked it along up to the indepents war then Washington came to New Brunswick, then his soldiers came to the mine and ordered our men to surrender. I was there at the time our men all came out of the mine. there was a little fight between six solgers and eighteen of our miners of the solgers was killed and several of them hurt.

I will never return to America again.

I will give you a description of the mine.

The west shaft is over one hundred feet deep. We mined many hundred tons of copper ore and sent it home to Ingland, and we sold it for seventy dollars a ton on an average.

There is two large floors in this shaft. sometimes the vane is fore or five foot wide and again it narrows to one foot then widens out again to 4 or 5 foot. this is a very rich vane of copper, there is a shaft east a little north of the above shaft which is about one hundred and fifty feet distance which has a large vane of black copper in it. We worked both shafts. We left our tools in the mine. If you should get the mine will you let me know.

Yours Affectionately,

Good By (Signed) J. G. George

The account of the battle between the "solgers" and miners is no worse than a great many others which we have read.

Armenian Mineral Wealth

The Department of Mines of the Armenian Republic, in a report on the minerals of that country, states that Armenia was the cradle of metallurgy, and that there are hundreds of abandoned mines in the country, and numerous ruins of forges and foundries. The mining industry of Russian Armenia is represented by twenty-two copper-ore, rock-salt, and iron-pyrites enterprises, eighteen of which exploit old mine workings. There are seven copper smelters. The average annual production during the years 1911, 1912, and 1913 was 154,900 tons of copper ore, 10,000 tons of iron pyrites, and 6,614 tons of copper metal. The Russian-Armenian production of copper before the war was 26 per cent of the total production of Russia.

*From M'Cullock's "Practical, Theoretical and Historical Dictionary of Commerce and Commercial Navigation"; 1847. Vol. 1, p. 481.

Men of Note in the Mining Industry

Colonel William Boyce Thompson

A RECITAL of the achievements of William Boyce Thompson suggests a composite biography of several great men. How could one man do so much before his fifty-second year? The answer is simple—work. This explanation is like that of the prestidigitator who says, "Ladies and gentlemen, the quickness of the hand deceives the eye," and leaves his audience as mystified as before. "The outstanding characteristic of Colonel Thompson," said one of his intimates, "is his capacity for work. His evenings are usually spent on work of some kind." With this recipe, therefore, for reaching the top, the young aspirant may go his way, bearing in mind that what is meant is the kind of work that gets results of the right kind. There it is in a nutshell. And the results? Colonel Thompson is to be credited with the success of Inspiration, Magma, and Nevada Consolidated, of which no mining man need be told. Less well known is the fact that he was mainly responsible for daylight saving, having put Senator Calder up to this parsimonious piece of business in the first place. His title of colonel dates from the war, when he was commissioned a lieutenant colonel and sent to Russia as a member of the Red Cross Commission, of which he later became head. He had been actively backing the Belgian Relief work before this, and it was through his efforts that the Rocky Mountain Club, of which he was vice-president, postponed the erection of a costly clubhouse, that the funds might be used to aid war sufferers abroad.

COLONEL WILLIAM BOYCE THOMPSON

New York's prominent men, more often than not, were born outside of the city. Some of them came originally from Brooklyn and other Eastern points. Thompson comes from Montana. To go back to the beginning, he was born in Virginia City, in that state, in 1869, his father having followed prospecting, mining, and lumbering on his own account. His education was received at Phillips Exeter, in New Hampshire, and at the Columbia School of Mines. Then came a few years of knocking about his native state, in which he learned more of the ins and outs of mining. At the age of twenty-nine he headed again for the metropolis, determined to sit in the big game. He came with little cash and lots of nerve, and before long his ability as an organizer was evident. When the Utah Copper project was launched, Thompson, believing in D. C. Jackling, backed his faith with money and reaped a corresponding reward. His ability was signally recognized by the metropolitan business interests, when, in 1914, he was elected a director of the Federal Reserve Bank of New York. From this position he resigned last December, upon his appointment as chairman of the ways and means committee of the National Republican Committee. He is also president of the Roosevelt Memorial Association. Colonel Thompson's schemes are big. Nothing else seems to attract him. One of the more recent ones, of which comparatively little has been published, is the mineral exploration work in China which engineers representing him have undertaken. Another project, now under way, is the prospecting and development of the huge Flin Flon ore deposit, in northern Manitoba, in which he is engaged, together with his associates. In all his dealings he will have facts and not theories, and goes to heavy expense, if necessary, to determine them. On this trait undoubtedly rests his success. Two P's, patience and persistence, are said to be his mottoes, and in his successful handling of the Inspiration project these characteristics may readily be discerned.

Although Colonel Thompson has amassed great wealth, this has not been his object. Apparently it is the fun of playing the game, rather than the reward, that attracts him. Having brought Inspiration to successful production, he disposed of the property to Anaconda.

He has given largely. While in Russia he dug heavily into his own fortune to combat the German propaganda that was designed to draw that country from the war. His interests aside from business are varied. He is seen now as a collector of minerals, now as an exhibitor at the flower show. He belongs to several clubs. All things considered, Colonel Thompson gets a great deal out of life.

BY THE WAY

A Chance for the Reno Station

A map in process of being made, which shows the occurrences of minerals in the United States, has been submitted to the U. S. Geological Survey, with the request that it be criticized, particularly as to "the occurrences of alimony and manganese." At the Survey it is stated that neither its field researches nor statistical inquiries have been expanded to cover the subject of alimony, although during the war period they did considerable work in determining the extent of the nation's antimony deposits.

Anybody Lose This?

"Yellville, Ark.—Gus Young, an ore buyer and real estate man of this place, found the remains of a fragment of a meteror several days ago near the Winchester mine on the Buffalo River in Searcy County. He and Tobe Woods, a lawyer residing at Marshall, Ark., were going through the woods when his attention was attracted to a burned area some six feet in circumference. Upon examination he saw a strange stone lying buried to a depth of six inches in the center of this area, and upon picking it up found it to be a fragment of a meteror. The fragment resembles a big cinder, much the same as are taken from base burners, with the exception that it is highly glazed on the surface and some iron can still be seen in its composition. In bringing it home it became broken in three parts. When first discovered it was 18 in. long, 8 in. in circumference at the head, and tapered to a tail."

Put to the Test

C. C. Norton, president of the Jazz Cat Oil Co., is going to wash his hands completely of W. E. Stephens, according to the *Verde Copper News*, unless the latter immediately disproves the charge that his "vibratile motion instrument" is a fake when it comes to testing for the presence of oil. Unless he does this forthwith, Mr. Stephens is going to lose the golden opportunity of testing the Verde Valley, in Arizona, for oil for the Jazz Cat company. "Stephens must present some positive proofs or we shall have nothing to do with him," says Mr. Norton. So there, Mr. Stephens, get busy with that vibratile motion instrument of yours.

Why Boys Leave Home

Down in the Oklahoma and Kansas sections of the Joplin-Miami zinc and lead district many of the mining men live either in Joplin or Miami and, finding it inconvenient to go home every day, spend all but the week-end at the mine. Idle time in the evenings has naturally led to various diversions, including the indoor national game, mostly at a small limit. A stranger in the district, however, who had heard interesting tales about these evening games, had occasion not long ago to visit a mine office in the Kansas section, northwest of Picher, in the evening, and found seven of the boys seated around a table. Much to his astonishment, however, he found that they were playing pitch a nickel on the "corner." "First thing you know you boys will get to be gamblers," he commented, whereat there were protestations from the players that they were only passing the time away. About a week later the same visitor had occasion to visit the same office and again found the same boys gathered around the table, pasteboards in hand. He expected to find that the stakes had been raised decidedly, having had some experience in such things. Instead he found that the game of pitch and the regulation playing cards had been eliminated entirely, and the boys were playing "Rook" and entirely for the fun of it, not a cent being ventured. While he was there one of the leading players, the ground boss at the property, threw down his cards and quit, declaring: "I've got to cut this out; it's growing on me. First thing I know I won't want to do anything else." And he withdrew from the game.

Nothing But the Truth

This story looks too open-faced to be new, yet is told in sober earnestness by an Arizona mining engineer: A party of sightseers had been taken, of an evening, into one of the mines at Globe, Ariz. As the visitors were being hoisted, one of the ladies exclaimed: "It has been a wonderful trip. I feel that we should come again in daylight, when we can see things so much better."

It Is Hard To Please

The following letter was sent to us from Chile by a company that had received it from a disgruntled prospector. We find it quite idiomatic:

In regards to that telegram of 15th I thought i would receive somcthing of that sort, Because I dident like the way that Man you call an Engineer took Samples he dident go into the Earth he Scratched on top like a hen Now? you or any entelegant man ought to know when water hits gold it will part from anything but the solid rock on those Veines is exposed to the Sun the Rock will Powder he took only on the very top the *peones* or me was to take samples we would go at least one to two meters in depth, him no on the very top of the earth. As to my crosscut I wanted to go one meter in depth he said he dident have time nor money enough what do you think of that he took what I was cleaning off to find the *guier*[1] and said that was enough the *peones* laughed at him & said tbat wasant nothing atall but he was paying the men so I couldant say any thing we cleaned off the *guier* with a bar no wedges nor a hammer we just got the hole cleaned out that isant no time to take samples. You have to open up the work you cant pick up gold on the floor of the hole he was only 3 days on the mine where he ought to have been at least 15 days; I AM NOT AT TALL PLEASED WITH HIS WORK ATALL It isant Justes for you or me. I like Engineer tall slim man I dont know his name a man about 45 years of age that man knows his business; but this other has been in the air to much[2] to know much a bout Gold mines he says let me have the pan I am going to the river to get samples what do you think he brought back it was colores he said it was Pure Sand OXIDE OF IRON stain he calls it gold color the man must be simple Simon I can figuer the Compy Out. I am going out to the mine & get some samples for you that you will be proud of all that stoughf he took i would be a shamed to get souch stough i would expect to get fired at once; or say I dident get to the mine i took sick or something because he had good *guier* I will say that much But i gave him that myself when you find good *guier* you will find good Gold that is Rich *guier* but the gold you cant expect to get gold on the hanging wall do you no nor any body else I want Justes as you do neither one has yet got Justes, hoping to here from you soon.

Respectfully Yours, C. MURPHY.

[1]The word *"guier"* above should be spelled *"guia,"* which is Spanish for "stringer" or "veinlet."

[2]The reference to the engineer having been too much in the air probably is related to the fact that he was in the U. S. Air Service during the war.

CONSULTATION

U. S. Platinum Deposits and Production

"Are there any mines regularly producing platinum in the United States, or is the metal purely a byproduct in the recovery of other metals? I realize that the domestic production is very small."

Crude platinum in 1919 was produced mainly by the gold dredges operating along the foothills of the Sierra Nevada as a byproduct from gold recovery. The total United States production was estimated by the U. S. Geological Survey at 824 troy ounces, a record production in recent years, in spite of its relative smallness, and the largest output since 1906, which was 1,439 oz. Domestic production in 1913, 1914, 1915, 1916, 1917 and 1918, was 483, 570, 742, 750, 605, and 647 oz., respectively. Most of the 1919 output came from California, but Boss Mine, Clark County, Nev., produced some platinum- and palladium-bearing copper ore, which was shipped to Eastern refiners for treatment. The Rambler Mine, Albany County, Wyo., also made a recovery of platinum and palladium from similar ore. The Salt Chuck mine, in Kasaan, Alaska, described in a previous issue of the *Engineering and Mining Journal*, was a producer of very rich ore.

As to other localities which are potential platinum-producing areas and which have produced in the past, there might be mentioned the placer gold fields of Butte, Yuba, Calaveras, and Stanislaus counties, Cal., where the platinum is derived mainly from the Mother Lode country's serpentine areas. Other platiniferous localities are in Nevada County, and in the Klamath Mountains in Trinity, Siskiyou, Humboldt and Del Norte counties.

In southwestern Oregon, the stream placer deposits of Josephine, Curry and Coos counties have been known to carry platinum. Beach placers in Curry and Coos counties have produced some of this metal. The Blue Mountains of northeastern Oregon, in Grant and Baker counties, have been sources, particularly near Sumpter. Utah and Washington have also reported the discovery of platinum, but the production has been unimportant.

The Customs Tariff on Metals

"Will you please inform me what the duties on the metals copper, lead, zinc, nickel, quicksilver, and antimony are?"

The customs duties on these metals, according to the Customs Tariff Act of 1913, are as follows:

Copper in ores, matte, bars, ingots, pigs, regulus, plates, scrap and composition metal is admitted duty free. Manufactured copper forms carry a duty of from 5 to 20 per cent.

Lead ores command a duty of ¾c. per lb. of lead contained. Lead in bars, pigs, granules, bullion, alloys, iron, hard metal, old scrap lead, and refuse (lead content taxable) commands a duty of 25 per cent. Lead pipes, sheets, shot and wire, white lead (dry or in oil), and red lead also carry the same duty.

Zinc slabs, blocks or pigs and old zinc suitable only for remanufacture, 15 per cent duty; zinc-bearing ores (on zinc content) 15 per cent; zinc dust, sheets not polished or plated, 15 per cent; zinc oxide, 10 per cent.

Nickel in ore, matte, or other crude form, free; nickel in alloys, pigs, plates, ingots, bars, and oxide, 10 per cent; nickel in sheets and strips, 20 per cent.

Quicksilver commands a duty of 10 per cent.

Antimony ore is admitted free; metal and regulus, 10 per cent; antimonial type metal, 25 per cent; antimony containing 10 per cent lead, 10 per cent.

Lead Mining and Refining Companies

"I have been trying to secure the addresses of the lead companies in the United States that are both miners and refiners of lead, and have been referred to you for the information. I will be very grateful if you can have the addresses sent me or tell me where I will be able to secure them."

Lead companies in the United States that are both miners and refiners of lead are given in the following list:

American Smelting & Refining Co., 120 Broadway, New York. (Subsidiary companies all over the United States.)

American Metal Co., 61 Broadway, New York. (Has several subsidiary companies.)

Bunker Hill & Sullivan Mining & Concentrating Co., 1,022 Crocker Building, San Francisco. (Smelting company is a subsidiary.)

St. Joseph Lead Co., 61 Broadway, New York.

Anaconda Copper Mining Co., 42 Broadway, New York. (Controls subsidiary lead companies.)

U. S. Smelting & Refining Co., 120 Broadway, New York. (Controls subsidiary lead companies.)

Eagle-Picher Lead Co., Joplin, Mo.

American Zinc, Lead & Smelting Co., 55 Congress St., Boston, Mass. (Controls a subsidiary lead company.)

Northport Smelting & Refining Co., Northport, Wash. (Controlled by Hercules Mining Co., in Burke, Idaho, and Tamarack & Custer Mining Co., Wallace, Idaho. The bullion is refined by the Pennsylvania Smelting & Refining Co. at Pittsburgh.)

National Lead Co., 111 Broadway, New York. (Controls a subsidiary.)

Geophone Manufacturers

"In referring to your article "Military Mining in France," in *Engineering and Mining Journal* of March 6, 1920, showing in the frontispiece a soldier using the geophone, kindly let me know where in the United States I can get a geophone and what would be the price of it."

The instrument is finding increasing commercial application, which supplements its chief use in rescue work in underground mining operations. Thus the geophone has been successfully used in detecting leaks in water mains and locating underground water courses. The manufacturers claim that knocks in automobile valves and cylinders have also been located with the aid of the instrument. An important use in mining work for which the geophone is peculiarly adapted is checking underground surveys designed to connect drifts, raises, and other workings.

The Globe Phone Manufacturing Co., of Reading, Mass., manufactures the instrument and can furnish prices for the different styles.

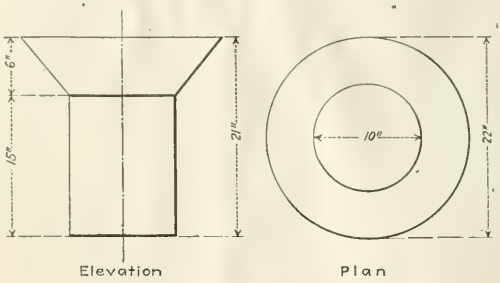
HANDY KNOWLEDGE

Another Method of "Holding the Sack"

By LEROY A. PALMER

Written for *Engineering and Mining Journal*

I was much interested in the description of a device for holding a sack while filling it with ore which appeared in a recent issue of the *Engineering and Mining Journal*, but the type of funnel shown in the accompanying sketch, which is the design of one used for sacking concentrate at the Plymouth Consolidated mine, in Amador County, Cal., in my opinion, has it beaten.



FUNNEL FOR FILLING SACKS

Dimensions may be varied, of course. Those shown give the cylindrical portion a capacity of 100 lb. of ore which weighs 4,000 lb. per cu.yd. when broken.

In use, the sack is slipped over the funnel and the latter is stood on the floor, when the sack naturally slips down over the cylindrical part and rests on the floor while the funnel is being filled to the proper point. When filled, the sack is held up with one hand while the funnel is lifted out and the ore runs into the sack as it is being removed. Or, the mouth of the sack is taken in both hands, grasping the lower end of the cylinder at the same time, so that sack and funnel may be lifted at the same time and the ore run from the funnel to the sack.

The funnel is made of moderately heavy sheet iron, which may or may not be galvanized, according to the conditions to be met.

Motor Haulage Switch Protection

By T. H. ARNOLD

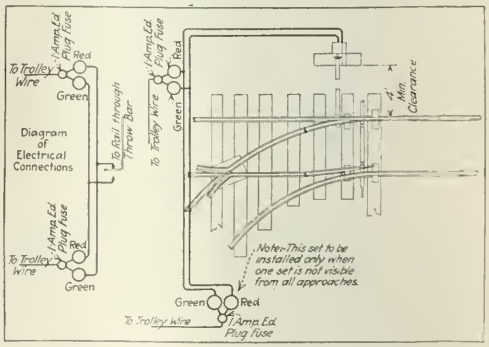
Written for *Engineering and Mining Journal*

The customary railroad switch stand lamp, turned with the operation of the switch, has not proved adaptable to underground mining conditions. A visible indication of the switch position is a necessity from a safety standpoint. This also expedites the handling of trains on the motor haulage. To meet these conditions, several electrical devices were tried out, all depending upon the operation of various forms of electric switches controlled by a bar attached to the movable switch points, this operation causing a red or green lamp to burn, depending upon the position of the switch.

The first form of lamp unit was simply two weatherproof sockets hanging from the mine timbers. The sockets were connected on one side directly to the trolley wire and the other side through the switch to the track. Thirty-five watt, 250-volt carbon lamps were used, the lamps being dipped in red or green lamp coloring. As the maintenance is rather high, and the lamp color faded rapidly, these have been superseded by a more satisfactory type, with three cleat receptacles mounted on a piece of 20-gage galvanized iron. The common wire of two receptacles carried through the third, which has a 3-amp. Edison plug fuse for protection. This wire then goes to the trolley. Two wires are carried through the switch to the track.

Twenty-five-watt, 250-volt mill type Mazda lamps have been substituted for the 35-watt carbon lamps, and color caps have been substituted for the dipped lamps with beneficial results, as the lamps are more visible and the color distinctions more positive. Also the color does not fade. A considerable saving is made in kw.-hr. consumption. As one lamp burns at each switch twenty-four hours a day, and thirty days per month, the saving on seventy-two switches will amount to 518 kw.-hr. a month. The life of the lamp is approximately double that of the carbon lamps, which will pay for the difference in cost of the two lamps.

The form of switch now being adopted is built up of two automatic door switches, one of the opening, and one of the closing, type. The plunger is spring-loaded to allow a possible movement of an inch and a half on the bar from the switch; the door switches require exactly ½-in. total movement. These switches are enclosed in a substantial iron box and can readily be mounted in place of the older types. They are safe from shock by accidental contact, and will withstand considerable moisture and rough handling.



WIRING DIAGRAM FOR MOTOR HAULAGE SWITCH PROTECTION

It is also customary to mount a 120-watt carbon lamp directly over each switch, on the lagging between the caps. In this way the caps cut off the direct light in the motorman's eyes. These lamps are being superseded by the 50-watt mill-type Mazda lamps with the tungsten filament.

THE PETROLEUM INDUSTRY

Physical and Chemical Data on Colorado Oil Shale

Results of Recent Work by Government Investigators on the Density, Heat of Combustion, Thermal Conductivity, Analyses, Specific Heat, and Oil Yield of a Representative Sample of Massive Rock

BY MARTIN J. GAVIN AND LESLIE H. SHARP*

Refinery Engineer, U. S. Bureau of Mines, and Chemical Engineer, State of Colorado, respectively

INVESTIGATIONS of the oil shales of Colorado were begun on Feb. 1, 1920, by the U. S. Bureau of Mines and the State of Colorado, under a co-operative agreement entered into by the Bureau and the state, funds for which were provided by the state. The investigations are for the purpose of determining, by large-scale laboratory retorting tests, those conditions which will produce optimum yield of best quality products from Colorado shales. (For an outline of the work and description of the apparatus, see Gavin, Martin J., and Sharp, Leslie H., "Investigations of the Fundamentals of Oil-Shale Retorting," Reports of Investigations, Bureau of Mines, July, 1920.)

In the preliminary work which is usually required when a new material is being dealt with, certain physical and chemical constants of the shales being investigated, and their products, were determined. These data will be of much value not only to the thorough retorting tests now under way at Boulder, but to engineers who will design and construct oil-shale plants. Although the figures presented in this report apply only to the shale used in the determinations, strictly speaking, the shale used was selected to represent, as well as possible, an average of the massive type of oil shale occurring in Colorado. The figures, therefore, can probably be applied with little danger of serious error to any massive Colorado oil shale which yields approximately a barrel (42 gal.) of oil to the ton.

SCOPE OF THE WORK

The following data were obtained on a representative Colorado oil shale:

1. Weight per cubic foot of different sizes of shale.
2. Apparent specific gravity.
3. Specific heat of raw and spent shale.
4. Heat of combustion of raw and spent shale.
5. Thermal conductivity of raw shale.
6. General analyses.
7. Oil yield.
8. Heat of combustion of crude shale oil.

The above-noted factors were determined for the oil shale obtained from De Beque, Col., which is being used in the retorting investigations. This shale is of the massive variety, and on laboratory tests yields oil of 0.905 specific gravity at the rate of 42.7 gal. to the ton (2,000 lb.). In addition, the specific heat was determined on a sample of oil shale from the Parachute Creek district, Col., as an indication of the order of variation of this factor in shales of the same approximate richness from different localities.

*Excerpt from U. S. Bureau of Mines, "Reports of Investigations."

DATA OBTAINED

The following data were obtained as a result of the work:

1. Oil yield, 42.7 gal. per ton.
   (Method, Bureau of Mines assay retort.)
2. Specific gravity of oil, 0.905 (24.7 deg. Bé.) at 15.56 deg. C. (60 deg. F.)
3. Weight per cubic foot (Method, direct weighing)

Size	Weight, Lb. per Cu. Ft.
Run of mine	53.775
Plus 1 in.	54.775
Minus 1 in.	56.015
Minus ¼ in.	58.200

4. Apparent specific gravity of raw shale, 1.92 to 2.06
   (Several specimens from large sample.)
   (Method, weight in air divided by loss of weight when immersed in water.)
5. Specific heat, (average of several closely agreeing determinations.)
   (Method, method of mixtures, Studentia calorimeter.)
   Specific heat, raw De Beque shale . . . 0.265 mean 20-90 deg. C.
   Specific heat, raw Parachute Creek shale . . . 0.242 mean 20-90 deg. C.
   Specific heat, spent De Beque shale . . . 0.223 mean 20-90 deg. C.
6. Heat of combustion
   (Method, combustion in oxygen in Emerson calorimeter.)
   Heat of combustion, raw De Beque shale, about 2,460 calories per gram.
   Heat of combustion, spent De Beque shale, about 600 calories per gram.

The determination of the heat of combustion of raw and spent shales cannot be considered entirely satisfactory. Except in one or two determinations with the raw shale, it was impossible to obtain complete combustion even when using oxygen at 500-lb. pressure in the calorimeter bomb. In no test was it possible to obtain complete combustion of the spent shale in the bomb. Both the physical appearance of the ash taken from the bomb and the fact that various residues lost 2 to 6 per cent, in the case of the raw shale, and 13 to 15 per cent in that of the spent shale, indicate that combustion was incomplete.

In two instances samples of raw shale were completely burned in the bomb, and showed no further loss on subsequent ignition. These two determinations indicated the heat of combustion of the shale to be 2,432 and 2,486 calories per gram, respectively. As regards the spent shale, the heat of combustion was calculated by making a rather arbitrary correction on the basis of the loss on ignition of the residue after combustion in the calorimeter. There is little scientific justification for making such a correction, but the fact that the figures obtained on several determinations agree so closely probably makes it worth while to present the results obtained. Indications are that the heat of combustion varies somewhat even between carefully taken

samples of the same lot of shale. It was not considered advisable to spend any additional time on more carefully determining these figures at present, as it was intended merely to show that spent shale and even raw shale probably could not be considered satisfactory fuel for direct combustion. Later it is hoped that modifications in the method can be worked out which will permit the practical operator to obtain accurate and trustworthy results in this regard.

7 Thermal conductivity
Thermal conductivity, De Beque raw shale, range 25 to 75 deg. C., 0.00382. (Method, Forbes' method, giving absolute conductivity.)

8 Analytical data

De Beque Raw Shale	Sample 1 Per Cent	Sample 2 Per Cent
Loss at 110 deg. C. (moisture)	0 60	0 59
Loss on ignition	40 00	39 70
Ash or residue	59 40	59 71
Totals	100 00	100 00
Ash Analysis		
Silica (SiO_2)	44 70	45 10
Iron and alumina (Fe_2O_3 and Al_2O_3)	25 60	26 35
Lime (CaO)	17 65	18 35
Magnesium (MgO)	5 28	5 35
Undetermined	6 77	4 85
Totals	100 00	100 00

9 Heat of combustion.
Heat of combustion, crude shale oil, 10,215 calories per gram. (Method, combustion with oxygen in Emerson calorimeter.)

Comparative Values

The following tables are presented for the purpose of comparing various physical and chemical data on oil shale obtained in the present investigation with similar data on other more familiar substances.

TABLE I DENSITY AND WEIGHT PER CUBIC FOOT OF VARIOUS SUBSTANCES

Material	Grams per Cu. Centimeter (Density) *c*	Pounds per Cubic Foot (in Place) *d*	Authority
Massive Colorado oil shale	1 92–2 06 *a*	119 8–128 5	Present work
Anthracite coal	1 4 –1 8	87 112	Smithsonian Inst
Bituminous coal	1 2 –1 5	75 – 94	Smithsonian Inst
Clay	1 8 –2 6	122 –162	Smithsonian Inst.
Coke	1 0 –1 7	62 –105	Smithsonian Inst.
Limestone	2 68–2 76	167 –171	Smithsonian Inst
Peat	0 84	52	Smithsonian Inst
Sandstone	2 14–2 36	134 –147	Smithsonian Inst.
Petroleum	*a* 878–9 65 *b*	a54 8 60 *2b*	Smithsonian Inst.

a At 16 deg. *b* At 0 deg. C. *c* The determined density of a material depends on its state (especially if porous), and its previous treatment, i. e., whether air dried, how long, and at what temperature. The method used in this work gives apparent density (grams per cubic centimeter), but, from the nature of the material used, this figure is undoubtedly close to the true density. *d* Obtained by multiplying density by 62 4 *e* Ordinary atmospheric temperature is understood.

Table II presents specific heats of raw and spent oil shales as determined in the present investigation, compared with specific heats of other materials.

Specific heat of a substance is the ratio of the amount of heat measured in calories required to raise the temperature of one gram of the substance 1 deg., to the amount of heat required to raise the temperature of 1 gram of water 1 deg C., at a specified temperature. The specific heat of a substance varies with the temperature of the substance.

TABLE II. SPECIFIC HEATS OF VARIOUS MATERIALS

Material	Specific Heat	Mean Temp., Deg. C. *a*	Authority
Massive De Beque, Col., oil shale	0 265	20–90	Present work
Massive Parachute Creek, Col., oil shale	0 242	20–90	Present work
Spent De Beque, Col., oil shale	0 223	20–90	Present work
Sandstone	0 22		Smithsonian Inst.
Limestone	0 216	15 100	Morano
Granite	0 192	12–100	Joly
Asbestos	0 195	20 98	Ulrich
Clay, dry	0 22	20–100	Mean of several
Wood	0 42		
Gas coal	0 3145	20–1040	Smithsonian Inst.

a At 16 deg. C.

Table III presents the heats of combustion of the raw and spent shale and crude shale oil in comparison with average figures for well-known fuel materials.

TABLE III HEATS OF COMBUSTION OF VARIOUS SUBSTANCES

Material	Heat of Combustion — Calories per Gram	B.t.u. per Pound	Authority
Massive De Beque, Col., oil shale	2,460 *a*	4,428 *a*	Present work
Spent De Beque, Col., oil shale	600 *a*	1,080 *a*	Present work
Bituminous coals	6,088– 7,852	10,958–14,134	Smithsonian Inst
Anthracite coals	6,987– 7,417	12,577–13,351	Smithsonian Inst
Lignite coals	3,526– 3,994	6,347– 7,189	Smithsonian Inst
Coke	7,000	12,600	Smithsonian Inst.
Fuel oils (heavy)	10,200–10,500	18,360–18,900	Smithsonian Inst.
Peats (air-dried)	4,867– 5,726	8,761–10,307	Smithsonian Inst.
De Beque shale oil (sp. gr. 0.905)	10,215	18,387	Present work
Fuel oil (light), (sp. gr. 0.903)	10,710	19,280	Wadsworth

a Approximate values as already mentioned.

Table IV presents the thermal conductivity of De Beque, Col., massive oil shale, and various other good and poor heat conductors.

Thermal conductivity, "*k*," is the heat in gram calories flowing in one second through a plate 1 centimeter thick, per square centimeter, for 1 deg. C. temperature difference between faces of the plate. "*K*" is found to vary with the absolute temperature of the plate.

TABLE IV HEAT CONDUCTIVITIES FOR VARIOUS SUBSTANCES

Material	K	Temp., Deg. C.	Authority
Copper	0 918	18	Jaeger & Diesselhorst
Copper	0 908	100	Jaeger & Diesselhorst
Iron, cast	0 108	18	Jaeger & Diesselhorst
Iron, cast	0 108	100	Jaeger & Diesselhorst
Lead	0 083	18	Jaeger & Diesselhorst
Lead	0 076	100	Jaeger & Diesselhorst
Iron, wrought	0 144	18	Jaeger & Diesselhorst
Iron, wrought	0 142	100	Jaeger & Diesselhorst
Carborundum brick	0 0032 to 0 027	150–1200	Wologdine
Magnesia brick	0 0027 to 0 0072	50–1130	Wologdine
Silica brick	0 002 to 0 0033	100–1000	Wologdine
Fireclay brick	0 0032 to 0 0054	125 1220	Wologdine
Firebrick	0 00028		Hutton-Blard
Firebrick	0 00109	100	Barratt
Limestone	0 0046 to 0 0057	40	Poole
Limestone	0 0039 to 0 0049	100	Poole
Limestone	0 0032 to 0 0035	350	Poole
85 per cent magnesia asbestos	0 00017	Mean 10–500	Randolph
Oil shale (De Beque, Col.)	0 00382	Mean 25–75	Present work
Oil shale (De Beque, Col.)	0 00518	Mean 25–40	Present work
Oil shale (De Beque, Col.)	0 00314	Mean 40–75	Present work

General chemical analyses of oil shales ordinarily have little value except in comparison with other shales. Analytical figures may serve to indicate the fusibility of the shale ash and its possible utilization for brick or cement making and the like. In comparison with analyses of other oil shales, the Bureau of Mines is attempting to use analytical data, especially data having to do with loss on ignition (volatile and fixed carbon), as an indication of possible oil yield and the analyses of shale ashes as a means of classifying shales by districts and as possibly influencing the quality of oils recovered from the various shales.

Table V shows the difference in composition of mineral matter (ash) of shales from different localities. It also indicates the relationships between volatile and fixed carbon and oil yield.

TABLE V. ANALYSES OF OIL SHALES FROM VARIOUS LOCALITIES

Source of Shale	Ash Analysis — SiO_2	Fe_2O_3 and Al_2O_3	CaO	MgO	Volatile and Fixed Carbon	Oil Yield, Gallons per Ton *c*
De Beque, Col. *a*	44 70	25 60	17 65	5.28	40 0	42 7
Elko, Nev. *b*	65 5	23 5	0 6	0 8	33 5	32 5
Dragon, Utah *b*	45 8	16 4	23 9	7 9	42 2	41 6
Dragon, Utah *b*	46 8	17 5	23 9	8 9	34 3	21 7
Green River, Wyo. *b*	38 9	12 4	38 3	4 9	34 9	23.4
Green River, Wyo. *b*	41 9	18 8	17 6	10.9	48 1	58 7
Kentucky *b*	52 0	19 1	12 5	8 2	29 3	18.2
Ione, Cal. *b*	43 0	38 1	8 7	2 5	62 9	52 0
Casmalia, Cal. *b*	75 8	19 1	1 4	0 9	*d*	18.0

a Present work. *b* T. B Brighton, analyst, unpublished work, Bureau of Mines, Salt Lake City *c* Laboratory assay. *d* Not determined.

NEWS FROM THE OIL FIELDS

Deepest Gulf Coast Well Produces From 3,700 Ft.

From Our Special Correspondent

Several important completions have been made recently in the Gulf Coast fields. At West Columbia, in Brazoria County, Tex., the No. 1 Hogg well of the Gulf Production Co. came in, making 700 bbl. from a depth of 3,700 ft. This is probably the deepest producing Gulf Coast well. At Humble, the Sun Co. has struck oil on Lot 11 of Block 2, Riverside addition, at 3,200 ft. In the old Barber's Hill field, Chambers County, the joint well of the United Petroleum Co. and G. C. Smith et al. came in, making about 700 bbl. from 1,900 ft. Previously, the production from this field had been gradually decreasing. Now there is considerable leasing, and at least two other companies will drill again. Two good wells were also completed at Hull, Liberty County, one a 1,500-bbl. well of the Republic Production Co. and the other a 300-bbl. well of the Phoenix Development Co. The production of the Hull field has been increasing gradually for the last few months. The famous No. 1 Abrams well of the Texas Co. at West Columbia, which has been decreasing in its former rate of flow, suddenly stopped flowing for five hours early Sept. 5th. It was sanded, and the insertion of a flow pipe caused the flow to resume. The rate was not given.

Gas was turned into the mains from the Amarillo gas field on Sept. 4th. It is stated this field can supply 500,000,000 cu ft. of gas daily.

It is believed a large gas field will be opened south of Burkburnett and adjoining the Texhoma field. Recently, J. I. Staley completed a well at 1,450 ft. having a gas flow of 7,000,000 cu.ft. This is the third large gas well completed in an area of four or five square miles.

In Eastland County a development of importance in the southern part is the discovery of oil in quantity in the Caddo lime. Previously this formation was considered dry in most places, and wells were drilled right on through it. The Pittsburgh Western Oil Co., however, shot its Pruett well, south of Carbon, at about 2,300 ft. and obtained a good producer. Later the Atlantic Oil & Refining Co. developed a flow of 1,000 bbl. in one of its wells to the southwest of the Pruett well by shooting at 2,400 ft. Many wells that were drilled through this stratum may be plugged back and shot in an effort to get production from this lime.

Two gas blowouts are reported in the Pettus well of the Goliad Oil Co., near Goliad, Goliad County. These occurred at 2,700 ft. Whether this will be an oil producer cannot be determined until casing is set.

Market Arranged for Louisiana Natural Gas

From Our Special Correspondent

According to a recent report at a special session of the New Orleans commission council held on Sept. 1, 1920, a fifty-year lease to supply that city with natural gas was granted certain interests, not named, represented by W. E. Wren, of Minden, La., and W. A. Trimpe, of Houston, Tex. The franchise grants to the new company the right to lay gas mains and distributing pipes under the streets, but does not exclude the present company now supplying artificial gas. Work of installing mains must begin within twelve months from the time of acceptance of the franchise, and six miles of mains must be laid within a year from that date. The price of gas is fixed at 65c. per 1,000 cu.ft. for domestic use up to 6,000,000 cu.ft. daily, and when the consumption exceeds that figure, 50c. per 1,000 cu.ft. Other clauses limit the minimum of B.t.u. contained in the gas and provide for artificial gas in case of failure of the natural-gas supply, and payments to the city for the franchise based upon the consumption. The supply of natural gas, it is stated, has been acquired, but its source is not yet made public. It is probable, however, that it will come from the big gas field a few miles south of Houma, Terrebonne Parish.

The American Oil & Drilling Co. has started drilling on the J. J. Thompson plantation two miles from Opelousas, St. Landry Parish. An area of 8,000 acres has been leased.

Drilling will be done near Church Point, Acadia Parish, where W. G. Morgan has a mineral lease on 9,000 acres. In 1903 the Crowley Oil & Development Co. brought in a small oil well near here.

The Detroit Oil & Gas Co. will drill for oil on its recently acquired lease in Iberia Parish about four miles west of New Iberia. The rig for this work has been received.

Gas Coming Through Salt Water at Holbrook, Ariz.

From Our Special Correspondent

Rising through 700 ft. of salt water, gas that will burn is coming from the Adamana well in Arizona. The bore has been stopped at 2,140 ft. for casing, in fear that a big gasser will be developed. For several hundred feet the drill has been passing through alternating strata of sandstone, limestone, and rock salt, the log being similar to that of the Hopi well, now blocked by lost tools at 2,500 ft. depth. The Holbrook well, now down 1,600 ft., is to be driven to 3,000. Zuni is down 400 ft.

Warren County, Kentucky, Has Another Gusher

From Our Special Correspondent

A gusher was brought in at 225 ft. on Sept. 3 on the farm of Mrs. J. W. Stone, Warren County, Ky., adjoining the General W. L. Sibert gusher. It is estimated at 1,800 bbl. daily production.

The Richpond Oil Co., operating in Warren County, reports two good wells on the John W. Phelps lease, estimated at 140 bbl. each. They were brought in at 395 and 450 ft. The company has started No. 3 and 4 on the Frank Holland lease. A 100-bbl. well is reported on the Skiles lease situated along the Smallhouse Pike. This is considered a new pool. The oil was of a light grade.

The Hugh Potter well on the Bailey lease, Warren County, owned by the Whittle Oil Syndicate, is pumping 150 bbl. a day.

Butler County, northwest of Warren, is looked upon as a possible extension of the oil fields, following the recent discovery of oil at Gilstrup. A company of farmers and business men, after drilling 1,250 ft. without success, struck oil sand with a flow of gas. The well will be sunk deeper. Another wildcat test will be made soon.

Several good wells have been brought in in the Merba pool, Menifee County. No. 1, on the Shelby Palmer lease, has been completed. A location for No. 2 of the same operator has been staked out on the Edgar Smallwood farm. Several companies are resuming operations in this field. Indications are that it will equal Lee and Wolfe, other central-eastern counties of Kentucky.

Oil men are giving attention to Clinton County following a strike at Beach Bottom. This well reached a showing of oil at 1,735 ft., with small quantities of oil for 40 ft. The driller estimates it as good for about 50 bbl.

Montana Has 2,000-Bbl. Gusher

From Our Special Correspondent

Well No. 2 of the Frantz Corporation, a subsidiary of the Elk Basin Consolidated, was brought under control recently after it had spouted unrestrained for more than a week at the rate of around 2,000 bbl. daily, with a flush production of 3,000 bbl. at one time, it was estimated. As many men as could be obtained were busily engaged in throwing up dirt dams to impound the oil. For the grade of oil, which runs up to 50 per cent gasoline, the Frantz well is said by oil men to stand out for volume among the foremost producers in the country. Piping of the oil from the well to Winnett, Mont., a distance of about twenty miles, began last week, the oil being shipped to the Elk Basin refineries in Wyoming.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Federal Title to Mining Claim Confirmed

North American Transportation & Trading Co. Loses Appeal Against the United States—Was Awarded Value of Claim at Time of Taking by Government

The Supreme Court of the United States has affirmed the judgment of the U. S. Court of Claims in the suit brought by the North American Transportation & Trading Co. in the Court of Claims in 1906 to recover the value of a placer mining claim situated on the public land near Nome, Alaska. It was alleged this mining claim was taken by the United States in 1900. General Randall, of the United States Army, commanding the Department of Alaska, took possession, as a site for an army post, of a large tract of public land which included the mining claim. The tract has been used as an army post continuously since possession was first taken by General Randall. The buildings erected thereon are situated on that portion of the land which had been the company's placer claim, so that the company has not been able to operate.

The court said that when the government, without instituting condemnation proceedings, appropriates for a public use, under legislative authority, private property to which it asserts no title, it impliedly promises to pay for same.

The company claimed $100,000 from the United States, alleged to be the value of the mining claim, and the further sum of $7,500 per annum for the use and occupancy of said claim from 1900. The court of claims found the value of the mining claim when it was taken to have been $23,800, and an award therefor was given the company. The loss of this use for nearly twenty years was due to the company's delay in prosecuting its suit, the Court of Claims having no power from Congress to allow interest. This award was sustained as correct.

"Unless Lease" Valid

An "unless lease" for oil and gas exploration and development purposes was the subject of a suit in equity brought by E. L. Brunson and others against the Carter Oil Co. in the United States District Court for the Eastern District of Oklahoma.

Judge Williams, in deciding the case for the oil company, held that such an exploration "unless lease" for oil and gas, for which the lessee paid a substantial bonus, with a privilege of renewal of the lease by payment of a substantial sum annually, was a valid mutual contract based on a valuable consideration, and not subject to forfeiture because of failure to make an annual payment in time to a grantee of lessor, where it was in fact made before due, but through mistake of a clerk in failing to make proper entry of transfer of title on the records of the lessee the payment was sent to lessor, instead of to his assignees.

An "unless lease" was considered in another case where the court said: "It would seem to me that a lease of this character, the lessor receiving valuable consideration for the privilege of exploration for oil, would confer a valid right of exploration for the time and on the terms spoken of in it. Such would seem to be the intent of the parties and the justice of the matter, notwithstanding the contract imposed no obligation on the lessee to drill or pay. The lessor has been paid his price for giving such privilege."

Must Consummate Transaction To Earn Commission

Broker Loses Suit Against the Esperanza Mining Co. and Guggenheim Exploration Co. for Sale of Mexican Mining Property

In the suit of Dennis B. Harris against the Esperanza Mining Co. and the Guggenheim Exploration Co. to recover commissions amounting to $202,500, alleged to have been earned by Brad Barnar by procuring the sale of a Mexican mining property, the New Jersey Court of Chancery dismissed claimant's bill, upholding defendant's contention that Barnar was not the "procuring cause of any sale" of the property in question.

The defendant Guggenheim Exploration Co. alleged that it never purchased the mines of the Mexican company, but that a syndicate composed of the said defendant, an English corporation known as the Venture Co., Ltd., and a firm of brokers of London, England, known as L. Hirsch & Co., as the transferees of an option held by one E. A. Wiltsee, purchased from various individuals a majority of the capital stock of the Mexican corporation, in good faith and for a valuable consideration, namely $3,000 in Mexican currency for each share of stock, and that this price was paid without the knowledge that Brad Barnar or his assignee had any claim for commissions.

The court said that where negotiations between the parties introduced by a broker had terminated without a sale, the fact that the prospective purchaser subsequently acquired an interest in the mines by employing as its manager one who had acquired an option on the property, as the result of negotiations independent of the broker does not entitle the broker to a commission.

Washington Statute Does Not Authorize Use of Second-Class Tidelands

In Seattle, Wash., Warren Stetson applied for a writ of mandamus to require the Commissioner of Public Lands to execute to him a lease for mining and extracting petroleum and natural gas from certain tidelands belonging to the State of Washington. The commissioner had refused to execute the lease on the ground that tidelands are not lands within the meaning of the state statute, Sections 6,791 and 6,792.

Though the Supreme Court of Washington held that tidelands are "lands belonging to the state," it would not interfere with the action of the commissioner in refusing to execute lease of unsurveyed tidelands for extraction of petroleum and natural gas under the above sections of the law authorizing the leasing of such lands, "not to exceed one section," though the application for a lease described the land affected as "containing 640 acres," as the area of the described land has not been ascertained and cannot be determined by any mathematical process from the description contained in the application. This results from the fact that there was no official or state survey of second-class tidelands in the State of Washington.

Mineral Reservation Exempts Operator From Negligence in Mining

In the action taken by Atherton against the Clearview Coal Co. for negligence in the mining of coal, the property of the company, underneath the surface of land owned by the complainant, the Supreme Court of Pennsylvania held that the mineral reservations in the deed exempted the owner of minerals from liability for negligence in mining.

The exception, or reservation, contained in the deed of the surface of the land to Atherton, reserved the right to mine and remove all coal and minerals beneath the surface, with the right to mine and remove the same by any subterranean process, without liability under any circumstances for damages done to the surface or improvements erected thereon.

The court said such reservation was sufficiently broad to include liability for negligent mining, and there could be no recoveries for injuries to buildings from improper blasting, for the intention of the parties to the deed of conveyance, as shown by the language used, must govern in the interpretation of the written instruments, and it is apparent all liability was excluded.

ECHOES FROM THE FRATERNITY

Super-Power Survey Committee To Report June 30, 1921

W. S. Murray and Assistant Engineers Making Critical Examination of Country's Power Resources and Conservation

A committee representing the engineers of the United States appeared before the Appropriations Committee of the House of Representatives last April to urge the necessity of a careful survey of our natural-power resources, with a view to securing more efficient generation, transmission, and use of electricity. W. S. Murray, consulting electrical engineer of New York City, who had charge of the electrification of the N. Y., N. H. & H. R.R., had outlined a Super-Power System which offered definite plans for eliminating the economic waste of our present power arrangements, and Congress was urged to contribute to the necessary expenses of a proper preliminary power survey of the country.

Public interest and opinion were sufficiently strong to secure favorable action from both houses of Congress, and $125,000 was appropriated to finance an administrative and engineering force that will show clearly in its report (a) the points where present wastes are occurring and (b) the design of a regional system which would eliminate these wastes, for a zone 150 miles deep along the Atlantic seaboard between Boston, Mass., and Washington, D. C. W. S. Murray is naturally chairman of the engineering staff of the Super-Power Survey, as this organization is called, and its headquarters are at 709 Sixth Avenue, New York City.

As organized, this investigation under W. S. Murray's chairmanship is divided into the three departments of power and transmission under L. E. Imlay; railways under Cary T. Hutchinson; and other industries under Henry W. Butler; all three assisted by the engineer-secretary, Henry Flood, Jr., who will collaborate in the collection of field data and preparing the data for the report. N. C. Grover, chief hydraulic engineer of the U. S. Geological Survey, and O. P. Hood, chief mechanical engineer, U. S. Bureau of Mines, are also collaborating with the staff of the survey.

Every two months from now until April 30, 1921, the chairman of the engineering staff meets an advisory board under the chairmanship of Prof. L. P. Breckenridge, of Yale, presents the progress of the work and discusses with the board his program for the next two months. This advisory board is designed to secure the counsel of men representative of power producers, consumers and the interests of the people in a national power policy, and properly embraces eminent representatives from all these classes, such as E. G. Buckland, vice-president N. Y., N. H. & H. R.R.; Magnus W. Alexander, National Industrial Conference; Henry W. Butler, consulting engineer, New York City; the Secretary of the Interior; the Director of U. S. Geological Survey; and others.

The final report of the Survey will be made June 30, 1921, and the responsibility for taking further action will rest on the Congress. As a recent editorial in *Power* very truly said:

"This undertaking is not alone of particular interest to those living along the North Atlantic seaboard, but to the entire country. Railway congestions in this district did not alone affect the industries located in this region but practically the entire nation. Consequently, the Super-Power Survey, at present under way, merits national support."

Iron Trade Control Association of Germany

Acting Commercial Attaché Henry F. Grady reports from The Hague, Netherlands, that by a decree of the German National Government, dated April 1, 1920, there was established for the control of the iron trade an autonomous body with legal standing called the "Eisenwirtschaftsbund" (Iron Trade Control Association) with headquarters at Duesseldorf. A translation of this decree may be consulted at the Bureau of Foreign and Domestic Commerce, Washington, D. C., on referring to file No. 42075.—*U. S Commerce Reports.*

Ontario Mining Association held its first annual meeting at Sudbury, Ont., Aug. 17 to 19. Among the important matters considered was the position of iron-ore mining in Canada. The association appointed R. W. Leonard, A. J. Young and G. S. Cowie as a commission to assist the provincial and dominion governments in any possible study of Canada's iron-ore industry.

The South African Institution of Engineers awarded its gold medal for 1918-1919 to Henry S. Potter, member of the institution, for his paper, "Hammer Drills: Their History, Design and Operation," published in the Journal of the Institution, Vol. 17, Nos. 4, 5 and 6. The Central Mining-Rand Mines award for the same season was made to T. H. Bayldon, also a member of the institution, for his "Notes on Experiments Made With a View to Reducing the Consumption of Explosives and Increasing the Fathoms Broken Per Machine Shift in Machine Stoping," published in the same journal, Vol. 16, No. 12.

Mining Standards Committee Urged by Mining Congress

Would Not Compete With Existing Bodies, Says W. R. Roberts—Invitations Being Issued to Denver Conference

The American Mining Congress has undertaken to organize a nation-wide movement for the standardization and improvement of mining practice as it pertains to mining machinery and equipment, cost accounting, safety codes, life- and time-saving devices, and co-operative methods.

At an informal conference in Chicago on Aug. 30 between officers of the congress and representatives of the American Engineering Standards Committee, the National Safety Council, the American Institute of Mining Engineers, and the U. S. Bureau of Mines, a resolution was adopted requesting the American Engineering Standards Committee to at once organize a mining standards committee composed of members selected by the bodies represented in the informal conference.

"It is not the intention of this committee to in any way duplicate the work of existing bodies," said Col. Warren R. Roberts after the meeting "There will be no competition and no friction. The American Mining Congress represents the industry because it is composed entirely of operators, and hence, is the industry. We intend to take up and consider all of the standards that have been or may be suggested or adopted by either the Government or by voluntary organizations, and to make these standards operative and profitable. We will also propose such changes and new standards as our committee, by experience and contact with the actual conditions in the mines, believes would be of value or necessity. The standardization conference in Denver during the annual meeting of the American Mining Congress in November will be, I believe, one of the most important meetings ever held, and its influence will be felt permanently in both mining and manufacturing. Among the most necessary things to be developed is to show how standardization has made possible wonderful progress in other lines; and how the coal men have materially strengthened their business standing by recent adoption of standardized accounting, without which they might have suffered many embarrassments during the strikes and wage conferences."

The official invitation now being prepared is signed by Colonel Roberts, chairman of the general committee on the standardization of coal-mining machinery; Charles A. Mitke, of Bisbee, Ariz., and Richard A. Parker.

Engineering Council Experience Guided F. A. E. S.

Organizing Conference Recognized Successes and Limitations of the Council—Plans a Broader and More Effective Body

In connection with the Federated American Engineering Societies two questions have arisen:

1. "If Engineering Council is a success why should the proposed federation supplant it?" and

2. "If Engineering Council is a failure why should the Federation be organized along lines so nearly parallel?"

These are basic questions and worthy the serious consideration they have received, not only from the joint conference committee when it was preparing its report, but also from the committee on constitution and by-laws of the Washington organizing conference.

When the joint conference committee, composed of conferees of four of the then five member societies of Engineering Council, considered the question of co-operation of these societies in matters of common concern to the engineer, the functions and accomplishments of Engineering Council naturally came under review. There were present as conferees three members of Engineering Council, and by invitation of the committee Council also had an official representative present.

The committee decided that some form of comprehensive organization was necessary to provide a medium that could speak for the engineering and allied technical professions on matters of common concern to them. The committee also decided, which decision was concurred in by the official representative of Engineering Council and the members of the committee who were also representatives on Engineering Council, that

"If desired, Engineering Council can be moulded into this organization by making it more democratic and founding it on direct representation of all engineers, rather than by appointment as at present."

It was agreed that Engineering Council is at present not properly constituted to carry on efficiently the work which it has undertaken; its organization is from the top downward, rather than from the bottom upward, which the committee deemed desirable if a thoroughly representative and efficient organization was to be established.

It has been admitted by Engineering Council, and it was so pointed out to the members of the joint conference committee, that Engineering Council has been handicapped from the beginning in regard to funds for its operations, in freedom of action on the matters that came before it, by reason of the necessity for reference to the member societies and to the United Engineering Society, and the great difficulty in electing additional member societies. The annual contributions of the member societies never exceeded $22,000; which amount was wholly inadequate for meeting the demands for service which Council has been desirous of rendering.

Despite these difficulties, Engineering Council has been able to accomplish a great deal, as was pointed out by the joint conference committee in Bulletin No. 3, and particularly has it been successful in its work of developing among its member societies the habit of united effort in matters of common concern to the engineer and the allied technical professions. Engineering Council may be said to be a success, and considering the conditions under which it has operated, to be a commendable success. It is evident, however, that basic defects in its organization prevent Engineering Council fulfilling the real functions of a comprehensive body representing the engineering profession, and these defects are not remedial through reorganization.

Engineering Council has six member societies. At the organizing conference in Washington 71 societies were represented, with an aggregate membership of over 80 per cent of all the individuals represented by the 110 societies invited.

Engineering Council Approved Action of Conference

The action of the organizing conference in creating the Federated American Engineering Societies and its governing board, American Engineering Council, was unanimous. This action has received the unanimous approval and support of Engineering Council. The affirmative consideration that is being accorded the invitation to become members of the Federated American Engineering Societies insures that American Engineering Council will have a far greater number of member societies at its initial meeting in November than Engineering Council, based on its present rate of growth, could possibly have had under existing conditions at the end of many years.

The work of Engineering Council is not to be abandoned, but is to be carried on and extended under a more comprehensive program made possible by the more representative American Engineering Council.

The deficiencies of Engineering Council are not in the quality of the work that it has accomplished, but rather have been due to its organic limitations and to the fact that it is not sufficiently representative of the local, state and regional organizations and affiliations. The organizing conference in Washington laid the foundation for a more democratic organization in which the local, state, regional engineering, and allied technical organizations and affiliations will be represented and have a real voice in its management.

The organizing conference in its wisdom recognized the successes and limitations of Engineering Council and has evolved an organization in which all of these successes will be utilized and a broader opportunity afforded for more effective work on behalf of the engineering and allied technical professions.

Harding and Cox Answer Queries Put by A. A. E.

Candidates State Positions Concerning Department of Public Works, Conservation and the Budget System

In reply to the following questions, drafted at the recent annual convention of the American Association of Engineers,

1. Are you in favor of a National Department of Public Works, for the purpose of reducing and co-ordinating the present number of bureaus and commissions, and reducing the useless expenditures of money incident thereto?

2. Are you in favor of assembling and co-ordinating all the engineering and construction enterprises of the Government (excepting the purely military works) in a department such as the National Department of Public Works, to the end that economy and efficiency will be obtained?

3. Do you favor the appointment of an engineer of recognized ability and unimpeachable character as a member of the Interstate Commerce Commission?

4. Do you favor a progressive and constructive program of conservation and development of our natural resources?

5. Do you favor the budget system of appropriation of public funds?

6. Do you favor the reclamation of waste lands by drainage, irrigation, flood control or other methods?

Do you favor giving the settler the advantage of procuring the land by a sound financial system such as is provided by a rotating fund?

the following letters have been received:

State of Ohio,
Executive Department,
Columbus
August 13, 1920.

Mr. L. K. Sherman, President,
American Association of Engineers,
63 East Adams St., Chicago, Ill.

My dear Mr. Sherman:

My reply to every one of the questions you ask is unequivocally "Yes."

Time will not permit, nor do I consider it proper, that I answer the ordinary questionnaire. My past record and public utterances must be sufficient. However, as in the case of your letter, the reply to questions asked and my record and public announcements are one and the same. I therefore take great pleasure in making this statement.

With every good wish, I am,
Very truly yours, JAMES M. COX.

Marion, Ohio,
August 9, 1920.

Mr. C. E. Drayer, Secretary,
American Association of Engineers,
63 East Adams St., Chicago, Ill.

My dear Mr. Drayer:

Your letter to Mr. Christian of Aug. 4 has been brought to my attention.

It is not an easy matter for me to make a detailed reply to the inquiries conveyed in your letter, and I do not care to enter into a categorical reply to questionnaires, no matter how friendly they may be and no matter how reputable and high-standing is the source from which they come.

My theory of a campaign is, that a man's candidacy ought to be based on the formal and public utterances, though, of course, we are all of us informal enough to discuss informally many of the problems which are in the minds of various groups of our American citizenship.

I have had up the matter of the Department of Public Works in some personal interviews, and quite agree with you that the question is an exceedingly interesting and important one. I fear I should be unworthy of public confidence if I ventured to decide so important and far-reaching a question without the very fullest study. It involves the reorganization of several departments. Undoubtedly, there is necessity for this, but I should be very reluctant to unalterably commit myself to it without the very fullest of understanding.

You may be interested to know that I have already sent for the Congressional hearings on this particular question.

I may say, in a general way, that I think very well of the appointment of an engineer on the Interstate Commerce Commission and I have always spoken heartily in favor of a progressive and constructive program of conservation. I am sure you know that I favor the budget system and a very forward policy relating to reclamation and irrigation.

Very sincerely yours, W. G. HARDING.

Book Reviews

South African Engineers' Directory. Compiled and published by *The South African Mining and Engineering Journal*, 176-180, Stock Exchange Building, Johannesburg. Cloth, 6 x 10, pp. 422. First edition, 1920. Price, 30s.

This directory is the only one of its kind covering that part of the world, and embraces every branch of the engineering, electrical, iron, steel, machinery, hardware, and allied trades throughout the Union, Rhodesia, and Mozambique. One section gives an alphabetical list of all firms, with such data as postal and telegraphic addresses, names of the partners or directors, agencies represented, capital, and other details. Another section gives the names arranged geographically. Another is a list of about 1,000 overseas manufacturers and their South African representatives. A buyer's index of factories and firms selling various classes of merchandise is followed by what will probably be of most interest to our readers, a list of the mining and industrial companies, with the names and addresses of both major and minor officials. An alphabetical classified list of engineers and mining officials is also given. The book is very complete, and those who know South Africa tell us that it is also exceptionally accurate.

Statistical Abstract of the United States, 1919. Cloth; 6 x 9; pp. 864. For sale by the Superintendent of Documents, Washington, D. C., for 50c.

There is an old saying to the effect that figures don't lie but liars can figure. This book affords plenty of material, as it contains nothing but statistics, although a volume of almost 900 pages. For those whose requirements extend beyond such tomes as the "World Almanac," this should be a very valuable book.

Technical Papers

Clay.—Bulletin 58 of the Iowa State College Engineering Experiment Station, Ames, Iowa, tells of the possibilities of pottery manufacture from Iowa clays. Those who have clay deposits in other parts of the country can get from this bulletin information as to the uses of various kinds of clay and methods of testing.

Fuel Oil.—Oil fuel is cheaper per heat unit than coal in most parts of the United States. It also has many advantages. How to change over to oil, in boilers previously equipped to burn coal, is described in a three-page article in the Aug. 14 *Electrical World* (New York, 25c.).

Magnesite.—The U. S. Tariff Commission (Washington, D. C.) has issued a twenty-eight-page pamphlet entitled "Information Concerning the Magnesite Industry," which gives data on the grades and uses, sources of supply, mining and calcining methods, costs, and competitive marketing conditions. This country consumes normally one-half of the world's output, and before the war 90 per cent of the domestic supply was imported, chiefly from Austria and Greece. A slightly ferruginous magnesite is required for metallurgical purposes. Pure domestic ores are satisfactory only if iron is added, which has been generally done.

Pulverized Coal.—Joseph F. Shadgen has a four-page article in the Aug. 19 *Iron Age* on the science of powdered-fuel combustion, including reference to thermic fundamentals, effects of various air quantities on temperature and gases produced, the ash problem, and burner essentials. Previous articles by the same author were, "The Status of the Powdered-Fuel Problem," in the Jan. 1 issue of *The Iron Age*; "Methods of Pulverizing Coal," in the issue of Feb. 5; and "Pulverized Coal Distributing Systems," in the issue of May 20.

Mining in Quebec.—"The Report on Mining Operations in the Province of Quebec During 1919" (free, from the Department of Colonization, Mines and Fisheries, Quebec, Que.) will be of especial interest to those engaged in the asbestos and magnesite industry, for those minerals, along with copper and sulphur ore, are Quebec's chief mineral products. The asbestos industry flourished during the last year, but the value of magnesite produced was only about one-quarter that of 1918.

Selling a Prospect.—The editor of the *Arizona Mining Journal* has a four-page article in the August number (price 20c., Phœnix, Ariz.) on how a prospector or owner should go about interesting capital in his property. Some of the things the exploration engineer wants to know are outlined.

Graphite.—In the *Canadian Mining Journal* (Gardenvale, Que., 15c.) for Aug. 20 is a four-page article on the past and present methods of concentrating graphite ore. Flotation is now commonly used, but the problem is rather one of proper grinding. The "perfect process" of M. J. Paterson, mentioned on the page preceding the article, seems to have received scant attention.

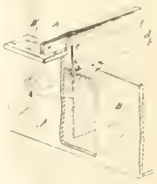
Porphyry Copper.—A history of the past activities and an illustrated description of present conditions at the mines of the Copper Canyon Mining Co. cover six pages in the Aug. 15 issue of the *Salt Lake Mining Review* (Salt Lake, Utah, 15c.). This property is seven miles southwest of Battle Mountain, Nev., and promises to be a large producer of the "porphyry" type.

Clay.—The Bureau of Mines has issued Technical Paper 233, "The Properties of Some Stoneware Clays" (pp. 41). This gives the results of a study of the properties of some Ohio and Pennsylvania clays. Obtainable from the Superintendent of Documents, Washington, D. C., for 10c.

Recent Patents

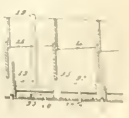
1,347,189. Recovery of Zinc by Electrolysis. Royale Hillman Stevens, assignor to Electrolytic Zinc Co. of Australasia Proprietary, Ltd., Melbourne, Victoria, Australia. Filed Nov. 11, 1919.

In the electrolytic process for the recovery of zinc, providing a protective coating for the cathode above the normal solution level by first carrying out a preliminary electrolysis with the cathode immersed to substantially a line immediately below the supporting bars, the cathodes having wooden strips affixed at or about the normal solution level which prevent the deposition of zinc under them, and then removing the said strips and proceeding with the electrolysis in the ordinary way in cells with the solution at normal level, whereby the subsequently deposited zinc strips along the line of weakness at or about the solution level.



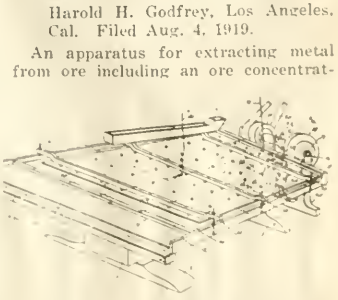
1,346,818. Flotation Ore Separator. Rudolf Gahl, Miami, Ariz., assignor, my mesne assignments, to Pneumatic Process Flotation Co., New York, N. Y. Filed Jan. 31, 1916.

A flotation ore separator comprising a receptacle having an impervious bottom, means for supplying ore to be treated to said receptacle, and means for removing concentrates therefrom, said receptacle having located near the bottom thereof a series of independently removable foraminous air chambers having longitudinally extending upper surfaces, said air chambers being arranged for travel of substantially the whole of the pulp over the series.



1,347,026. Apparatus for Extracting Metal From Ores and the Like. Harold H. Godfrey, Los Angeles, Cal. Filed Aug. 4, 1919.

An apparatus for extracting metal from ore including an ore concentrating shaking table inclined longitudinally and transversely, said table being covered with a cathode, and an anode spaced above said cathode.



MEN YOU SHOULD KNOW ABOUT

J. B. Tyrrell, of Toronto, Ont., has gone to Newfoundland on professional business.

C. W. Cooke has completed several months' geological work in Colombia, and is again in the United States.

J. B. Harper, of Jerome, Ariz., who was recently visiting New York on professional business, has returned to Jerome.

D. E. Winchester has completed an extended field study of oil shales, and now is engaged in writing his report thereon.

John Sterling, chief inspector of mines for Alberta, is in Scotland for a rest after his serious illness during the summer.

Harry J. Wolf, of New York City, has completed mine examinations in southeastern Arizona and has gone to Denver, Col.

Harold Kingsmill, of New York, stopped in Salt Lake City Aug. 25 for a short stay while returning East from Eureka, Nev.

Robert N. Bell, retiring state mine inspector of Idaho, will take over and operate the Clayton mine in Custer County, Wash.

K. C. Heald, of the staff of the U. S. Geological Survey, is inspecting the work being done by Survey geologists in Western oil fields.

Paul Liver, of Wallace, Idaho, was elected president and manager of the Giant Mining & Development Co. at the annual meeting.

Roy L. Barns, of the Solvay Process Co., sailed for France on Sept. 9. He will study alkaline deposits in Belgium, France, and England.

W. W. Risdon, of Albuquerque, N. M., has been appointed as the New Mexico state inspector of coal mines, to succeed the late J. E. Sheridan.

Y. Fukihara, mining engineer, of Tokyo, Japan, is visiting mines in the United States on his way home from an extended visit to England.

J. Carlton Bray recently made a professional examination of the Nevada Western Gold & Silver Mining Co. property near Pyramid Lake, Nev.

F. M. Manson and **Morris P. Kirk** are inspecting mining properties in the Lordsburg, N. M., district, and also in the Chiricahuas, in Cochise County, Ariz.

K. S. Twitchell, mining engineer of San Francisco, Cal., sailed this week for a trip of several months in Europe. Most of the time Mr. Twitchell will devote to France.

William H. Crague, metals specialist, and **Raymond Richards**, oil specialist, have been appointed tax-valuation engineers in the income-tax unit of the Bureau of Internal Revenue.

Charles E. Knox, president of the Montana-Tonopah Mining Co., Tonopah, Nev., was among those present at the beginning of operations of the Gold Canyon Dredging Co., of Dayton, Nev.

S. F. Shaw, of Charcas, San Luis Potosi, Mexico, has resigned from the American Smelting & Refining Co., to become manager of Cia. Minera La Constancia, at Sierra Mojada, Coahuila.

W. A. Funk has recently returned from Colombia, South America, where he was in charge of the Chicago mine in the Guamoco district. Mr. Funk will resume his practice as a mining engineer, at Idaho Springs, Col.

Angus W. Macdonald, employment agent of the companies of Dominion Steel Corporation, and recently superintendent of Black Diamond Coal Co. at Lethbridge, Alberta, has been appointed superintendent of industrial relations by the corporation.

WILLIAM SPENCER MURRAY

William Spencer Murray, consulting engineer of New York City, author of the Super-Power System, chairman of the Super-Power Committee and of its engineering staff, was born in Annapolis, Md., in 1873, and was graduated in electrical engineering from Lehigh University in 1895. After seven years of practical training with the Westinghouse Electric & Manufacturing Co., he engaged in four years of consulting practice in Boston. After this Mr. Murray, in 1905, became chief electrical engineer of the N. Y., N. H. & H. R.R., and took full charge of the great task of carrying out the electrification of the New Haven. He was president of the Housatonic Power Co. in 1917-18, and a member of the electrical engineering firm of McHenry & Murray from 1913 to 1917, and vice-president of the A. I. E. E. from 1913 to 1914. His experience in large-scale electrical engineering undertakings has logically led to his conception of a nation-wide survey of our power system and to his selection, by Secretary Payne, to execute the restricted survey as authorized by the last Congress.

Walter H. Wiley, of Los Angeles; **Fred Searls, Jr.**, of Berkeley, and **Albert Burch**, of San Francisco, Cal., all retained by the Hecla Mining Co. in the pending apex litigation with the Federal Mining & Smelting Co., were recently in Wallace, Idaho, in connection with that case. They were accompanied by John P. Gray, chief attorney for the Hecla.

Recent visitors to New York included the following engineers and mining men: Emilio Mosonyi, Salvador Deep Well Boring Co., San Salvador, C. A.; P. R. Hines, Allis-Chalmers Manufacturing Co., Milwaukee, Wis.; L. A. Barton, Shreveport, La.; Everett W. Smith, Roasting & Magnetic Concentrator Zinc Co., Ltd., Montauban, Que.; F. F. Kett, San Francisco, Cal.; Courtenay de Kalb, Baltimore, Md.; William F. Jahn, El Salvador silver mine, Gilman, Mont.; Charles C. Selbie, of Pasadena, Cal., and Dundu, Caixa 347, Loanda, Angola, Africa; F. J. S. Sur, San Antonio, Tex.; Dr. E. Barth, Roswell, N. M.; A. Matsuhara, Kyoto, Japan; K. S. Twitchell, Los Angeles, Cal.; H. C. Anchor, Dome Extension Mines, South Porcupine, Ont.

SOCIETIES

American Mining Congress, holding its twenty-third annual convention at Denver, Col., Nov. 15 to 20, invites all manufacturers of mining machinery, all engineers, all mine operators, their officials, and all others interested to the **First National Standardization Conference**. This conference, meeting on the dates mentioned in the Albany Hotel, Denver, will discuss the improvement and standardization of mine practice as applied to mining equipment, machinery, labor- and life-saving devices, safety codes, costs accounting, government and state co-operation, and related subjects. The first annual joint meeting was at St. Louis in 1919, and the standardization committees have now divided their work into two general divisions, Metals and Coal. Address all inquiries to John T. Burns, assistant secretary, American Mining Congress, Albany Hotel, Denver, Col.

National Safety Council has issued the preliminary edition of the program of the **Ninth Annual Safety Congress** to be held in the Auditorium, Milwaukee, Wis., Sept. 27 to Oct. 1, inclusive. That week is also to be "No Accident Week" for Milwaukee. The Mining Section begins its sessions on Sept. 28 at 2:30 p.m. and includes papers on Vocational Training, Industrial Nurses, Safety Devices on Hoisting Engines, Handling Mine Cars, Gas Explosion Prevention, Hazards in Open-Cut Mining, by C. A. Mitke, L. F. Mitten, D. E. A. Charlton, and others. Headquarters will be at Hotel Wisconsin, 3d St. near Grand Ave. J. C. Pinney, 108 Mason St., Milwaukee, Wis., will attend to requests for hotel reservations.

THE MINING NEWS

LEADING EVENTS

National Tax Association Meets in Salt Lake City

Various Plans of Taxation Discussed by Delegates—Utah Copper Workings at Bingham Visited

The National Tax Association recently met in Salt Lake City, the place of meeting being the Hotel Utah. The question of a plan of taxation to take the place of the tax on stock dividends under the head of excess profits tax refused by the supreme court was discussed on Wednesday, Sept. 9, when it was announced that treasury officials are seriously considering the imposition of a tax on undivided earnings. John E. Walker, special attorney for the Internal Revenue Bureau, speaking for his chief, T. S. Adams, who was unable to be present, said that Mr. Adams was giving much thought to this form of taxation, combined with an extension of special excise taxes on commodities sufficiently in common use to yield a considerable revenue to take the place of that which the supreme court decision placed out of the reach of the Federal officials.

At the close of the evening session, Prof. Charles M. Bullock, of Harvard, at the round table discussion spoke in opposition to the proposed form of taxation, saying that it would place larger corporations in a more favorable position and work hardship on newer and smaller enterprises. Meyer D. Rothschild of New York, chairman of the business men's national tax committee, speaking for the proposed plan, held that the little business men would be in rather a better position than at present. Thomas W. Page, chairman of the U. S. tariff commission, opened the evening session by giving an outline of the history and work of the commission, now four years old, describing also the chaotic condition of commercial relations between countries following the world war.

A paper by Prof. R. M. Haig, of Columbia University, was then read by A. E. Holcomb on "The Exemption of Mortgage Interest as a Solution of the Housing Problem," stating that real estate stands to lose more through such a policy than any other interest, as any breakdown in income taxation would throw the burden back on realty. A report adopted unanimously by the committee on exemptions was read by Prof. Carl C. Plehn, of the University of California. This report urged "that there should be no privileged class free from bearing their share of the cost of the institutions upon which their well-being, if not their lives, depended."

Douglas Sutherland, of the Illinois constitutional convention, gave an account of taxation problems in his state. On the afternoon of Sept. 9 members, after a morning session given over to round table discussion, were taken to Bingham as the guests of the Utah Copper Co., where they were shown about by John M. Hayes, treasurer of the company, who explained the pioneer work of D. C. Jackling in bringing to commercial use low-grade porphyry ores.

WEEKLY RÉSUMÉ

It is reported from California that the Rising Sun Mining Co., at Colfax, has found the rich ore shoot lost years ago. At Salt Lake City the National Tax Association convened during the week. In Nevada, the Gold Canyon Dredging Co. has begun its operations. Virginia City, on the Comstock, has experienced a strike of miners. Word is received from Melbourne that the Electrolytic Zinc Co. has acquired the Mount Reed and Roseberry mines, in Tasmania. At Hill City, S. D., the National Tin Corporation has suspended operations. Little of note is reported from Washington. Work is to be undertaken by the Bureau of Mines looking to the improvement of drill steel.

Lake Ore Shipments in August Pass Last Year's Figures

Iron-ore shipments from the head of Lake Superior are now 3,200,000 tons greater than at a similar date in 1919, shipments during August, 1920, having exceeded those of August, 1919, by 2,500,000 tons because of the coal dock strike which so seriously curtailed ore shipments during that period last year. At this writing shipments have practically ceased over the D. M. & N. on account of a strike of wipers and hostlers at the Proctor shops. The men are not employees of the railroad, but are hired by a contractor to whom the railroad company sub-lets that phase of its work. The men are now paid 50c. an hour for a twelve-hour day and are striking for 60c. an hour and time and one-half for over eight hours. A compromise of 55c. has been offered, but has not been accepted. Below are detailed figures of 1919 and 1920 shipments:

	August, 1919	August, 1920
D. M. & N., Duluth	1,645,788	2,351,918
D. & I. R., Two Harbors	847,944	1,444,926
C. & N. W., Ashland	302,305	1,101,991
Soo, Ashland	72,940	225,303
Soo, Superior	171,743	251,596
N. P., Superior	67,644	93,895
G. N., Superior	700,710	1,921,023

Unloading and loading ore carriers at lower lake ports have greatly improved and fleet capacity in the ore trade has been more than maintained in spite of increased coal shipments which have been made.

Comstock Miners Walk Out

Strike Unauthorized by Unions—I.W.W. Control Apparent—Seek Dollar Per Day Increase

Underground workers at Virginia City and Gold Hill, Nevada, walked out on Sept. 5. The strike was not authorized by the unions but was apparently organized and directed by an I.W.W. element. A mass meeting of miners was called for Sunday, Sept. 5, and on that day, at the meeting, all miners who approved the disregarding of the secret ballot and the demand for a dollar per day increase were asked to step to the right and those against to step to the left. The result was apparent approval on the part of the underground men. The "hybrid organization" then attempted to serve notice on the operators but the operators refused to recognize such notices and on Sept. 6 issued the following statement which clearly indicates the situation:

"In view of the walkout of miners of the Comstock district and their subsequent demand for a general increase of $1 per day, together with the elimination of the secret ballot, we, the undersigned operators, make the following statement of our position:

"Owing to the increased prices of mine supplies and equipment, and increased freight rates, the cost of mining has, during the past few months, been steadily climbing. On this account, and believing that a reduction in cost might be expected in the near future, many of us have been considering seriously the advisability of suspending operations in the hope of such a decrease. We have been unwilling to do this on account of the large number of men who would be thrown out of employment. By reason of this unannounced walkout the miners have settled this question for us.

"This action of the miners was taken in spite of the existence of several contracts, some of which were effective until Jan. 1, 1921, and all of which were subject to 30 days' notice before they could be nullified. In view of the absolute proof that the cost of living has already decreased and will continue to decrease, we do not feel that a raise in wages is at all warranted at this time We are ready and willing to resume operations under the old scale of wages.

"None of the organizations represented by the undersigned operators is opposed to unionism on the Comstock.

"(Signed)

"R. A. Hardy,
"George H. Drysdale,
"H. B. Bulmer,
"H. L. Slosson, Jr.,
"Alex. Wise."

Operations at Virginia have been con-

tinued under difficulties which are not appreciated by the miners. In spite of increasing costs, efficiency has not increased and as a consequence unit costs have risen greatly. If pumps have to be pulled, as intimated, the added cost of unwatering and repairing later may operate to prevent some mines from resuming. From 300 to 350 miners are involved. Governor Emmet D. Boyle is using every effort to clear up the situation in a way that will be equitable to both parties.

Rising Sun Mine at Colfax, Cal., Finds Lost Vein

An important strike has been made by the Rising Sun Consolidated Mines Co., near Colfax, Cal. The property, which was famous about forty years ago for its rich ore, has been closed down until recently. The rich ore streak was lost years ago and much development work has been done in an effort to find the vein. Although good ore has been found it was not until Sept. 6 that the main orebody was uncovered. Crews on the 6th, 7th, 8th and 9th levels all cut the lost vein at about the same time, it is stated. The ore is free milling gold quartz, about 4 ft. wide. Some assays are said to run several thousand dollars per ton.

Mackay School of Mines Expects Good Year

The number of inquiries received from prospective students before registration day indicates that the Mackay School of Mines, connected with the University of Nevada at Reno, will have a larger attendance than ever before. It is the expressed opinion of the director, F. C. Lincoln, that the coming year will be the most successful in its history.

Mining schools at various camps in the state have been affiliated with the Mackay School of Mines, but the ones at Goldfield and Ely have been discontinued, and it is probable that the one at McGill will be also. Those at Virginia City and Tonopah will continue. A rearrangement of the mineral exhibits at the museum has been made recently and many gifts of fine mineral collections have been received recently.

The contract is expected to be let at once for the new building to house the Rare and Precious Metals Station of the U. S. Bureau of Mines, which will be in line with the east wing of the Mackay School. It will have two stories and basement and cost $30,000. The first carload of machinery to be used at the station has been shipped from Golden, Col., the former location. Charles E. Davis, of the Bureau of Mines, is now in Reno but the balance of the staff is not expected until the building is finished.

The staff of the Mackay School of Mines consists of F. C. Lincoln, director and professor of mining; J. C. Jones, professor of geology and mineralogy; and Walter S. Palmer, professor of metallurgy.

Midvale Smelter Seeks Platinum Stolen From Laboratory

166 Grams Taken Recently—Sheriff's Office of Salt Lake County, Utah, Hunting Thieves

The recovery of 166 grams of platinum stolen the night of Aug. 30 from the chemical laboratory of the U. S. Smelting, Refining & Mining Co. at Midvale, Utah, is being sought by the sheriff's office of Salt Lake County. These pieces have been listed as follows by the company:

Clyinders[1]	Numbers on Cylinders	Size of Nos. on Cylinders
1	6	$\frac{1}{4}$ in.
1	31	$\frac{1}{4}$ in.
1	25	$\frac{1}{4}$ in.
1	29	$\frac{1}{4}$ in.
1	1	$\frac{1}{16}$ in.
1	3	$\frac{1}{16}$ in.
1	5	$\frac{1}{16}$ in.
1	6	$\frac{1}{16}$ in.
1	7	$\frac{1}{16}$ in.
1	9	$\frac{1}{16}$ in.
9 Spirals		
2 Crucibles		
2 Crucible covers		
3 Filtering cones		

[1] All cylinders have "B & Co." on stem.

The superintendent, E. H. Hamilton, will be glad to receive any information relating to the stolen platinum.

Joplin Zinc Producers Expected Higher Price on Slab Zinc

Zinc producers of the Joplin-Miami district have been interested in the effect of the recent freight rate increase on offerings for zinc ore and have been surprised to note that slab zinc is not quoted higher on account of it. Figures showing just what the rate increases mean for smelters buying ore in the Joplin field were recently prepared by Ross A. Blanchard, traffic manager for the American Zinc Lead & Smelting Co., and were presented by him to the Tri-state branch of the American Zinc Institute at the weekly meeting at Picher. They were as follows:

INCREASE ON ORE PER TON FROM JOPLIN DISTRICT TO VARIOUS SMELTING POINTS

	Old rate.	New rate.	Increase per ton
To St. Louis	$3.70	$5.00	$1.30
To La Salle	4.60	6.13	1.53
To Cleveland and Donora	6.10	8.35	2.25
To Fort Smith	2.40	3.25	.85
To Bartlesville	1.90	2.55	.65

INCREASE ON SLAB ZINC PER TON FROM SMELTER TO SELLING MARKET

	Old rate.	New rate.	Increase
From Bartlesville and Fort Smith	$3.53	$4.79	$1.26
From East St. Louis to Boston	7.40	0.15	2.75

When it is considered that smelters must first pay the freight on the ore and then again on the slab zinc to East St. Louis or to New York, the increased rates are decidedly important.

The Utah Power & Light Co. has been granted permission to extend its power lines through the town of Morgan in Morgan County, Utah, in order to supply power to the district beyond that place. Morgan itself is supplied by a private company, which buys the power at wholesale from the Utah power company.

New Cornelia Co-operative Store Described

Profits Distributed Among Company's Employees in Proportion to Amount of Their Purchases

E. D. Gardner, mining engineer of the U. S. Bureau of Mines, describes the New Cornelia co-operative store at Ajo, Ariz., as follows:

"The town of Ajo is built in the desert and consisted of but a few houses when the New Cornelia Copper Co. started operations. Since there were no stores at Ajo or vicinity the New Cornelia Co-operative Mercantile Co. was established to serve the needs of the employees of the New Cornelia and allied companies.

Weight of Platinum, grams	Size of Cylinders
17.0002	$4\frac{1}{2}$ x 2 in.—$5\frac{5}{8}$-in. stem
15.6973	$4\frac{1}{2}$ x 2 in.—$5\frac{5}{8}$-in. stem
15.4663	$4\frac{1}{2}$ x 2 in.—$5\frac{5}{8}$-in. stem
15.6608	$4\frac{1}{2}$ x 2 in.—$5\frac{5}{8}$-in. stem
11.50	$3\frac{7}{8}$ x 2 in.—4 -in. stem
11.50	$3\frac{7}{8}$ x 2 in.—4 -in. stem
11.50	$3\frac{7}{8}$ x 2 in.—4 -in. stem
11.50	$3\frac{7}{8}$ x 2 in.—4 -in. stem
11.50	$3\frac{7}{8}$ x 2 in.—4 -in. stem
11.50	$3\frac{7}{8}$ x 2 in.—4 -in. stem
about 6 gm.	$4\frac{1}{2}$ in. long—$\frac{1}{4}$-in. flat coil
about 20 gm.	$4\frac{1}{2}$ in. long—$\frac{1}{4}$-in. flat coil
about 5 gm.	$4\frac{1}{2}$ in. long—$\frac{1}{4}$-in. flat coil
about 2 gm.	$4\frac{1}{2}$ in. long—$\frac{1}{4}$-in. flat coil

"The New Cornelia Copper Co. advanced the money to erect the store building and to buy the stock, and assumes all risks. In all, $85,000 has been advanced, representing the capital stock of the enterprise.

"The store is run by a store manager appointed by the copper company and who reports only to the general superintendent. A committee of seven workmen, representing the various departments, meet with the store manager monthly and make suggestions for the betterment of the service and present complaints which have been brought to their attention.

"The store is well managed, carries a large and well assorted stock and is modern in every respect. Prices are at the same level as in the other southwestern mining camps. The copper company does not participate in the profits of the store but does receive 6 per cent interest on the capital advanced. At the end of the year, after making proper deductions for interest on capital account, depreciation of store equipment and fixtures, and for a proper sum to the surplus account, the rest of the profits is distributed among the employees of the company in proportion to the amount of their purchases.

"To participate in the store profits employees must be in the company's employ at Christmas, when the dividend or rebate is paid, and must have worked four months previous to Dec. 20, when the books are made up.

"When a man quits he forfeits any interest in the dividend fund which he may have acquired, and it has been found that this rule promotes the stability of the working force beside reducing the cost of living of the regular employees.

"The following profits have been distributed by the store to date: 1917 (9 months) $12,052.60 to 472 employees; 1918, $32,777.71 to 773 employees; 1919, $40,825.05 to 618 employees. The average discount has been 15 per cent and about 70 per cent of the men have benefited.

"Employees, to receive the rebate, must make purchases on credit and all store accounts are deducted from pay checks. Thereby no bad debts are accumulated. The store does considerable cash business with others than employees and the profit from these purchases as well as from the business by the men who have quit the company's service, all goes into the general dividend fund.

Mine-Rescue Car Visits Engelmine, Cal.

The U. S. Bureau of Mines' rescue car No. 1, stationed at Reno, Nev., has just completed a two weeks' stay at Engelmine, Plumas County, Cal. E. D. Gardner and R. Hicox conducted classes in first aid and mine rescue for miners, foremen and superintendents of the district. The classes were held in the evening both at Engelmine and the upper mine of the Engels Copper Co.

Operations in St. Louis County, Minn., Compared

The mine inspector of St. Louis County, Minn., has submitted his annual report as of June 30, 1920. Below is a summary of the report together with a comparison with the preceding year:

	1919	1920
Number of mines operated	117	114
Number of mines idle	49	58
Total number of mines	166	172
Number of inspections	299	305
Number of men employed underground	6,552	5,898
Number of men employed in open pits	2,692	2,795
Number of men employed in stripping	2,470	2,624
Number of men employed on surface	2,498	2,804
Total number of men employed	14,212	14,121
Tons ore shipped from underground	9,575,514	7,850,590
Tons ore shipped from open pits	22,253,295	17,499,334
Total shipments	31,828,809	25,349,924
Cubic yards stripping removed	14,124,832	11,699,279
Fatal accidents underground	18	26
Fatal accidents open pit, stripping and surface	15	10
Total fatal accidents	33	36
Accident factor per 1,000 men employed	2 39	2 59
Tons ore per fatal accident	964,509	704,164
Number serious non-fatal accidents	21	36
Average wage	$5 55	$6 93

The greater part of the Mesabi Range, in the iron country, is included in St. Louis County.

Electrolytic Zinc Co. Acquires Read-Roseberry Mines

Reserves of Zinc Ore in Properties Taken Over Exceed 1,000,000 Tons —Gets Option To Buy Zeehan Smelters

From Our Melbourne Correspondent

An agreement has been executed whereby the Electrolytic Zinc Co. of Australasia Proprietary Ltd. will take over as from July 31 the mines and other assets of the Mount Read & Roseberry Mines Ltd., Tasmania. The consideration for the sale is the issue to the Mount Read & Roseberry Mines of 350,000 ordinary shares of £1 each fully paid in the capital of the Electrolytic Zinc Co.; the right to the Mount Read & Roseberry mines to take up 150,000 cumulative participating preference shares of £1 each in the Electrolytic Zinc Co.; and the right of the Mount Lyell Mining & Railway Co. to appoint two directors to the board of the Electrolytic Zinc Co.

The authorized capital of the Electrolytic Zinc Co. is £1,000,000 in 1,000,000 shares of £1 each, with power to increase from time to time. The issued capital at date is 600,000 ordinary shares of £1 each, fully paid, which are held by the undermentioned companies in the following proportions: Amalgamated Zinc (De Bavay's), 240,000 shares; Broken Hill South, 120,000; North Broken Hill, 120,000; Zinc Corporation, 120,000; total 600,000.

It is intended to increase forthwith the subscribed capital by a further issue of ordinary shares, which will be offered to the shareholding companies pro rata to the respective holdings at this date. Steps will then be taken to increase the authorized capital to £2,500,000, divided as follows: 1,250,000 8 per cent cumulative participating preferential as to capital and dividends, and ranking *paripassu* with the ordinary shares in any dividend distribution over and above 8 per cent on such ordinary shares; and to issue as rights to the individual shareholders in the constituent companies 1,050,000 of such preference shares. Of the 1,250,000 ordinary capital, 350,000 shares of £1 each fully paid will be issued to the Mount Read & Roseberry Mines Ltd. in terms of the agreement. These shares will be deferred as to dividends until July 31, 1925, after which date they will rank with the other ordinary shares issued in any distribution of profits.

The assets acquired under the agreement comprise the Hercules and Roseberry groups of mines, with ore reserves estimated at over 1,000,000 tons of the following average: 27.40 per cent zinc, 7.30 per cent lead, 9.57 oz. silver per ton, 0.127 oz. gold per ton. In addition the interest is acquired in an option to purchase the Zeehan smelters from the Government of Tasmania.

In a circular to shareholders, the directors of the Mount Read & Roseberry Mines point out that the issued capital of that company is 256,503 shares, and the company is under obligation to issue 97,500 shares to the Tasmanian Copper Co., making a total of 354,003 shares. The company is indebted to the Mount Lyell company for advances made for working capital to a total of £180,000. An arrangement has been made for the discharge of this indebtedness by an allotment of 180,000 of the deferred ordinary shares in the Electrolytic Zinc Co. In consideration of the Mount Lyell company being released from any further obligation under its agreement with the Mount Read & Roseberry Mines it will accept an allotment of 30,000 deferred ordinary shares in the Electrolytic Zinc Co. in full settlement of its rights as the holder of 100,000 shares in the Mount Read & Roseberry Mines. On a proportional basis, the Mount Lyell company would have been entitled to approximately 48,000 shares. Should it be decided to distribute the remaining 140,000 deferred ordinary shares in the Electrolytic Zinc Co., shareholders would receive approximately fifty-five such shares for each 100 shares held by them, but the distribution will be slightly reduced by the number of shares required to meet the company's expenses after June 30, 1920. The Mount Lyell company will have the right to apply for 90,000 out of the 150,000 participating cumulative preference shares in the Electrolytic Zinc company, which the Mount Read & Roseberry company is entitled to subscribe for at par. It is the intention of the board to give shareholders the opportunity of taking up the remaining 60,000 shares when the issue is made by the Electrolytic Zinc Co.

MINE RESCUE CAR NO. 1 OF U. S. BUREAU OF MINES

The Lake Rolleston scheme, like the King River scheme, will be held in abeyance for the time being. It will be possible to concentrate upon the Great Lake scheme. All mining, smelting and concentrating will be done at Roseberry and Zeehan. At the same time power will be carried to Launceston.

Gold Canyon Dredging Co.'s Start A Gala Occasion

Large Crowd Sees New Dredge Begin Work—Governor Emmet D. Boyle Addresses Gathering

The intense interest which has been manifested in the operations of the Gold Canyon Dredging Co., at its immense holdings of gold placer ground but a few miles from the historic Comstock lode in Nevada, culminated on Sunday, Sept. 5, when not less than 1,200 people came to see the big steel dredge begin its work. Men prominent in the mining world were present, many Californians being among them, though Bulkeley Wells, president of the company, and Harry Payne Whitney, one of the principal stockholders, were unable to come.

The interest in the occasion felt by most of the visitors was expressed by George L. Hurst, manager of the dredging department of the Bethlehem Shipbuilding Corporation, of San Francisco, who said: "This is a great gala occasion. I have never seen anything like it. You would think we were launching one of Uncle Sam's battleships. This is even better, for not one of our sixteen launchings in 1918 drew such a crowd as this."

Among those who addressed the crowd before the current was turned on and the dredge put in operation were: Roy H. Elliott, assistant manager of the Gold Canyon Dredging Co., who acted as master of ceremonies in the absence of President Bulkeley Wells and General Manager Fred G. Farish; Walter E. Clark, president of the University of Nevada; Dr. Aurelia Rhinehart, president of Mills College, California; Emmet D. Boyle, Governor of Nevada; and Edwin Higgins, consulting engineer for the company. The latter gave many interesting facts regarding the history of gold dredging in general, as well as the particular dredge on which he was standing.

Program Committee Named for Mining Congress

The advisory program committee for the convention of the American Mining Congress to be held at Denver, Col., in November has been appointed with the following membership: Bulkeley Wells, ex-officio chairman; D. W. Brunton, Albert Burch, James F. Callbreath, John C. Howard, E. W. Parker, Col. Warren W. Roberts, Carl Scholz, George Otis Smith, J. E. Spurr, and Francis A. Thompson.

Civil Service Examinations

Those interested in the following should apply to the Civil Service Commission, Washington, D. C., for form 1,312, stating the title of examination desired:

Ore-dressing engineer, $2,400-$3,600; both sexes; male eligibles preferred. An open competitive examination. Applications received up to Oct. 12. A vacancy in the Bureau of Mines, for duty at Moscow, Ida., may be filled from results of examination.

Recent Production Reports

Shattuck-Arizona in August produced 194,003 lb. copper, 563,452 lb. lead, 34,661 oz. silver and 406.71 oz. gold. Production of copper in July was 166,938 lb.

Sons of Gwalia, Kalgoorlie, crushed 11,120 tons of ore in July yielding £15,919 in gold, this value being based on the normal price of gold.

Cerro de Pasco produced 4,444,000 lb. copper in August, compared with 3,652,000 in July.

Phelps Dodge produced 8,365,000 lb. copper in August compared with 8,357,000 in July. Of the August output the Copper Queen Branch produced 5,054,000 lb.; Moctezuma Copper, 2,490,000; Burro Mountain Branch, 92,000; and custom ores yielded 729,000.

North Butte produced 1,286,137 lb. copper in August.

U. V. Extension's August production was 5,805,568 lb. copper against 3,304,878 in July.

Calumet & Arizona produced 5,200,000 lb. copper in August, of which 3,650,000 lb. was available for the company. The figure corresponding to the latter in July was 3,528,000.

New Cornelia's August output was 3,842,000 lb. copper, as compared with 3,522,000 in July.

Miami Copper produced 4,630,720 lb. copper in August against 4,459,298 in July.

Arizona Copper's output of copper in August was 3,000,000 lb., unchanged from recent months.

Inspiration produced 7,200,000 lb. copper in August against 6,500,000 in July.

East Butte's smelter produced 1,566,800 lb. copper in August against 1,537,880 in July.

Utah Copper's August production was 8,820,000 lb. copper against 8,500,000 in July.

Chino Copper produced 4,000,148 lb. copper in August compared with 4,360,932 in July.

Ray Consolidated's output in August was 4,505,000 lb. copper compared with 4,500,000 in July.

Nevada Consolidated's August production was 4,650,000 lb. copper, unchanged from June and July.

Greene-Cananea's August output was 3,500,000 lb. copper unchanged from July.

Butte & Superior's August output was 7,800,000 lb. zinc and 140,000 oz. silver against 7,914,024 lb. zinc and 159,778 oz. silver in July.

Interstate Callahan produced in August 4,452,000 lb. of zinc concentrates carrying 52-53 per cent zinc, 2,014,000 lb. of lead concentrates (including some lead ore) running 60 per cent lead, and 20,140 oz. silver. Zinc concentrates produced in July totaled 4,400,000 lb., the grade being the same as that given above.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Bureau of Mines To Study Drill Steel

More work will be done by the U. S. Bureau of Mines in the near future on problems looking to the improvement of drill steel. Some work has been done on this subject by the Bureau, but in view of the revelations at the recent meeting of the American Institute of Mining Engineers more attention will be given the matter. It was pointed out very clearly at the meeting that, while there has been great development in drills during the past two decades, there has been little if any improvement in drill steel. If a steel is developed which will stand up longer, it will mean the saving of considerable losses of time in changing drills.

Officials of the U. S. Bureau of Mines have been surprised by the number of companies that are directly interested in the lead and zinc industry in the Mississippi Valley. A list of such companies was compiled so that invitations could be issued to their representatives to attend the meeting in St. Louis on Oct. 9. On Sept. 11, there were 137 companies on the list, with prospects that others would be added.

Before the nature of the mining and the metallurgical work, which is to be undertaken at the new experiment station at Rolla, Mo., is determined the Bureau wants to hear from the industry itself as to what problems are most pressing. The appropriation for the work is $25,000, which is too small to permit the study of all of the problems.

With the development of sources of aluminum in certain clay deposits, there has come an insistent demand that the Government undertake some work on that subject. Some are of the opinion that aluminum-bearing clays which could be worked profitably are much more widely distributed than is generally supposed. This carries with it the possibility of using these clays as a source of aluminum oxide.

It is also claimed that the small operators, who are trying to get a foothold in the aluminum industry, are entitled to the results of Government research in such matters as cheap methods of manufacturing aluminum oxide and the losses in re-melting. The highly organized concerns in the industry are able to carry on their own research but it is argued that it would be in the public interest for the government to undertake work on such problems as would be of benefit to the entire industry, especially to the smaller interests.

In addition, it is requested that research be done on the alloys of aluminum. It was pointed out that the Germans developed duralumin for their Zeppelin construction, an alloy at once light and of great strength. It is believed that aluminum alloys alone offer a great field for development.

It is also pointed out that there is great need for research in the whole matter of non-ferrous alloys. The demand for alloys with special properties has been augmented greatly by the development of automobile and aeroplane industries. Even in an alloy as well understood as is brass, the full possibilities of varying the percentages of copper and zinc have not been realized.

War Minerals Awards

Awards recommended by the War Minerals Relief Commission, for the week ended Sept. 4, are as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): G. L. Sledge, manganese, $100, 23 per cent; Bulkeley Wells, chrome, $7,098.95, 45 per cent; Ozark Manganese Co., manganese, $4,290.76, 39 per cent; the Hillside mine, chrome, $10,642.27, 63 per cent; Floyd Brown, manganese, $132, 4 per cent; E. K. Hoy, chrome, $845.50, 14 per cent.

In the pyrites claim of the Kelsey Mines Co., the Commission previously awarded $1,961.21. A further allowance of $918.84 has been made. In the chrome claim of Byrnes Bros., which was disallowed, the sum of $400.96 has been awarded on a re-examination of the claim. On a previous award, J. J. Cummings, Jr., was allowed $120 on a manganese claim. An additional $487.50 has been allowed. To date the Commission has acted on 994 claims.

Building materials have soared to such a point that the Government bureaus interested are studying every possible economy. It is believed that great economies can be effected in the mining of the non-minerals which are used so extensively in the building trades. During 1920, it is estimated that $400,000,000 worth of non-minerals and mineral products were used for those purposes. It is claimed that the average efficiency is low in the recovery of talc, soapstone, slate, limestone, granite, building stone and gypsum.

NEWS BY MINING DISTRICTS

SOUTH AFRICA

American Vanadium & Lead Mines, Ltd., Organized

Johannesburg—An important flotation has recently been announced under the name of the African Vanadium & Lead Mines, Ltd. The nominal capital is £200,000, of which £105,000 is to be issued. The chief object of the company is to take over and continue the working of the Doornhoek vanadium and lead mines in the Zeerust district. It is intended to supplement and improve the existing plant by the installation of a new haulage system, a concentrator, water supply, and power and lighting equipment for the production of high-grade lead and vanadium concentrates for shipment overseas or for local realization, and to acquire the existing stocks of ore.

The operations at the mine have hitherto been confined to recovery of galena nodules containing 80 per cent of lead and 6 oz. of silver per ton, which occur with great frequency. In the course of recovering these nodules, large quantities of lead ore, finely disseminated in the gangue, were recovered, and in the absence of any means of concentration were dumped on the surface. The masses thus dumped and available for immediate shipment are stated in the company's prospectus to be approximately 100,000 tons. Samples of these dumps show value varying from 5.83 per cent to 23.35 per cent lead after removing all visible galena.

It is also planned by the company to erect a plant for smelting and reducing vanadium and lead ores and concentrates, if this be found necessary. The remaining area may also be explored and prospected.

CANADA

Ontario

Government Not To Build Branch of T. & N. O. Ry. to Kirkland Lake—Dome Shareholders Ratify Dome Ex. Proposal

Porcupine—At a special meeting of the shareholders of the Dome Mines on Sept. 4 the proposal of the directors to purchase the property of the Dome Extension Co. was unanimously ratified. The shareholders of the Dome Extension will receive one share of Dome stock for each thirty shares of their Dome Extension holdings.

The new hospital of the Hollinger Consolidated, constructed on the most modern design, is almost completed. The main building is 113 x 37 ft. with a westerly wing 37 x 39 ft. The normal capacity is 35 patients, but in case of emergency twice that number could be accommodated.

At the North Davidson an orebody, reported to be 4 ft. wide, has been encountered in the shaft at a depth of 60 ft.

Boston Creek—The Miller Independence has cut several promising stringers conveying iron and copper sulphides on the 500-ft. level. The inclined shaft which opened up rich ore at a depth of 200 ft. has been dewatered for the purpose of further exploration

The Patricia mine, which has been closed down since the plant was destroyed by a bush fire last fall, has been optioned to T. J. Flynn.

Kirkland Lake—The mine managers of Kirkland Lake have been officially advised by the Ontario government that they do not intend to construct a branch line of the Timiskaming & Northern Ontario Ry. to the camp at present. This change of plan is due to the attitude of the Associated Goldfields of Larder Lake in refusing to submit its property to inspection by government engineers. In the first instance the government declared its intention to build the railway to Kirkland Lake, a distance of four or five miles. The mining interests stated that a good macadam road would be preferable, and the government acceded to their request and constructed a motor road at a cost of $100,000. Then the railway proposition was renewed in connection with the opening up of new mining territory lying between the proved up Kirkland Lake area and Larder Lake, and was favorably considered, the government promising to build the road, provided the property owners interested would permit government engineers to report on their resources and that their finding warranted the construction of a railway. Now the government announces that inasmuch as the Associated Goldfields, the only operating company at Larder Lake, has not accepted the provision for an examination of its property, and that as it has complied with the wishes of the Kirkland Lake operators in regard to the motor road, it would not feel justified in proceeding with the construction of a railway at the present time.

The Ontario government has begun the building of a wagon road from the Tough-Oakes mine east through Level township to Mud Lake.

At the Hunton Kirkland sinking operations have been begun, to carry the shaft down from its present depth of 40 ft. to the 200-ft. level.

Cobalt—New equipment, including a

shoveling machine and crushing machinery, is being installed at the Kerr Lake to handle a large tonnage of low-grade ore on the dumps, which will be shipped by aerial tram for treatment at the Dominion Reduction plant. Production is being maintained at upward of 50,000 oz. of silver per month.

ARIZONA

Ash Peak Extension Under Development

Duncan—The Ash Peak Extension is being developed and operated under the management of John Horrigan. The shaft has been sunk to the 500-ft. level, and drifting is in progress on the vein, which is 9 ft. wide and assays 25 to 30 oz. silver per ton. Eighteen to twenty tons per day is produced from development work, and transported by motor truck a distance of 10 miles to Duncan, whence it is shipped to the smelter at El Paso. This development is on the northwesterly extension of the Ash Peak vein, which outcrops prominently for a continuous distance of about two miles.

The Ash Peak Mining Co. has developed its property by the 800-ft. Shamrock shaft and the 500-ft. Commerce shaft, together with about 7,500 ft. of drifting on the vein. Much of this development work is in payable ore averaging about 14 oz. silver and $1 gold per ton. The company plans extensive surface improvements in the near future. The new equipment will include a 100-ton cyanide mill, compressor plant and new hoisting machinery at the Shamrock shaft. Arthur Murphy, Jr., is manager.

CALIFORNIA

Rich Strike Made at Spanish Dry Diggings—La Grange Hydraulic Mine Stripped of Equipment

Placerville—A rich vein of ore has been cut in the old Grit Consolidated mine at Spanish Dry Diggings. The strike was made by going below the old tunnel with the development work. The mine was formerly owned by William Buckman, who sold out his interests to the Grit Con. Mining Co. for $30,000. The property was one of the richest mines in the early days, but the vein was lost and has been sought continually until it was recently relocated by the present owners.

Grass Valley—The power shortage has seriously affected the employment conditions in this country and the latest result of the curtailment of power is that the Idaho-Maryland has let out thirty-five of its men until power conditions improve. Although the period of unemployment is known to be only temporary, many of the miners are leaving for other places, and the prospects are that when power is again normal there will be a dearth of miners.

The recent strike at the Alcalde mine is said to be fully as good as at first reported. Much ore has been taken out, and a large body of very rich ore uncovered.

Redding—The Yankee John Development Co., operating four miles west of Redding, has purchased the Simmons ranch, including the Reese reservoir and water rights. The deal was made principally because of the water rights, which will enable the new owners to obtain ample water supply for operations at the Yankee John gold mine.

The last lot of machinery has been removed from the famous La Grange hydraulic mine near Weaverville, and will be shipped to China. The noted old producer, for many years the largest hydraulic property in the world, was closed a few years ago, and at present indications are that it will never again be worked.

Sutter Creek—The Central Eureka Mines Co. has cut its main orebody on the 3,900-ft. level. Because of the shortage of electric power the output for last month was greatly curtailed, and only twenty stamps could operate. Instead of the usual three shifts, only two were able to work.

The Argonaut has been unwatered to the 3,300-ft. level, and plans are being made for renewing development at this point, for it was here that the rich orebody was first encountered and was afterwards traced and mined to the 4,800-ft. level. Unwatering is continuing at the rate of about 150,000 gal. daily.

Bakersfield—The Rand Silver mine reports that it has $3,000,000 worth of ore in sight and is paying dividends amounting to $25,000 per month.

NEVADA

Nevada Con. Opens Large Orebody at 700 Level—Gold Pen Mines Co. Shuts Down

Ely—A large body of high-grade ore is said to have been opened up by Nevada Consolidated on the 700-ft. level of the Ruth mine which is said to be getting richer as development proceeds. When this orebody was examined several weeks ago by Louis Ross, it was figured that it would run "better than 7 per cent copper," but late reports indicate that the values are much in excess of the figure given. It has been drifted on for a distance of 100 ft. and crosscutting is in progress to see if the width is as great as on the levels above. Great significance lies in the fact that this same orebody averages but 2½ per cent copper on the 500 and 600 levels above. A saving of 20c. per ton in treatment costs is expected as a result of rearranging the company's mill at McGill so as to use flotation, also an increase in extraction by five per cent. At full capacity the mill treats 14,000 tons daily.

Rand—The property of the Gold Pen Mines Co. at the camp of Rand, near Rawhide, has been shut down. A disagreement of the principal stockholders as to future operations is said to have been the cause.

Pioche—The Burke mine, one of the principal producers in the Pioche district in the early 70's, is being opened under lease from the Amalgamated Pioche Mines & Smelters Corp. to Charles Stindt and associates of Pioche. Preliminary examination disclosed the impracticability of utilizing the old two-compartment Burke shaft, through which the mine has been developed in the past, and it was decided to sink a new incline shaft at a point about 1,000 ft. easterly on the Burke fissure. This incline is now down 75 ft. and is following the well-defined Burke fissure, which has a dip of 50 deg.

Ore shipments from the Pioche district for the week ended Sept. 3 were as follows: Prince Consolidated, 1,900 tons; Virginia-Louise, 800 tons; Black Metals, 100 tons; Bristol Mines, 250 tons; Combined Metals, 150 tons; Con. Nevada Utah, 40 tons; total, 3,240 tons.

IDAHO

Coeur d'Alene District

Amazon Dixie To Resume Development Soon; Will Deepen Shaft—Big Creek Co.'s Flume Completed

Wallace — The installation of new electrical equipment by the Amazon-Dixie Mining Co. is nearing completion and development will be resumed at once. An electric transmission line has been completed to the mine and a large transformer is being placed at the point of diversion from the main line of the Montana Power Co. A large station on the main tunnel level has been cut to accommodate a new electric hoist, a new compressor is in position. new dry room completed, and various other additions are in preparation for operations on a larger scale. Considerable ore is exposed in the main tunnel for a distance of 600 ft. From this level a shaft has been sunk 400 ft., from which the vein has been explored 350 ft., showing more and better ore than in the tunnel. The plan now is to sink 400 ft. further with the expectation of developing sufficient ore to justify the construction of a mill. The ore is lead-silver. Wesley Everett is manager of the company. The control is owned by Cleveland men of large means.

An important strike of copper-silver ore is reported by the Lookout Mountain Mining Co., operating on Pine Creek. Driving on the vein has exposed two and a half feet of ore which carries high values in both metals, and work on the surface indicates that it is the beginning of a long ore shoot. The company is also driving a tunnel to a very promising lead-silver vein. Control of the company is owned in Kellogg.

The Big Creek Mining Co. will resume operations at once. The company was restrained from permitting the mill water and tailings from entering the creek on complaint of the Kellogg Power & Water Co., which alleged contamination of the water, which is used for domestic purposes in Kellogg. The company has now completed a flume

which will convey the water from the mill to a point far removed from the creek. The management states that the mine and mill are now in position to insure steady operation.

The Montana-Standard, a silver-lead property that has been idle for many years, situated in Montana near the Idaho line, twelve miles from Thompson Falls, has been taken under bond and lease by Mahoney Brothers, of Spokane (until recently of Wallace). It is announced that development and probably shipments will begin at once.

L. W. Stedman, manager of the Paragon Mining Co., which holds a large group of claims about five miles above Murray, states that he expects to begin shipping soon. The company has a 100-ton mill which has been completely overhauled and repaired. The product of the company is both lead-silver and zinc. The ore will be moved to the railroad at Prichard or Delta by motor trucks. F. O. Hammer, of St. Paul, secretary of the company, recently spent several days at the mine.

UTAH

Eagle & Blue Bell's Operations Normal —Tintic Standard Building Mill Foundations

Eureka—Ore shipments from the Tintic district for the week ended Sept. 3 amounted to 141 cars. The Eagle & Blue Bell is keeping up its regular output of about 100 tons daily, the ore coming from levels between the 1,000 and 1,800 levels. The disaffection of a few radicals was unable to impair the working force and the company has the usual number of men at work. Development work, suspended for a time, has been resumed.

The Pinion Queen is working three shifts and sinking its shaft as rapidly as possible. E. J. Raddatz of the Tintic Standard is president.

The Mammoth is disposing of its 250,000 tons of dump ore, said to be worth about $7 a ton, at the rate of two cars a day. The mine is also sending out first class ore from its workings.

The Tintic Standard has a large force at work on the foundations of the mill which it is building at Warm Springs Creek. The boarding house, pump house, machine shop and other buildings have already been constructed.

In the Plutus, small stringers of ore have been opened on the 1,700 level, and prospects of ore in commercial amount soon are considered good.

Bingham Canyon — The Montana-Bingham is now under the same direction as the Bingham Mines. Imer Pett is manager.

Salt Lake City—The Woodlawn property in Big Cottonwood is being developed and a shipment is expected soon. Ore is reported in three places.

Park City—Shipments of ore and concentrates for the week ended Sept. 3 amounted to 2,186 tons, the Ontario and the Silver King Coalition with 600 and 582 tons, respectively, heading the list.

MONTANA

Davis-Daly Makes Rich Strike on 2,700 Level

Butte—On Sept. 11 the Davis-Daly company opened 27 ft. of ore running 6½ per cent copper and 5 oz. silver on the 2,700 level of the Colorado mine. The strike was made in drifting on an orebody already opened. It is said that this development is one of the most important of the year in the Butte district.

SOUTH DAKOTA

National Tin Corporation Suspends Operations—Cutting Mine Closed Down

Hill City—The operations of the National Tin Corporation have been suspended. It is not stated when work will again be resumed. Alexander Roy, manager, has gone to New York City to attend a meeting of company officials, after which a statement will probably be made as to what will be done in the future.

Deadwood—The Cutting mine has closed down. The large amount of water encountered within the last few months has made this advisable. It is not stated as to just when operations will be resumed but it is certain that no work will be done until suitable pumps can be installed.

Lead — The electrification of the Homestake company's Ellison hoist is being pushed. Some of the machinery has arrived and is being placed in position. When completed this shaft will be equipped with skips and together with the B. & M. hoist will raise all the ore from the mine.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Federal Company Takes Option on Acme Mill and Lease—Much Activity Near Baxter; 20 Prospect Drills Running

Commerce, Okla. — Otis W. White started up two mines in the Oklahoma field on Aug. 11 that have been idle for several months. One was the Otis L., formerly known as the Sullivan, at Commerce, and the other the Miami Metals, at Picher, which has been down since a tornado destroyed its hopper and derrick last spring. Part of the dirt at the Otis L. will be taken from the old Queen City lease, hoisted from a shaft on the Emma Gordon lease and milled at the Otis L. mill on the Sullivan lease. The office for both mines will be at Commerce. White is manager for both properties, with Edward Depee holding the contract for hoisting the dirt at the Otis L. and L. E. Cartwright superintendent for the Miami Metals.

Joplin, Mo.—Creech & Baker have taken a lease on the Fifteenth Street mine in Joplin. They have pumped the water out and are making a good production from four drifts in ore.

Picher, Okla.—The St. Louis S. & R. Co. has completed a new shaft a quarter mile southeast of the mill shaft at its No. 1 mill and has started operation of that property once more after idleness of several months. The dirt is being carried to the mill over a surface railroad. The company has been operating its No. 2 mill steadily. Its mill on the Kropp land, about a mile to the southeast, gave a recovery of 11 per cent (in local parlance) for August. Charles E. Schwarz is manager for the St. Louis.

Hockerville, Okla.—The Federal M. & S. Co. has taken a thirty-day option on the Acme Mining Co.'s mill and lease southeast of Picher and is drilling the ground. The option is on the lease and the No. 1 mill, the No. 2 mill being reserved by the Acme company for treating tailings. The Federal's Lucky O. K. company is having success with the Farmington property, located across the Oklahoma-Kansas state line to the south, and seems to have a good mine there although it had been virtually condemned by other operators. P. W. George is district manager for the company.

Baxter, Kan.—Continued production is being made by Chanute Spelter Co., a subsidiary of American Metal Co. At its Hartley mine west of Baxter it produced 1,905 tons of zinc and lead concentrates in August. The recovery for the month averaged 19 per cent (locally speaking). The company is sinking a shaft on its Brewster land lease one mile north of the Hartley and has it down to 175 ft. It expects to encounter water at 195 ft. and will go to 230 ft. for ore. The company is not expecting any such head of water as at Hartley, where company officials say one million dollars was spent before a pound of ore was produced, most of it being for pumping. About 2,500 gal. per min. still being pumped at this property.

General activity continues in the vicinity of Baxter on account of the rich ground found in the Chanute Hartley mine, and twenty prospect drills were working on Saturday, Sept. 11, on leases in this territory. Two shafts were also going down, one by the Victor Rakowsky interests on a lease just north of the Hartley and another by Messe and associates, one mile west of the Hartley.

LOUISIANA

Myles and Avery Island Companies Shipping Salt Steadily — Jefferson Island's Deposit Being Developed

Weeks Island—The Myles Salt Co., operating at Weeks Island, Iberia Parish, is making regular shipments of sized salt and of compressed salt bricks. Shipments are reported to be anywhere from 500 to 1,000 tons daily. The mine and breaker are completely electrified, and electric haulage and electric shoveling machines are used underground.

Avery Island—The Avery Island Salt

Mining Co., at Avery Island, Iberia Parish, is shipping a large tonnage of salt daily, some of it in the form of high-grade rock salt. Considerable new work is planned at this property including the sinking of an air shaft and the complete electrification of the plant.

Jefferson Island — The Jefferson Island Salt Co. started work about eight months ago to develop the salt body on Jefferson Island. This is on the line between Iberia and Vermilion parishes and about three miles north of the Abbeville branch of the Southern Pacific R.R. To date only development work has been done. Considerable difficulty is being experienced in making a watertight seal between the overlying strata and the salt. A three-mile railroad spur is under construction from the main line to the mine.

ALABAMA

Secondary vs. Primary Iron Ore Tonnage Discussed

Birmingham—The estimated tonnage of secondary ores in the South has materially increased in the last few years against a decrease in that of the primary ores. The possible exhaustion of the ores of the northern ranges is being discussed while to the fore comes the fact that development in the secondary ores is showing greater possibilities than have ever been considered and attention is bound to be attracted to the South, to the Alabama fields and to adjacent states. Investigations have been made recently as to secondary ores and interesting conclusions have been arrived at. Y. A. Dyer, mining and consulting engineer of Birmingham, who has just returned from a trip through the iron ore lands of Alabama, Georgia and other Southern districts, was asked for an opinion on the subject by the correspondent of the *Engineering and Mining Journal*. He made the following statement:

"With pig iron production in the United States proceeding at the rate of 32,000,000 to 35,000,000 tons per annum, requiring an average ore consumption of 65,000,000 to 75,000,000 tons, there is little wonder that the iron and steel interests of this country are ever on the alert for prospects which may lead to augmenting their ore supply—more particularly the reserve supply of what is commonly termed merchantable or primary ore.

"There is no discounting the fact that the United States has from 75,000,000,000 to 80,000,000,000 tons of non-merchantable or secondary ores, but the 'eternal trend' in the past and at present has been and is to woefully disregard secondary ores and vigilantly seek to mine, at maximum production, the primary ores. Thus far the universal policy has been to sidestep even the blending of primary and secondary ores in furnace mixtures, except in extreme cases of necessity. According to the Eckel estimate (which I consider a thorough and practical one) of 1912, the United States is conservatively and rationally credited with possessing 7,550,000,000 tons of "available" or primary ores. Since that period, to the present date, there has been mined approximately 531,000,000 tons with approximately 400,000,000 tons credited to Lake ore operations. This would leave 7,019,000,000 tons of primary ores now credited to the United States.

"At the time the Eckel estimate was made, the Lake district was credited with maximum reserves of 2,500,000,000 tons and Southern red ores 2,000,000,000 tons. Since that time approximately 400,000,000 tons of Lake ores have been exhausted and approximately 50,000,000 tons of Southern red ores, bringing the Lake reserves to 2,100,000,000 tons and Southern red ores to 1,950,000,000 tons. However, since 1912 there have been no new developments which have raised the Lake ore estimates, while in the Birmingham district the Shades Valley deposit of self-fluxing ore has been proven up by drill-holes, shaft and slope at depths ranging from 1,100 ft. to 2,000 ft. This proven area of basin ore practically doubles the tonnage estimate of self-fluxing red ore and very materially increases the secondary ore tonnage estimate outside of the self-fluxing area. One company alone, which has put a twin slope into operation, estimates its tonnage of self-fluxing ore in Shades Valley to be 10,000,000 to 15,000,000 tons. The district's ore production rate of 6,000,000 to 7,000,000 tons annually seems to cause no immediate concern, even among large producers, with reference to the exhaustion time of primary ores. Two hundred to 300 years' supply of primary ores, at present mining rate, seems a long time in the future, compared with thirty to thirty-five years' supply, at the present rate of exhaustion, of primary Lake ores. To the trained engineed this is a powerfully appealing factor, for it means that furnace practice from the standpoint of raw materials in the Birmingham district is fixed for many years hence and practically the only mining methods which are likely to change are slope to shaft and haulage conditions. The character of deposit, analysis of ore and thickness of vein have been proven persistent. In fact thickness of vein has increased with depth from the outerop to basin.

"Except in the case of foundry iron producers, the large deposits of rich brown ores seem to have been temporarily forgotten. The above tonnage estimate of red ores does not take into consideration the 75,000,000 tons of 'available' brown ores credited to Alabama by Eckel. At present these deposits are only worked sporadically for the reason that attention seems to be riveted, for the time at least, on low-cost self-fluxing ore. There has been no decrease in the quality of brown hematite ores. In fact, thus far only the rich wash deposits have been worked to any extent in the Warrior drainage area, Tennessee drainage area and the Appalachian deposits extending from the Shelby deposits on the south to the Rock Run-Piedmont area on the east. The term 'non-merchantable or secondary brown ore' is only applicable in the sense of 'availability' either from the standpoint of mining cost or transportation conditions. In time either will be met by rational mining and washing methods, for the richness of the ore is practically the same whether the washing ratio be 1:20 or 1:2. It simply involves the flushing of much or little earthy matter in which the ore is imbedded. The conglomerate boulder, or mountain ore, is not taken into consideration in tonnage estimates. There are many million tons of this type ore in Alabama. Only the valley or gentle sloping hill ore constitutes the brown ore tonnage of Alabama and the South. What may be termed 'inaccessible,' for the time being, brown ore in the state of Alabama will constitute many million tons, and throughout the distance from Shelby, Ala., on the south to Canton, Ga., on the east the total tonnage will reach well up into the nine-figure column. Prospect work is being done constantly on the brown ores of Alabama and Georgia, and I have covered the ground through the entire area inspecting, prospecting and reporting on various properties within the past four years."

CHRONOLOGY OF MINING

August, 1920

Aug. 2.—Burro Mountain branch of Phelps Dodge Corporation started first unit of new mill.

Aug. 7.—Rochester Combined Mines property in Nevada advertised for sale. —New mine-rescue car of Bureau of Mines destroyed by fire in shops of New York Central R.R.

Aug. 17.—Ontario Mining Association held first general meeting, at Sudbury, Ont.—Change house at Cliffs Shaft mine, Ishpeming, Mich., damaged by fire.

Aug. 20.—Steamer "Superior City" of the U. S. Steel Corporation, sank in Lake Superior in collision with the "Willis L. King" of Jones & Laughlin; 29 lives lost.—Gruss Copper Co., Portola, Cal., started new 15-stamp mill.

Aug. 23.—Lake Superior Meeting of A. I. M. E. formally opened at Houghton, Mich.; closed at Duluth, Minn., on Aug. 28.—Pedro Zamora, Mexican bandit, released Charles Hoyle and five other American and English engineers, retaining for ransom W. A. Gardiner and W. B. Johnson.

Aug. 24.—Case of Northport Mining & Smelting Co. vs. Lone Pine-Surprise Consolidated Mining Co., opened at Spokane, Wash., before Judge Rudkin. —Public Utilities Commission of Utah refused to allow increase in freight charges on shipments of coal and ore. —Manganese ore shipment from Brazil reached Mobile, Ala., for consumers in Birmingham district.

Aug. 26.—Freight rates on lead bullion and blister copper from Salt Lake smelters to Atlantic seaboard raised ¾ per cent.

THE MARKET REPORT

Daily Prices of Metals in New York

Sept.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
9	18.10@18.50	41.75	44.75@45.25	8.75	8.40@8.80	7.70@7.75
10	18.10@18.50	41.75	44.75@45.00	8.65	8.30@8.70	7.65@7.70
11	18.10@18.50	41.75	45.00@45.25	8.50	8.20@8.60	7.65
13	18.10@18.50	41.75	44.75@45.00	8.50	8.30	7.65
14	18.10@18.50	42.00	44.75@45.00	8.45	8.25	7.65
15	18.10@18.50	42.00	44.75@45.00	8.40	8.20	7.65

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price, to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	M
9	97 1/8	97 1/8	112	267	273 3/4	35 3/4	35 1/2	39	40 1/4
10	97	97 1/8	112	269 1/2	275 1/2	35 1/2	35	39 3/4	41
11	.	....	.	....	....	....	....	....	....
13	97 3/8	98	112	272 3/4	279	35 1/4	34 3/4	39 1/2	40 1/2
14	99 3/4	99 1/2	112	274 1/2	279 1/2	35	34 3/4	39 1/2	40 1/2
15	100	99 1/2	112	273 3/4	279 3/4	34 3/4	34 1/2	39 1/2	40 1/2

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver			Sept.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
9	352 3/4	99 1/2	93 1/2	58 1/2	13	348	99 1/2	94	59 3/8
10	351	99 1/2	94 1/4	59	14	344	99 1/2	94 1/2	60 1/8
11	349 1/2	99 1/2	93 1/2	59	15	345	99 1/2	95	60 3/4

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Sept. 15, 1920

There has been no substantial improvement in the metal market. Buying of the major metals took place in slightly larger quantities this week, but not in such an amount as to disturb the generally dull condition prevailing. This stagnant business in the metal market has now continued for many weeks, particularly in the copper market, but it is the consensus of opinion of those in close touch with the metal trade that improvement will soon set in to raise the position of metals such as copper and zinc. The London market showed a slightly upward trend on Monday, Tuesday and Wednesday of this week.

Copper

The purchases of copper improved slightly during the week, and consumers in general are still refraining from purchasing large quantities. It is naturally to their advantage to be able to obtain copper at the low market prices, and they realize that they can purchase sufficient copper for their current needs at attractive quotations. However, producers are satisfied that a better sentiment is developing among copper consumers and that it will take but a small impetus to raise the market out of the depths and place it on a higher level. Little interest is manifested in futures.

Lead

On Monday, the A. S. & R. Co., reflecting the downward tendency in the market, lowered their official price of 9c. New York, to 8½c. Our quotation, based upon sales, still reflects the larger tonnages disposed of by the A. S. & R. at their official price, as stated last week, but the metal could be obtained for prices around 7⅞@8c. Lead inquiries are slacking, and the importations of lead which have been made during the last few weeks have partly succeeded in neutralizing the shortage of lead in this country. Consumers are holding off in the anticipation of a further decline, and those importers who expected the market to stay at the recent high level have already had to take unlooked for losses by the recent decline. Consumption of lead is still good. Future delivery is nominal.

Zinc

Prices again showed a slight drop and the market is still quiet. Importations of cheap re-shipment American zinc are being made. All such zinc which can be satisfactorily proven to the authorities to be of American origin is entitled to be admitted duty free, but it is doubtful if in every case the necessary evidence is procurable. Smelters working on bonded and domestic ores are in a position similar to the silver smelters, who are compelled to satisfy the Government as to the origin of all silver proffered at $1 per oz. to the Treasury Department.

Tin

There was a small improvement in the London market during the first three days of this week, but the market is still erratic and quiet. Last Spring, when tin first exhibited a declining tendency, many consumers, not anticipating a further decline, filled their future requirements, to their own detriment, as tin subsequently dropped much further in price. Hence the reluctance of consumers to enter into the market at present. They prefer to wait and watch the market and exchange. Tin consumption is still good, but the production of electrolytic is decreasing.

Straits tin for future delivery: Sept 9th, 44.75@45.00c.; 10th, 45.00@45.50c.; 11th, 45.50@46.00c.; 13th, 45.00@45.50c.; 14th, 45.00@45.50c.; 15th, 45.25@45.50c.

Arrivals of tin in long tons: Sept. 1st, Penang, 375; 7th, Australia, 100; 9th, Batavia, 100; London, 25; 10th, Straits, 925; China, 175; London, 75; Penang, 200; 13th, China, 175; Singapore, 375; Penang, 400.

Silver

The silver market for the last week has been steady, with a tendency toward higher prices. Business, however, has been done on a moderate scale only, owing to the reluctance of holders to sell at current figures, and a rather limited buying market from the East. There seems to be good reason to look for more activity in the export trade from the Orient. Shanghai rates close at about 106 and Hongkong at 76. Generally speaking, the feeling is that there is room for improvement in the price of silver.

Mexican Dollars—Sept. 9, 71⅛; 10th, 71¼; 11th, 71; 13th, 71⅜; 14th, 71⅛; 15th, 72⅛.

Gold

Gold in London on Sept. 9th, 115s. 9d.; 10th, 116s. 6d.; 13th 117s. 3d.; 14th, 119s. 0d.; 15th, 117s. 4d. Transvaal gold is continuing to come to this country, and it is said that this week's receipts will make the total over $40,000,000.

Foreign Exchange

Social and political unrest in Europe and a heavy supply of grain and cotton bills have further depressed foreign exchange. Sterling, $3.45, is the lowest since last March. Yesterday, francs were 6.43c.; lire, 4.24c.; and marks, 1.66c. New York funds in Montreal, per cent premium, 9.

Other Metals

Aluminum—Ingot, 99 per cent and purer, 35.1c.; 98@99 per cent, 34.9c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Market continues weak. Spot, 7c. per lb.; Cookson's "C" grade, 14@15c. Chinese and Japanese brands, 7c. W. C. C. brand, 9@9½c. [1]Chinese needle antimony, lump, firm at 8@9c. per lb. Standard powdered needle antimony (200 mesh), 10@12c. per lb.

Bismuth—$2.70 per lb., 500-lb. lots, and $2.72 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $3 per lb.; black oxide, $2 per lb.

Iridium—Nominal, $350@$400 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100@$110 per oz.

Platinum—Firm at $115 per oz.; $105 per oz. in 100 oz. lots.

Quicksilver—Market quiet; $75 per 75-lb. flask. San Francisco wires $75. Weak.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**, black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a minimum of 6 per cent silica, 70@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c. California production has fallen off, even since May, owing to the low price, which does not permit operation of mines that were worked in 1918 when prices were $1.50 a unit for 50 per cent. The market is strengthening, and should prices rise some abandoned properties will be reopened. There are considerable tonnages of 40 per cent ore at different points in California, which are being held for prices of 50@60c. a unit, f.o.b. cars, California.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range nonbessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55.

Manganese Ore—65@75c. per unit, seaport; chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 75@80c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**, guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $7 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $6@$7, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 11—Zinc blende, per ton, high, $49.70; basis 60 per cent zinc, premium, $47; Prime Western, $46; fines and slimes, $45@$42.50. Calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $47.16; calamine, $38.20; all zinc ores, $46.99.

Lead, high, $108.15; basis 80 per cent lead, $100. Average settling prices, all grades of lead, $103.88 per ton.

Shipments for the week: Blende, 13,102; calamine, 250; lead, 1,565 tons. Value, all ores the week, $790,080.

Platteville, Wis., Sept. 11—Blende, basis 60 per cent zinc, $53 base for one choice lot of 180 tons down to $50.50 contract price for high-grade. Lead ore, basis 80 per cent lead, reduced to $100 per ton. Shipments for the week: Blende, 787; lead, 194 tons. Shipments for the year: Blende, 49,046; calamine, 2,360; lead, 4,115; sulphur ore, 1,241 tons. Shipped during week to separating plants, 1,511 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax. Freight rate from mines to Sherbrooke, Quebec, over Quebec Central R.R., 20c. per cwt.; from Sherbrooke to New York, 27½c., carload lots; freight to New York for crude No. 1, f.o.b. Thetford mines, $8.45 per ton, carload lots. Car scarcity worse than ever before.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis. Business quiet; manufacturers not putting in much stock.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground,

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $25@$30 car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—Crucible flake, 85 per cent carbon content, 8c. per lb.; 88 per cent, 9½c.; 90 per cent, 10½c., all f.o.b. New York. Crucible grades of Alabama graphite sell as follows, f.o.b. Ashland, Ala.: 80 per cent, 5c.; 90 per cent, 10c. Lubricating grades in increasing demand, with price ranging from 11c. for the 85 per cent guaranteed grade in car lots to 30 and 40c. for higher grades. Mexican, amorphous, $45@$55 per short ton; Korean, 3½c. per lb.; Madagascar, 8c.; Ceylon, 4½@15½c.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. The last price quoted for plaster of paris in carload lots was $4.25 per 250-lb. bbl., f.o.b. mill, alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $100@$150 per ton, Philadelphia. Domestic, uncut f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 4@5c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand or Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $10@$20 per ton; roofing grades, $9@$15; rubber grades, $10@$15, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $200, freight allowed; last half, $170; English, $170 @$175, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $80@$85, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, $1.10@$1.15 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire quoted, 22½@ 23c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$100@$110 per net ton, carload lots, eastern points.

Chrome Cement—40 to 45 per cent Cr_2O_3, $50 per net ton, and $55 in sacks, carload lots, eastern shipping points.

Clay Brick — First-quality fire clay, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio, and Kentucky works; second quality, $50@$55. First quality, St. Louis, $45; New Jersey, $75.

Magnesite Brick—$110@$120 per ton, eastern shipping points; 9-in. straights, $90@$100; 9-in. arches, wedges and keys, $95@$105; soaps and splits, $110 @$120.

Silica Brick—9-in., per 1,000, $56@ $61, Birmingham, Ala.; $55@$60, Mount Union, Pa.; $65, Chicago district.

Iron Trade Review

Pittsburgh, Sept. 14, 1920

Pig Iron—The deadlock in pig iron is clearly marked, consumers being content with present commitments and regarding prices as at their peak. From July to August production of merchant pig iron increased 6 or 7 per cent, and further increases are to be expected, though consumption seems clearly to be declining. The refusal of Chicago and Birmingham district furnacemen to follow the recent advances in other markets is considered significant. We quote the Valley market unchanged at $50 for foundry and malleable and $48.50 for bessemer and basic, freight to Pittsburgh being $1.96.

Steel—Billets remain stagnant, with the $60 quotation almost nominal. Sheet bars are quotable at $67.50@$70 on the basis of last sales, with demand light. Forging billets are down to $75.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $17@$18; foundry, $18@$20.

Europe's Zinc Activities

Both London and United States Markets Dull—Germany Entering the Market, Great Britain's Industry Partly Closed, and Belgium Strenuously Attempting To Regain Her Important Pre-War Position

THE zinc market is still in the same inactive condition that has characterized it for many weeks. Quotations do not vary widely, and the average price for August, 8.185c. per lb., New York, showed but a small gain over the July average of 8.070c. The June average, 7.815c., was the lowest recorded so far this year, and although it would appear that the market has been given an upward impetus, a tendency is exhibited at present to lose a part of the gain made, mainly owing to the depressing influence of the London market.

In pre-war years the United States was accustomed to be content with a mediocre foreign trade in zinc, for domestic consumption almost balanced domestic zinc production. The war seriously disturbed this relation, and there is a desire on the part of the industry to retain the support and beneficent effect of the foreign market; but little if any success has attended the efforts of the industry, since the armistice, to become a factor of major importance in the foreign market, a circumstance that has been due to the evident present inability of Europe to consume large quantities of spelter. Plentiful supplies of European and American zinc seem to be available in the London market. In fact, with the present condition of the United States and London markets, foreign zinc (mainly of American origin) is freely offered here. Not only that, but German zinc is also being offered in London, and is the present contributory cause to the decline in zinc. Considering the greater post-war importance of the foreign market, any light on conditions in Europe, Australia, or other zinc-producing countries is especially valuable and suggestive.

German Zinc a Factor in the Market

Germany, so it is reported, has raised the allowable percentage of zinc production which can be exported, from a former maximum of 25 per cent to a maximum of September-October production of 50 per cent—a 100 per cent increase in allowable exports. The pressure to sell German zinc is an indication that the output of Germany is increasing, but the condition of the industry there is still uncertain. The political developments which will be disclosed by Silesia's vote in the plebiscite, soon to be taken, will do much to make Germany's future position in the zinc trade of the world apparent. It is clearly to Germany's advantage under present low foreign exchange to sell all zinc possible.

Belgium is endeavoring rapidly to regain her former importance in the zinc trade. The directors of the Société Anonyme des Mines et Fonderies de Zinc de la Vielle Montagne, the most important Belgian producers, recently gave an estimate of European zinc production during 1919 as 100,000 metric tons, against 680,000 tons in 1913, of which amounts Belgium produced over 200,000 tons in 1913 and but 18,000 tons in 1919, chiefly on account of dearth of raw materials. Production in 1919 should be close to 85,000 tons. The directors call attention to the fact that Japan greatly curtailed her zinc industry in 1919, which had been greatly stimulated in war time, and from other sources it is learned that Japanese production dropped 50 per cent, from 44,500 metric tons in 1918 to 10,000 metric tons in 1919, and that zinc exports decreased at an even greater rate, or from a value of 9,067,000 yen in 1918 to a value of 2,931,000 yen in 1919.

Belgium's Efforts at Reconstruction

During 1919 efforts were directed to the reorganization of the French and Belgian works of the Société Anonyme. In Belgium the foundries at Valentin-Cocq, Angleur, and Flone only partially resumed activity during the latter part of 1919. The works at Baelen-Wezel (Campine) have been almost exclusively engaged in repairing the destruction incident to the war. The rolling mills at Haumont are being rebuilt. Owing to the production of the company's own mines at Moresnet, and in England, Sweden, Algeria, Italy, and Sardinia, and stocks of raw materials at hand, the company was able to supply its reduction works with zinc ore after the armistice, but an acute fuel shortage interfered with operations.

Belgium is now having a trying time producing zinc with the London prices as they are. It is reported that the cost of production varies between £43 and £48 per ton. (Coal at 100 fr. per ton).

English Zinc Industry in a Parlous State

The zinc-smelting industry in England is still handicapped by labor troubles, which have compelled the industry to partly shut down. Some of the smaller plants are entirely closed. The London correspondent of the American Zinc Institute estimates the cost of zinc production in England at over £50 per ton, whereas the market is around £38 per ton. However, the explanation is vouchsafed that the London price is artificial, as 90 per cent of the zinc delivered against contracts is American, and with zinc in the United States at 8c. it cannot be laid down at less than £50 per ton. The forced liquidation of large stocks of speculative zinc and the large available supplies account for the low quotation.

The imports of refined and G. O. B. zinc into England during May, June, and July, in tons, are given as follows, by the London Metal Exchange:

From	July	June	May
U. S. A.	11,556	6,117	9,421
Belgium	148	409	966
Scandinavia	225	464	525
Rest of Europe	317	484	808
Canada	125	50	101
Other countries	319	1	84
Totals	12,690	7,525	11,905
Delivered from warehouse during July	1,299	946	923

Zinc stocks on hand in Great Britain on July 31 totaled 25,828 tons, compared with 26,828 tons on June 30 and 23,411 tons on May 31.

The absence of demand in London and the large liquidated stocks have induced dealers to offer metal on the Atlantic seaboard at the attractive prices of 7.70 to 7.80c., duty paid. Domestic producers cannot compete with such prices and must wait until surplus supplies are consumed before they can again enter the market. In many cases the freight rate from the Atlantic seaboard to interior consuming points is lower than the rate from East St. Louis; hence the advantage to the consumer of using reshipment imported zinc of American origin.

Latest Rand Gold Production

During July, the gold production of the Rand, in South Africa, amounted to 736,000 oz., an increase in output over the June figure, 715,957 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917-1920

(Fine Ounces)

	1920	1919	1918	1917
January	670,503	676,059	714,182	782,634
February	625,330	636,728	659,750	721,321
March	707,036	712,379	696,281	787,094
April	686,979	694,944	717,099	742,778
May	699,041	724,995	741,217	729,385
June	715,957	702,379	727,696	759,724
July	736,000	725,497	736,199	757,890
August	.....	706,669	740,210	756,658
September	.....	698,558	708,206	738,231
October	.....	723,722	679,764	751,290
November	.....	677,970	658,701	722,839
December	.....	650,191	641,245	722,419

COMPANY REPORTS

Butte & Superior Mining Co. Resumes Normal Operation

Zinc; Montana

The following comparative statement shows the principal operating features of the Butte & Superior Mining Co. for the second quarter of 1920:

	Second Quarter, 1920	First Quarter, 1920
Dry tons of ore milled	81,619	130,204
Average zinc content (per cent)	13 339	14 164
Average silver content (oz. per ton)	5 340	5 530
Tons zinc concentrates produced	19,281	32,535
Average zinc in zinc concentrates (per cent)	52 774	53 859
Total zinc in zinc concentrates (lb.)	20,350,566	35,045,757
Average silver in zinc concentrates (oz. per ton)	19 429	19 499
Mill recovery (per cent zinc recovered in zinc concentrates)	93 457	95 018
Direct mining cost per ton	$7 000	$5 521
Direct milling cost per ton	$3 456	$2 610
Total direct cost mining and milling (per ton)	$10 456	$8 131
Indirect or general costs (per ton), exclusive of freight	$1 066	$0 497
Total costs (per ton)	$11 522	$8.628

The decrease in tonnage treated, with the resulting increase in costs, was due to the unsettled labor conditions during the entire quarter, which materially affected both mining and milling operations.

A strike called on April 19 resulted in a shutdown until May 5, when operations were resumed on a limited scale. Operations were being conducted on nearly a normal basis toward the end of the quarter.

The financial results for this quarter, as compared with the first quarter of 1920, are as follows:

	Second Quarter, 1920	First Quarter, 1920
Net value of zinc concentrates at mill	$587,957 25	$1,224,548 17
Net value of lead concentrates at mill and residual values	177,854 27	506,301 96
Miscellaneous	27,619 63	19,920 18
	$793,431 15	$1,750,770 31
Operating costs, depreciation, shutdown expense	940,432.97	1,123,514 36
Profit	(a) $147,001.82	$627,255 95
(a) Loss.		

The above statement includes charges for depreciation and shutdown expenses, but no allowance has been made for depletion or taxes.

The average price used in estimating the income for the period was 7.6487c. per pound.

Mond Nickel Co., Ltd., Shows Comfortable Profits

The annual report of the Mond Nickel Co., Ltd., for 1919 says that sundry credits stood at £750,232, showing a decrease of over £250.000, which was chiefly accounted for by the settlement of the amounts due to the government for taxation. The profits of the company were subject to taxation in England and in Canada, and it was to be hoped that by the end of the current financial year this tax would be entirely withdrawn. The substantial amount of £97,230, of "Additions in the United Kingdom," was made up of additions to the refining works at Clydach, and also to the new rolling mill which the company had acquired in Birmingham.

Since the end of the financial year the company had completed the purchase of the whole of the shares of Messrs. Henry Wiggin & Co., of Birmingham—the oldest established firm of nickel and nickel-silver manufacturers in England. Messrs. Wiggin owned three works in Birmingham, well equipped with rolling mills, wire-drawing plant, refining plant, and other machinery for the manufacture of their various products. The shares and debentures in associated companies stood at £316,501, and investments at £116,592. There had been no change since the previous year's report in the former item, but investments showed a reduction of about £560,000, owing to the sale of war bonds.

Stocks showed an increase of over £100,000, as compared with those of 1918, at which time, as large stocks of nickel had accumulated in the hands of the government and at the company's works at the end of the war, it was necessary to curtail production. These stocks had been substantially reduced, so much so that the company had begun producing on a larger scale at the refinery. The increase in the present stock was due to the increase in the stock of matte, which, during the year, was produced at a larger rate than was warranted by the amount refined. This the directors decided to do to keep the organization together in Canada, and to have a reserve of matte for contingencies.

The balance brought forward from 1918 was £168,058, and the balance at credit of profit-and-loss account was £382,354, making a total of £550,412, less directors' fees of £19,117, leaving a balance for distribution of £531,294, as compared with £422,658 in 1918. The total amount of dividend proposed to be paid was £332,500. In addition to the dividends the directors had also had to provide out of the profits £84,000 for income tax, which was the result of the change introduced in the previous year, of paying the dividends on the ordinary shares free of tax. This made a total of £416,500, leaving a balance of £114,794 to be carried forward to next year's accounts.

Davis-Daly Copper Co.

Copper; Montana

The report of the Davis-Daly Copper Co. for the second quarter of 1920 shows that tonnage hoisted amounted to 17,414 tons, producing 2,197,936 lb. of copper and 91,238.5 oz. of silver. The average assay of ore shipped for the period was 7.07 per cent copper and 5.88 oz. of silver to the ton.

Cash and quick assets on June 30, 1920, amounted to $580,176.99.

Receipts and disbursements follow:

RECEIPTS

	Ore Returns	Misc. Revenues
April	$105,759 35	$26,702 68
May	64,616 40	14,197.51
June	78,085 46	20,671.64
Total receipts, $311,034 04	$249,462 21	$61,571 83

DISBURSEMENTS

	Development	Mining Cost	Equipment	Butte Gen. Exp	Boston Exp.
April	$11,869 38	$62,791 82	$5,189 26	$13,869 14	$10,802 82 (a)
May	11,977 65	51,576 38	4,242 89	13,537 19	6,254 74
June	21,528 64	74,993 62	5,830 20	19,859 77	10,711 73 (a)
	$45,375 67	$189,361 82	$15,262 35	$47,266 10	$27,769 29

Total disbursements, as above, $325,035 23.
(a) Including U. S. Income Tax.

Chief Consolidated Mining Co.

Silver-Lead; Utah

The report of the Chief Consolidated Mining Co. for the second quarter of 1920 shows that 2,919,902 lb. of lead was contained in the ore mined, together with 513,285.4 oz. of silver, 100,935 lb. of zinc, 1,032.184 oz. of gold, and 471 lb. of copper. The average per ton of all ores was $39.44. Smelting, freight, and sampling was $19.12 per ton, giving a net value of $20.32 per ton. A total of 20,071 dry tons of ore was mined.

The net profit after payment of all charges was $18,073.09. A dividend of 10c. per share on the 884,232 shares of outstanding stock of par value $1 was paid on May 1.

MINING STOCKS

Week Ended September 11, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	59⅛	57½	57½	June '20, Q	.50
Ahmeek	Boston	N. Y. Curb	1	1		
Alaska-B.C.	N. Y. Curb	1	1	1		
Allouez	Boston	24½	24	24½	Mar. '19,	1.00
Anaconda	N. Y.	55⅞	53	53⅞	Aug. '20, Q	1.00
Ariz. Com'l	Boston	10½	10⅜	10⅜	Oct. '18,	.50
Big Ledge	N. Y. Curb			⅛		
Bingham Mines	Boston	8½	8½	8½	Sept. '19, Q	.25
Calumet & Ariz.	Boston	58	57	57	June '20, Q	1.00
Calumet & Hecla	Boston	300	285	290	June '20, Q	5.00
Canada Copper	N. Y. Curb			7/16		
Centennial	Boston	10⅛	10	10⅛	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	44⅛	42¼	41	June '20, Q	1.00
Chief Consol.	Boston Curb	3⅛	3⅛	2⅞	Feb. '20, Q	.10
Chile Copper	N. Y.	15⅛	14⅛	15		
Chino	N. Y.	30⅛	29	29	June '20, Q	37½
Columbus Rexall	Salt Lake	*39	*3⅜	*37		
Con. Ariz.	N. Y. Curb	⅛	1/16	⅛	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb			2¼		
Copper Range	Boston	36⅜	35⅞	36	June '20, Q	.50
Crystal Copper	Boston Curb	*40	*35	*37		
Davis-Daly	Boston	8⅛	8	8⅛	Mar. '20, Q	.25
East Butte	Boston	11⅛	10⅝	11⅛	Dec. '19, A	.50
First Nat'l	Boston Curb	*90	*77	*90	Feb. '19, SA	.15
Franklin	Boston	2⅛	2⅛	2⅛		
Gadsden Copper	N. Y. Curb			*71		
Granby Consol.	N. Y.	37⅛	36	36	May '19, Q	1.25
Greene-Cananea	N. Y.	27⅛	26⅝	26⅝	Aug. '20, Q	.50
Hancock	Boston	4	4	4		
Houghton	Boston Curb			*40		
Howe Sound	N. Y. Curb			3⅞	July '20, Q	.05
Inspiration Con.	N. Y.	48⅞	47⅛	47⅞	July '20, Q	1.00
Iron Cap	Boston Curb			9	Feb. '19, M	.25
Isle Royale	Boston	29⅛	28	29⅛	Sept. '19, SA	.50
Kennecott	N. Y.	26⅛	25⅞	26	June '20, Q	.50
Keweenaw	Boston			1⅞		
Lake Copper	Boston	4	3⅞	4		
La Salle	Boston	2¼	2⅛	2¼		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb			27⅛	Jan. '19, Q	.50
Majestic	Boston Curb			*13		
Mason Valley	Boston	1⅞	1⅜	1⅛		
Mass. Con.	Boston	3⅞	3	3⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	6⅜	6⅛	6⅝		
Miami	N. Y.	20⅛	19⅛	19⅝	Aug. '20, Q	.50
Michigan	Boston	4⅛	3⅛	3⅛		
Mohawk	Boston	60⅛	59⅜	60	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb			5⅞		
Nevada Con.	N. Y.	11⅞	11⅛	11⅛	June '20, Q	.25
New Arcadian	Boston			2⅜		
New Baltic	Boston Curb			3		
New Cornelia	Boston	18	17⅜	18	Aug. '20,	.25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	16⅞	16	16⅞	Oct. '18, Q	.25
North Lake	Boston			⅛		
Ohio Copper	N. Y. Curb			1/16		
Ojibway	Boston			1⅛		
Old Dominion	Boston	25⅜	24	25⅛	Dec. '18, Q	1.00
Osceola	Boston	39	38	39	June '20, Q	.50
Phelps Dodge	Open Mar.	†195	†180		July '20, Q	2.50
Quincy	Boston	48	45	48	Mar. '20, Q	1.00
Ray Con.	N. Y.	16⅛	15⅞	16	June '20, Q	.25
Ray Hercules	Boston Curb			*63		
St. Mary's M. L.	Boston	41⅛	40	41⅛	June '20, K	2.00
Seneca	Boston	15	14⅞	14⅞		
Shannon	Boston	1⅜	1⅛	1⅜	Nov. '17, Q	.25
Shattuck Ariz	N. Y.	8⅛	8⅛	8⅛	Jan. '20,	.25
South Lake	Boston			2		
South Utah	Boston			*15		
Superior	Boston	5	4⅞	4⅞	Apr. '17,	1.00
Superior & Boston	Boston	4⅛	4	4⅛		
Tenn. C. & C.	N. Y.	10	9⅞	9⅞	May '18, I	1.00
Tuolumne	Boston	*60	*60	*60	May '13,	.10
United Verde Ex.	Boston Curb	31	30⅛	30⅛	Aug. '20, Q	.50
Utah Con.	Boston	8	6⅞	8	Sept. '18,	.25
Utah Copper	N. Y.	66⅛	63⅜	64⅛	June '20, Q	1.50
Utah M. & T.	Boston	1⅛	1⅛	1 1/16	Dec. '17,	.50
Victoria	Boston			1⅜		
Winona	Boston	*50	*35	*50		
Wolverine	Boston	14⅛	13¼	13⅞	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	4⅛	4⅛	4⅛	June '20, QX	.20
St. Joseph Lead	N. Y.	17⅛	16	16	June '20, QX	.50
Stewart	Boston Curb			*16	Dec. '15,	.05
Utah Apex	Boston			1⅜	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	13⅜	12⅝	12⅞	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	46⅜	44	46⅜	Aug. '20, Q	1.50
Butte C. & Z.	N. Y.	8⅜	7⅜	7⅜	June '18, I	.50
Butte & Superior	N. Y.	20	19	19	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	10⅞	10⅛	10⅛	June '20, Q	.50
New Jersey Z.	N. Y. Curb	181	178	178⅛	Aug. '20, Q	4.00
Sneesss	N. Y. Curb	*5	*3⅛	*4⅛	July '16,	.03
Yellow Pine	Los Angeles			*95	June '20, Q	.03

Stock	Exch	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛		
Alaska Juneau	N. Y.	1⅛	1⅛	1		
Carson Hill	N. Y. Curb			24⅞		
Cresson Consol G	N. Y. Curb			¼	June '20, Q	.10
Dome Ex.	Toronto	*38	*37	*38		
Dome Mines	N. Y.	11⅛	11⅛	11⅛	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	May '20, Q	.02
Goldfield Con.	N. Y. Curb	*10	*8⅛	*9	Dec. '19,	.05
Hedley	Boston			4⅛	June '19,	.10
Hollinger Con.	Toronto	5.85	5.75	5.77	Aug. '20, BM	.05
Homestake	N. Y.	49	49	49	Sept. '19,	.50
Kirkland Lake	Toronto	*53	*51	*51		
Lake Shore	Toronto	1.13	1.10	1.10	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	2.01	1.94	1.97	May '20, K	.05
Porcupine Crown	Toronto			*26½	July '17,	.03
Portland	Colo. Sprgs.	‡		*60	July '20, Q	.01¼
Reorgan. Booth	N. Y. Curb	5	4	5	May '19,	.05
Silver Pick	N. Y. Curb	*7	*5	*6		
Teck Hughes	Toronto	*9	*9	*9		
Tom Reed	Los Angeles	1.09	1.02	1.02	Dec. '19,	.02
United Eastern	N. Y. Curb	2½	2⅛	2⅛	Apr. '20, Q	.21
Vindicator Consol	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome Consol	Toronto			*5½		
White Caps Min.	N. Y. Curb	*9	*7⅞	*8		
Yukon Gold	Boston Curb			1⅞	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*19	*15	*18	Apr. '20, M	.03
Beaver Con.	Toronto	*43	*41	*41	May '20, K	.03
Conigas	Toronto			2.55	Aug. '20, Q	.12½
Crown Reserve	Toronto	*29	*26½	*25⅜	Jan. '17,	.05
Kerr Lake	Boston	3	3	3	Sept. '19,	1.00
La Rose	Toronto	*35	*33	*33	Apr. '18,	.02
McKinley-Dar	N. Y. Curb			*55	July '20, Q	.03
Mining Corp.	Toronto	1.70	1.65	1.65	June '20, Q	.12½
Nipissing	N. Y. Curb	10	9⅞	10	July '20, Q	.25
Ontario Silver	N. Y.	5⅛	5⅛	5⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12,	.10
Peterson Lake	Toronto	*14⅛	*14	*14⅛	Jan. '17,	.01¼
Temiskaming	Toronto	*35	*33	*34	Jan. '20, K	.04
Trethewey	Toronto	*26	*25	*25⅜	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1⅞	*1⅞		
Barnes-King	Butte	‡		1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb	*8⅛	*7	*8		
El Salvador	N. Y. Curb	1⅞	1⅛	1⅞		
Jim Butler	N. Y. Curb	*15	*14	*15	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*5⅛	*4	*5⅛	June '16,	.05
Louisiana Con	N. Y. Curb	⅛	⅛	⅛		
MacNamara M	N. Y. Curb			⅛	May '10,	.02½
N.Y. Hond Rosar	Open Mar	†12⅛	†10⅛		July '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Jan '20, Q	.05
Tonopah-Divide	N. Y. Curb	1⅛	1⅛	1⅛		
Tonopah Ex	N. Y. Curb	1⅛	1⅛	1⅛	July '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '19, SA	.15
West End Con	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb			*20	July, '20, M	.01
Consol. M. & S	Montreal	26	25	25⅛	July '20, Q	.62½
Daly Mining	Salt Lake			2.50	July '20, Q	.10
Daly-West	Boston	4⅛	4	4⅛	July '20, Q	.25
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q	.10
Electric Point	Spokane			*70	May '20, SA	.03
Fed. M. & S	N. Y.	11	11	11	Jan. 09,	1.50
Fed. M. & S. pf	N. Y.	33	33	33	June, '20, Q	1.75
Florence Silver	Spokane	*35	*33	*35	Apr. '19,	.01¼
Grand Central	Salt Lake			*37½	June '20, K	.03
Iron Blossom	N. Y. Curb	⅛	⅛	⅛	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake			3.97½	July '20, Q	.12½
Marsh Mines	N. Y. Curb	*17	*16	*17		
Prince Consol.	N. Y. Curb	⅜	3/16	⅜	Nov '17,	.02½
Rambler-Cariboo	Spokane	*13	*12	*13	Feb '19,	.01
Rex Con.	N. Y. Curb			*6		
South Hecla	Salt Lake	*93	*53	*93	Sept '19, K	.15
Stand. S. L.	N. Y. Curb	½	½	½	Oct. '17,	.05
Tamarack-Custer	Spokane	2.35	2.25	2.35	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.32½	3.20	3.25	June '20, Q	.10
Wilbert	N. Y. Curb	*4	*3	*4	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	20	19⅛	19⅛	Mar. '19,	.50
Internat'l Nick pf	N. Y.			80⅛	Aug. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	5	5	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb			*10		
VANADIUM						
Vanadium Corp.	N. Y.	71⅛	67⅛	67⅛	July '20, Q	1.50
ASBESTOS						
Asbestos Corp	Montreal	90	85	90	July '20, Q	1.50
Asbestos Corp. pf	Montreal	100	97	100	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	61⅛	59⅛	60	June '20, Q	1.00
Am. S. & R. pf.	N. Y.	92	91⅞	92	June '20, Q	1.75
Am. Sm. pf. A.	N. Y.	72	72	72	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	59	58⅛	58⅛	July '20, Q	1.50
U.S.S.R. & M. pf.	Boston	44⅜	43¼	43¼	July '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly
SA, Semi-annually. BM, bimonthly. K, Irregular I, Initial. X, includes extra

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill.

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York — Current	New York — One Yr. Ago
No. 10	$3 55 7 00	7 09	7 02	8 25	$7 12–8 00	4 52
No. 12	3 60 7 05	7 09	7 07	8 30	7 12–8 05	4 52
No. 14	3 65 7 10	7 09	7 12	8 35	7 22–8 10	4 62
No. 16	3 75 6 20	7 09	7 17	8 45	7 32–8 20	4 72
Blacks:						
*Nos. 18 and 20	4 15 8 30	8 10	8 00	10 60	8 30–9 80	5 30
*Nos. 22 and 24	4 20 8 35	8 10	8 05	10 65	8 35–9 85	5 35
*No 26	4 25 8 40	8 10	8 10	10 70	8 40–9 90	5 40
*No. 28	4 35 8 50	8 10	8 20	10 80	8 50–10 00	5 50
Galvanized:						
No. 10	4 70 8 00	9 60	8 50		8 80–11 00	6 20
No. 12	4 80–8 10	9 60	8 60	10 10	8 90–11 00	6 25
No. 14	4 80 8 10	9 60	8 60	10 10	8 90–11 10	6 30
Nos. 18 and 20	5 10–8 40	9 60	8 90	10 40	9 15–11 40	6 60
Nos. 22 and 24	5 25 8 55	9 60	9 05	10 55	9 30 11 55	6 75
*No. 26	5 40 8 70	9 60	9 70	10 70	9 45 11 70	6 90
*No. 28	5 70 9 00	9 60	9 50	11 00	9 75 12 00	7 20

* For painted corrugated sheets, add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets, add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh — Current	Pittsburgh — One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, $\frac{9}{16}$ in. and larger	$4 00	$3 35	$3 55–$4 25	$5 34	$7 25
Track bolts	6 00 6 50	4 45	4.00–5.25	7 00	8 75
Standard section angle bars	3.00 4 00	3.00	2 75	2 00	5 30

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the $2.55 places named:

	Mill Pittsburgh	New York — Current	New York — 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2 45@$3 10	$4 58	$3 42	$4 04	$3 97
Channels, 3 to 15 in.	2 45@ 3 10	4 58	3 42	4 04	3 97
Angles, 3 to 6 in., $\frac{1}{4}$ in. thick	2 45@ 3 10	4 58	3 42	4 04	3 97
Tees, 3 in. and larger	2 45@ 3 25	4 63	3 52	4 09	4 02
Plates	2 65@ 4 00	4 78	3 67	4 24	4 17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4 00@$5 00	$2 55@$3 65	$2 25

RIVETS—The following quotations are per 100 lb.:

	STRUCTURAL Warehouse — Mill Pittsburgh	New York — Current	New York — One Yr. Ago	Chicago	St. Louis	San Francisco
$\frac{1}{2}$ in. and larger	$4 50	$6 00	$4 72	$5 62	$5 69	$7 05
CONE HEAD BOILER						
$\frac{3}{8}$ in. and larger	4 60	7 10	4 82	5 72	5.79	7 15
$\frac{7}{16}$ and $\frac{1}{2}$	4 75	7 25	4 92	5 87	5 94	7 40
$\frac{9}{16}$ and $\frac{5}{8}$	5 00	7 00	5 32	6 22	6 19	7 60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

San Francisco: Galvanized, iron rigging and guy ropes, +17½%; bright plow, 25% off.

Chicago, +12½% on galvanized, 30% off on bright

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight	$5 75	$8 15	$7 00	$7 00	$7 00
Assorted	5 85	8 40	7 15	7 15	7 25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh.

Iron bars $2 35@$4 00 Steel bars $4 27@$4 50

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago	Denver
$0 10	$0 16½	$0 18	$0 11½	$0 15	$0 18

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@14c.	13c.	15c.	14½
Hollow	18c.	...	...	21c.

STEEL AND IRON—The following discounts are to jobbers for carload lots at the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920:

BUTT WELD

Inches	Black	Galv.	Inches	Black	Galv.
⅛ to 3	52½@54	44@41½	¼ to 1¼	34½@24½	18½@8
			2 and 2½	33½	17½
LAP WELD					
2	50½@47	38½@34½	2	28½@20½	14½@6½
2½ to 6	53½@50	41½@37½	2½ to 6	30½@22½	17½@9½
7 to 12	50½@47	37½@33½	7 to 12	27½@19½	14½@6½
13 and 14	41½@37½				
15	38@35				
BUTT-WELD, EXTRA STRONG, PLAIN ENDS					
⅛ to 1½	55½@52	39½	¼ to 1¼	34½@24½	19½@9
2 to 3	56½@53	44½@40½	2 and 2½	34½@24½	19½@9½
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	48½@45	37½@33½	2	29½@21½	16½@8½
2½ to 4	51½@48	40½@36½	2½ to 4	31½@23½	19½@11½
4½ to 6	50½@47	39½@35½	4½ to 6	30½@22	18½@10½
7 to 8	46½@43	33½@29½	7 to 8	22½@14½	10½@2½
9 to 12	41½@38	28½@24½	9 to 12	17½@9½	5½@5½

From warehouses at the places named the following discounts hold for steel pipe:

	Black — New York	Black — Cleveland	Black — Chicago
⅜ to 3 in. butt welded	40%	40%	40@54
3½ to 6 in. lap welded	35%	42½%	40@50
	Galvanized — New York	Galvanized — Cleveland	Galvanized — Chicago
⅜ to 3 in. butt welded	24%	31%	30@40
3½ to 6 in. lap welded	20%	27%	27½@32½

Malleable fittings, Class B and C, from New York stock sell at list plus 25%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$6 00	$3 25	$0 75	$1 90	$0 50	$1 05
Hot pressed hexagon	+6 00	2 70	75	1 90	50	85
Cold punched square	+6 00	3 25	75	1 90	50	1 00
Cold punched hexagon	+6 00	2 70	75	1 90	50	1 00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50 10%
Chicago	50%	50%
Cleveland	50	60 10 10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+20%	20%	20%
Larger and longer up to 1 in. by 30 in.	+20	20%	20%

WASHERS—From warehouses at the places named the following amount is deducted from list price.

For wrought-iron washer

New York List Cleveland $2 50 Chicago $3 00

For cast-iron washers the base price per 100 lb. is as follows:

New York $7 00 Cleveland $4 50 Chicago $4 75

CONSTRUCTION MATERIALS

PREPARED ROOFING—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	New York — 1-Ply	New York — 2-Ply	New York — 3-Ply	Philadelphia — 1-Ply	Philadelphia — 2-Ply	Philadelphia — 3-Ply
No. 1 grade	$2 50	$3 00	$3 55	$2 40	$2 90	$3 45
No. 2 grade	2 25	2 70	3 20	2 15	2 60	3 10

Slate-surfaced roofing, red and green, in rolls of 108 sq.ft. costs $4.25 per roll in carload lots and $4.50 for smaller quantities.

Shingles, red and green slate finish, cost $8.75 per square in carloads, $9.00 in smaller quantities in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago

Tar felt (14 lb. per square of 100 sq.ft.), per roll	$3 50
Tar pitch (in 400-lb. bbls.), per 100 lb.	2 00
Asphalt pitch (in barrels), per ton	54 50
Asphalt felt (light), per ton	123 00
Asphalt felt (heavy), per ton	127 00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 2
Minneapolis	$0 1152	$0 2016	$0 3168
Seattle	09	.175	30
Los Angeles	10	.175	
New Orleans	23	28	30
Cincinnati	125	2186	.8286

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under			12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$73.00	$70.00		$65 00	$85 00	$75.00
Kansas City	51 00	51 25	$51 25	51 25	60 00	51 25
Seattle		34 00				35 00
New Orleans	47 00				55 00	
Atlanta	62.50	64 50	66.00	76 00	79 50	82 00
Baltimore	80 00				92 50	
Cincinnati	45 00	50 00	50 00		55 00	55 00
Montreal	87 00	87.00	70 00	85 00	79 00*	110 00
Los Angeles†		57 00				59.00
Detroit	67 00				79 00	79 00
Denver		43 75				44.75

	1-In. Rough, 10-In. x 16-Ft. and under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$110 00	$102 00	$52 00	$105 00	
Kansas City	102 00	106 50	106 50	113 00	$112 75
Seattle		37 50			38 50
New Orleans		42 00		46 50	
Atlanta	85.00	90 00		77 50	87 50
Baltimore (box)	57.50@65			57.50@62 50	
Cincinnati	50.00	55 00	50 00	45 00	50 00
Montreal	80 00	80 00	70 00	85.00	85 00
Los Angeles		58 00			
Detroit	50 00		49 00	44 00	
Denver		42 75			40 25

*Montreal—Up to 22 ft.; over which, $3.00 per M, increase up to 30 ft.

NAILS—the following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Denver	Chicago	San Francisco
Wire	$4.25	$6 00	$5 40	$4 45	$6 45
Cut			5 90	8@10	8.50

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags:

	Current	One Month Ago	One Year Ago Without Bags
New York (delivered)	$4.25	$4 10	$2 30
Jersey City (delivered)	4 25	3 22	2 27
Boston	3 32	3 32	2 42
Chicago	2 35	2 15	2 00
Pittsburgh	2 42	2 20	2 05
Cleveland	2 71	2 42	2 32

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton— Finished	Common	Lump per 200-lb. Barrel— Finished	Common
New York	$19 50	$18 50	$3 50* at plant	$3 30*
Kansas City	27 20	26.20	2 50	2 40
Chicago			2 40	1 75
St. Louis	25 00	21 00		2.25
Boston	27.50	25.25	3.70†	3 40†
San Francisco	23 50	19 50		2 25
Minneapolis	29.50	23 00	2.00†	1 85†
New Orleans	16.00		2.35	

NOTE—Refund of $0 10 per barrel.
*300-lb. barrels. †180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York Current	New York Year Ago	Chicago Current	Chicago Year Ago
Raw per barrel (5 bbl. lots)	$1.48	$2 15	$1.95	$2 53
5-gal. cans	1.51*	2.28	2.15	2 73

*To this *oil* price must be added the cost of the cans (returnable), which is $2 25 for a case of six.

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red Current Dry	Red Current In Oil	Red One Year Ago Dry	Red One Year Ago In Oil	White Current Dry and In Oil	White 1 Yr. Ago Dry and In Oil
100-lb. kegs	15.50	17.00	13 00	14 50	15.50	13 00
25- and 50-lb. kegs	15 75	17 25	13 25	14 75	15 75	13 25
12½-lb. kegs	16 00	17 50	13 50	15 00	16 00	13 50
5-lb. cans	18 50	20 00	15 00	16 50	18 50	15 00
1-lb. cans	20 50	22 00	16 00	17 50	20 50	16 00

MINING AND MILLING SUPPLIES

HOSE—

	FIRE:	50-Ft. Lengths
Underwriters' 2½ in		$0 85 per ft.
Common, 2½-in		30¢

AIR

	First Grade	Second Grade	Third Grade
¾-in. per ft	$0 60	$0 40	$0 30

STEAM—DISCOUNTS FROM LIST

First grade 20% Second grade 30% Third grade 45%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	25%	20%

RAWHIDE LACING—For cut, best grade, 25¢, 2nd grade, 30¢. For laces in sides, 79c. per sq.ft.; 2nd, 75c. For semi-tanned: cut, 20¢.; sides, 83c. per sq. ft.

MANILA ROPE—For rope smaller than ½-in. the price is ½ to $0 02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0 01. The number of feet per pound for the various sizes is as follows: ½-in., 8 ft.; ⅝ in., 6; ¾-in., 4½; 1-in., 3; 1¼-in., 2 ft. 10 in.; 1½-in., 2 ft. 4 in. Following is price per pound for ½ in. and larger, in 1200-ft. coils:

Boston	$0 32½	Kansas City	$0 30½
New York	29½	New Orleans	28½
Cincinnati	27	Seattle	28
Chicago	27½	St. Louis	26½
Minneapolis	29	Denver	30
San Francisco	27		

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1 00
Asbestos for high-pressure steam	1 70
Duck and rubber for piston packing	1 00
Flax, regular	1 20
Flax, waterproofed	1 70
Compressed asbestos sheet	90
Wire insertion asbestos sheet	1 50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1 30
Asbestos wick, ½- and 1-lb. balls	.85

RAILWAY TIES—For fair size orders, the following prices per tie hold

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft
Chicago—Plain	$2 00	$2 25
Chicago—Creosoted	2 25	2 50
San Francisco—Douglas fir, green	1 35	96
San Francisco—Douglas fir, creosoted	2 50	1 92

Prices per tie at Missouri mills; St. Louis prices about 25c. higher

Untreated A Grade White Oak	6x8x8	Untreated A Grade Red Oak	6x8x8
No. 1	$0.80	No. 1	$0 60
No. 2	.90	No. 2	.70
No. 3	1 00	No. 3	.80
No. 4	1 25		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago In. Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0 93-0 94	$2 30	$1 90	$1 85
Pure destructively distilled pine oil	1 80	1 90	1 85
Pine tar oil, sp gr 1 025-1 035	48	43	42
Crude turpentine, sp gr 0 900-0.970	2 00	1 76	1 73
Hardwood creosote, sp gr 0 96-0.99*	.35		

*F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York Current	New York One Year Ago	Cleveland	Chicago
White	11 00 15 50	13 00	16 00	11 00-14 00
Colored mixed	7 00 10.50	9 00 12 00	12 00	9 50 12 00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13¼x13¼	13¼x13¼
Cleveland	$55 00	$65 00
Chicago	41 00	43 53

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York		$0.3125	$0 3425		$2 30
Boston		28	31	34	2 40
Kansas City	$0 2475	27	30	34	2 40
New Orleans	2425	2825	3125	38	2 40
Seattle	18	205	225	29½	2 60
Chicago	2175	2525	.2975	.34	2 45
Minneapolis	.2067	2476	.2782		2 80
St. Louis	23	27	.30	3425	2 20
Denver	2175	2575	.2825	.33	2 70
Los Angeles	22	27	.31		2 95
Atlanta	22	245	.265		2 55
Cincinnati	2275	2525	2725		2 30
Montreal	.30	32	.37	.38	4 10

CHEMICALS

SODIUM CYANIDE—New York price is 25@ 30c. per lb. Chicago, 30c St. Louis, 31c., Birmingham, 45c.; Denver, 40c

SODIUM SULPHIDE—New York price per pound is 9c.@ 10c. for concentrated, Chicago, 5c. for concentrated, 3½c for crystals. Denver price is 6c. for crystals Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11@ 12c. per lb., Chicago 12½c.; St. Louis, 12c

ALUMINUM DUST—Chicago price is $1 10 per lb.; Birmingham, $1 52

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union Single 25-Lb. Drums	Union 25-Lb. Ton Lots
East of the Mississippi, North of Chattanooga	$106 00	$101 00	$1 52	$1 49
Southeastern portion U. S. A.	115 50	110 50	1 63	1 60
Texas (except E. Paso)	124 00	119 00	1 74	1 71
El Paso, Texas	126 00	121 00	1 77	1 73
Denver, Col.	124 00	119 00	1 74	1 71
West Coast	129 00	124 00	1.81	1.77

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 110 New York, September 25, 1920 *Number* 13

The Directorship of the Bureau of Mines

IT IS NO SECRET that the present gifted and deservedly popular Director of the Bureau of Mines accepted the position only with a desire to do temporary service; and that he is desirous to quit it at an early date to take up again the research work to which he has devoted himself with such remarkable results. The question as to who is to be his successor is therefore an imminent one. As he will probably be reasonably permanent, there is a strong feeling in the mining industry that the new director should represent that industry, by reason of his experience, in the broadest and most understanding way.

The Geological Survey, the complement and sometimes the rival of the Bureau of Mines, has always had at its head able and distinguished geologists—Powell, Wolcott, and the present Director, George Otis Smith. The Bureau of Mines, on the other hand, has never had at its head a man personally familiar with mining; and we believe that the program and history of the Bureau has reflected this unfamiliar and purely academic quality.

The problems of the mining industry are manifold, broad, and increasingly significant; and the man who, as the head of the Bureau of Mines, weighs them and determines the policy and program of the Bureau should be a super-mining-engineer, just as the head of the Department of Justice must be a super-jurist, and by no chance a physician. We, therefore, recommend to our mining societies, such as the Institute of Mining Engineers, the Mining and Metallurgical Society, and the American Mining Congress, that they carefully investigate this matter and formally advise the Secretary of the Interior of their conclusions. Hitherto the succession has been purely bureaucratic: the second Director had been Chief Clerk of the first administration; and the present Director was Chief Metallurgist of the second administration. A clear perspective demands a new and independent point of view from without, such as can be brought only by a man who has behind him another background than that given by years of academic and government service. The Director's experience, should, moreover, be varied. He should not be a specialized metallurgist, because this will not have given him the desired oversight of the industry. This is the opinion of the present Director—himself a metallurgist. And the Director should not, in our opinion, be a specialized geologist, and for similar reasons, and because of the complementary and adequate nature of the U. S. Geological Survey. He should be a seasoned type of man, for example, like Pope Yeatman, and to instance the type will save us a great deal of further definition.

The office is not remunerative, as we count remuneration nowadays; but neither is the post of Congressman or Senator; and the representative of the mining industry in Washington has more power, with the corresponding influence for good, than a member of either house of Congress. Therefore, our best men should be glad to make the financial sacrifice in order to serve.

Hoover as Secretary of the Interior

THERE is a strong expectation in all parts of the country that if the Republican candidate is elected to the Presidency he will reverse the recent practice and appoint to his Cabinet the strongest and most upstanding men that are available. His own expressed policy is to do this, and beyond question the sentiment of the country demands it. Among the strong men that are included in the provisional slate made up for the Cabinet is Hoover; and he is mentioned as the future Secretary of the Interior.

Anyone who has followed the trend of the master mining engineer's thought as expressed in recent writings and speeches—as in that at the Institute of Mining Engineers banquet at Minneapolis—cannot fail to be struck with his conspicuous fitness for that post. The Department of the Interior is concerned, more than anything else, with engineering problems. Hence the proposal to convert it into a new Department of Public Works, and to gather under it, so far as possible, the various engineering activities which are now sheltered under other departments. Hoover is in favor of this change; but whether or not this proposal materializes, it would be epochal for the Department of the Interior to be presided over by a man who understood the work and the functions of the bureau under his control, and it would be an excellent and sane precedent for all government activities. For the mining industry, of course, it would be a boon greatly to be desired, for the sympathy and understanding of the important mining bureaus in the department, which the Secretary would have, would reinvigorate them, and through their reinvigoration would give new impetus to mining.

The Engineers' Chance

THAT the abilities and capacities of engineers are underrated by the man in the street is still true, though not to the same extent as formerly. For this, we may thank Herbert Hoover and others who have shown the public that we really can do something besides build locomotives, mine ore, plan a sewer, or install a lighting system. Still, however, we know that most people think that a good lawyer or a good doctor is a more desirable citizen than a good engineer. That this is a myth, all of us engineers know full well. We know we have a right to cross the street uninjured, but does the chauffeur of the big speeding truck know it?

Things are being done nowadays by organization. The voice of one hundred thousand all saying the same

thing will carry considerably farther than the effort of any individual or small group. At last the opportunity of the engineer is here.

Has the organization to which you belong made application to become a member of the Federated American Engineering Societies? This organization already has an aggregate membership greater than that of any other engineering body in the world. Most of the national societies have already joined or will do so soon. But the local societies and the smaller groups are needed too. Turn to page 633. Write for more information. *You*, personally, bring the subject up at your next meeting. It rests with you, and if you do nothing, blame only yourself for the position of the engineer as a citizen.

Oxygen Breathing Apparatus

THE limitations of the practical utilization of oxygen breathing apparatus have attracted the attention of mining men generally. The necessity for careful examination and thorough upkeep is now universally recognized, and, in most installations of this equipment, testing apparatus is provided and the training of the men in the proper conditioning of the apparatus is not neglected. Given, however, an apparatus in perfect condition, the human factor, or a thorough understanding of its value and method of use on the part of the human being who is to wear it into a dangerous place, is equally vital. The quantity of oxygen is limited. On there being sufficient for the complete round trip proposed depends the life of the wearer.

George S. Rice, of the Bureau of Mines, in a recent publication of the Bureau, calls emphatic attention to the danger of making trips which are beyond the capacity of the apparatus or the physical strength of the wearer. The specific incident that brought about this warning was the death of three men in the Black Diamond coal mine, near Seattle, Wash., recently. These men, equipped with oxygen breathing apparatus, attempted to make a trip 1,200 ft. down a twenty-five-degree slope which was filled with black damp. The supply of oxygen in the tanks was sufficient for only forty-five minutes. Mr. Rice points out that:

> To go 1,200 ft. down a twenty-five degree slope, make observations, rest, and then return 1,200 ft., thus making a total distance of at least 2,400 ft. in forty-five minutes, is a quick trip when a man is not encumbered with a heavy load; but to attempt it cumbered by an apparatus weighing about forty pounds makes it more than a hazardous undertaking.

Mr. Rice says, further:

> Modern apparatus when fully charged will furnish oxygen for two to two and one-half hours when used with moderate exertion or with periods of rest, but a person uses four to five times as much oxygen in climbing a steep slope with a load of forty pounds as he would when walking at a moderate gait along a level road. It is quite probable, therefore, that the forty-five minute charge indicated by the dial will not last forty-five minutes with the violent exertion necessary. The Bureau of Mines, in its handbook on "Rescue and Recovery Operation in Mines After Fire and Explosions," on page 49, makes the following statement:
>
> "The rescue crews should observe every known precaution for their own safety while traveling in after-damp or other noxious gases. Each crew should be composed of at least five men, including the captain, and the members of the crew should not become separated. If any one member complains of feeling unwell or is observed to be staggering or breathing unnaturally the entire crew should immediately return to fresh air. In view of the liability of a member receiving some injury or his apparatus being damaged a crew should never advance such a distance nor travel over such faults or wrecks as would prevent the crew from carrying one of its members back to fresh air. With the types of breathing apparatus now in service the maximum straightaway unobstructed course should not exceed 5,000 ft. with a reserve crew at the fresh-air base."

While in the foregoing it is to be noted that the maximum distance to be traversed is 5,000 ft., this is for a level, unobstructed road, and, as previously indicated, a trip of 2,400 ft. down a steep incline would be more than equivalent to a 5,000-ft. trip on the level and which maximum distance calls for a fully charged apparatus; that is, with at least three times the amount of oxygen which it was alleged the three men had who made the disastrous trip in the Black Diamond mine. While all of the details of the affair are not known, at least enough has been indicated to send out a caution against men making such a foolhardy attempt, and it is desirable that full facts shall be known, so that the public shall not be prejudiced against an apparatus which has greatest value when it is carefully used and used in accordance with well-established rules.

Bisbee an American Camp

THOSE who have predicted that Bisbee, Ariz., was fated to become a Mexican camp by reason of its proximity to the border, as well as because of the labor situation, will be interested to hear that Grant H. Dowell, manager of the Copper Queen branch of the Phelps Dodge Corporation, recently said that his company would continue to employ English-speaking men underground as far as possible. This has long been the policy of the company, and at present most of its underground employees are American. According to Mr. Dowell, it has been necessary to employ much Mexican labor on the Sacramento Hill project, but this, in Mr. Dowell's opinion, would be only a temporary condition.

American labor has never taken kindly to the idea of a great influx of low-paid Mexican workmen from across the border, and for obvious reasons. It is equally obvious, however, that when American workmen are scarce, a great corporation, on whose continued operation depends the welfare of thousands, will employ such men as it can get, rather than shut down. With the so-called American standard of living in view, the workman in this country has demanded good wages and living conditions, and expects as his right that he be given a square deal in his relations with his employer. All these are to be had in the Bisbee district, where the large operators have gone to much expense to make the community attractive. The companies in this part of the Southwest will seek to keep their camps American, but in this they must be met halfway by labor, organized and unorganized. Only through co-operation can American standards be maintained.

Mining Engineering as a Liberal Education

MANY young men who are not entirely settled as to their future life calling desire to acquire a liberal education to expand their horizon and form a solid foundation for any future activities. Surely this is a wise motive. The question arises as to what education will most fundamentally broaden and develop and inform.

Fifty years ago the answer would have been decidedly "Latin and Greek"—the study of the languages and literature of the Greeks and Romans. The arguments

in favor of this were clever and insistent—in fact, there was no out-arguing the supporters of this, the only "true culture"; yet the notion was only an inherited one, passed down from the Middle Ages, when it held good; and modern progress has dropped it into the background. The daring "new culture" consisted in modern language and literature; in history, philosophy, political economy, and the like. Encroaching on these, again, came the newer claims of science; and last and freshest, the combination of science and engineering. This last is believed by many to afford a broader and sounder culture (as nowadays we must choose) than any of the others. Much that was formerly confined to the university is now outlined in our preparatory schools, so that the developing individual can swiftly record, as in the stages of evolution, the progress of knowledge in outlines of history, Latin, modern languages, mathematics and the like, before the college or university training begins.

If engineering is the soundest foundation of general culture (and the proposition is worth cogitation), mining engineering should be the preferred department, for it covers many special types of engineering—civil, mechanical, geological, electrical, and human. One mine may depend mainly for its success on industrial management, another on mechanical engineering, a third on geological engineering, a fourth on metallurgical engineering, and so on.

Concerning Communism

IN THE Chronicles of the immortal Froissart, among a thousand other interesting pictures, a glimpse of the condition of Ireland toward the end of the fourteenth century is given. The king of England, having finally induced four of the kings of Ireland to signify their allegiance, sent an English squire to instruct them in the refinements of civilization. "When these kings were seated at table, and the first dish was served, they would make their minstrels and principal servants sit beside them, eat from their plates and drink from their cups. They told me this was a praiseworthy custom in their country, *where everything was in common but their bed.*"

We perceive from this that the theory of communism, so incessantly preached in various queer corners even up to the present day, was in practice in Ireland at the period mentioned. The result was what must be inevitable when perfect equality of environment is established—the common standards were those of the lowest, just as the standards of a class at school which must all move forward together will be set by the mentality of the most backward. Froissart relates that the English tutor had difficulty in teaching the Irish kings to wear breeches, and to induce them to ride with saddle and stirrups, which was contrary to their custom.

Indeed, the instinct toward communism is age old, and has been experimented with in countless groups and colonies both here in the United States and elsewhere. The French touched lightly on communism immediately after the revolution, and abandoned it; and it was even tried by the Pilgrims of Plymouth for a brief period after their arrival.

The Eskimos of Alaska, when their country was first explored, were living in communistic villages. The sovereign merit for an Eskimo was giving, not getting; and he who had given away the most was the most honored. An Eskimo would work hard for a year, that he might give a great feast, and distribute his accumulation in presents. Contests were held between neighboring communities or villages in giving, and the side which gave away most to the other was the victor, and the community which had received the most went home humiliated in pride and reputation. Still, the level of the Eskimo in habits and intelligence was as low as the lowest: they were clothed in skins and used the few tools and weapons of the stone age. In the forests of Nicaragua certain groups of Indians live also on the communistic principle; indeed, this seems to have been the general principle of most of the Indian tribes whom the Europeans found in America; and their level of intelligence and manners was such as to merit the common appelation of "savages."

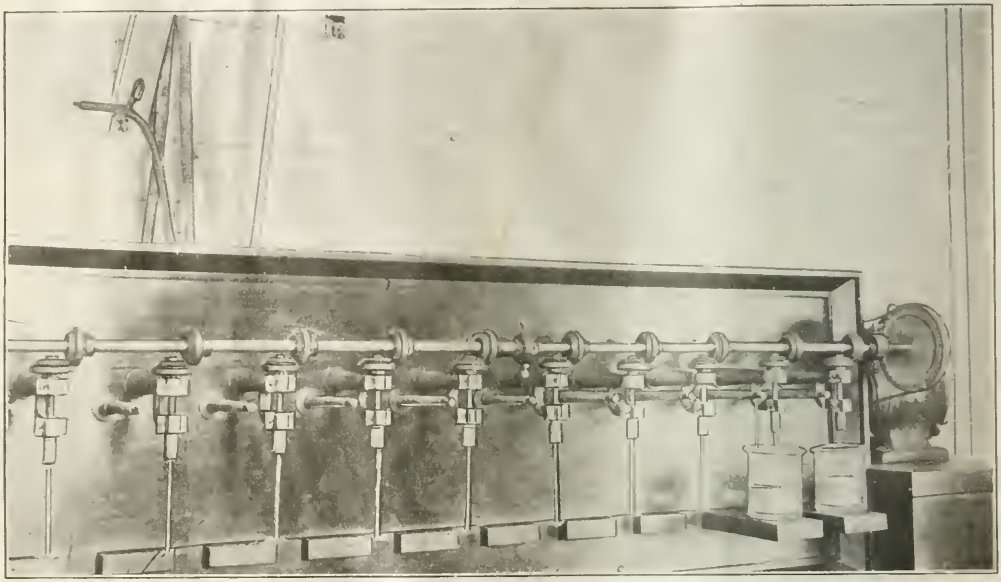
In the froth and turmoil of our present social condition, clusters of the light-headed are gathered together like ships in certain vortexes in the current, as in certain sections of New York, there to indulge in fads and theories which they fondly believe to be advanced. These are strange, vaporous, and unprofitable folk, who live idly on the interest of capital while they attack the institution of capital; or preach the doctrine that only the manual laborer should be fed while they themselves live by soap-box oratory, worthless literature and art, or organizing discontent. Were their theories put into practice, they would starve the first. Among these theories is communism, and bolshevism, which is a step further than communism, since it inverts the natural social fabric, and proclaims that the most advanced and productive shall get least, and those at the bottom of the scale in civilization and mental attainments shall get the lion's share. Such theories, however, it will be seen from the examples cited, are not advanced but ancient, and natural to the savage.

In a different school of thought is the opinion of Darwin, who argued at some length that the life and advance of civilization depend on a leisure class who can pursue the arts and sciences without the handicap of the daily work and worry as to the means of eating, drinking, and sleeping. Huxley was also of the same opinion. Evolution depends upon differentiation, and the permission of the development of irregularity; and this is as true with men as with race- or draft-horses.

Somewhere between these two schools of thought—the elementary and savage conception of communism, or the still more barbarous one of bolshevism, and the school which justifies an aristocracy—will doubtless be found the practical adjustments of the future. It will be remembered that the glory of English art and letters has not resulted appreciably from her professional leisure class, but rather from those geniuses who have come from all classes of the population.

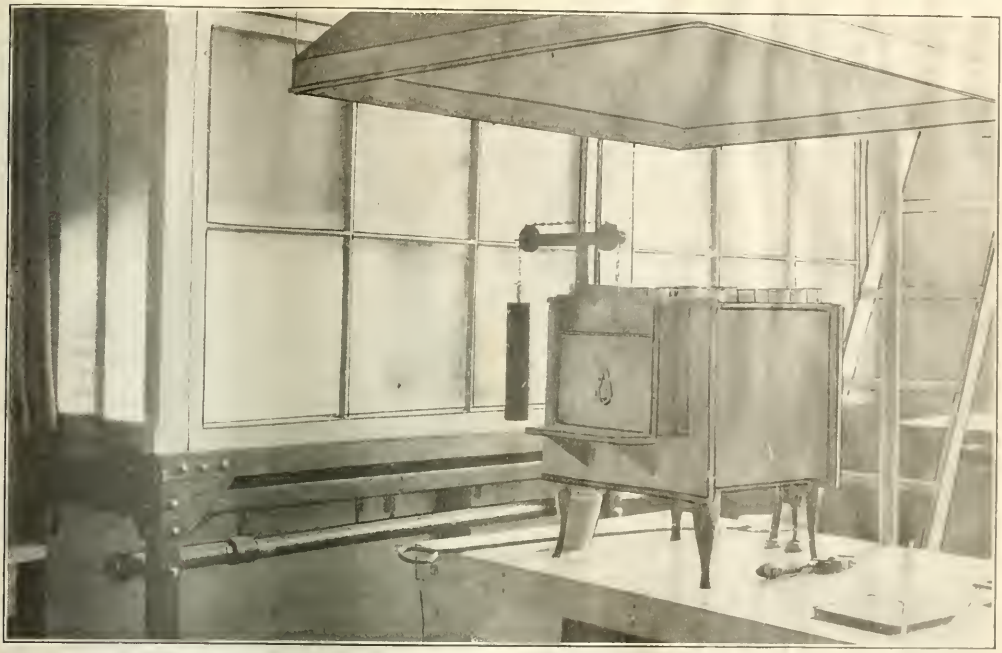
We shall doubtless settle finally on the conception suggested, among others, by Herbert Hoover, on *equality of opportunity*: a fair and equal start, with no inherited advantage or disadvantage, for every new-born babe. But after that, we shall be careful concerning levelings that are too repressive, and too injurious to the common welfare. Shall Edison, Root, and Kipling, Marconi, Coolidge, and Wells daily hoe the necessary corn and draw the household water; and thereby establish their equality with the honest bullet-heads who understand nothing else? Such men are sprung from the people, who will find it more profitable for the welfare and advancement of the whole commonwealth if their corn and water is provided for them.

Laboratory Practice in the Southwest

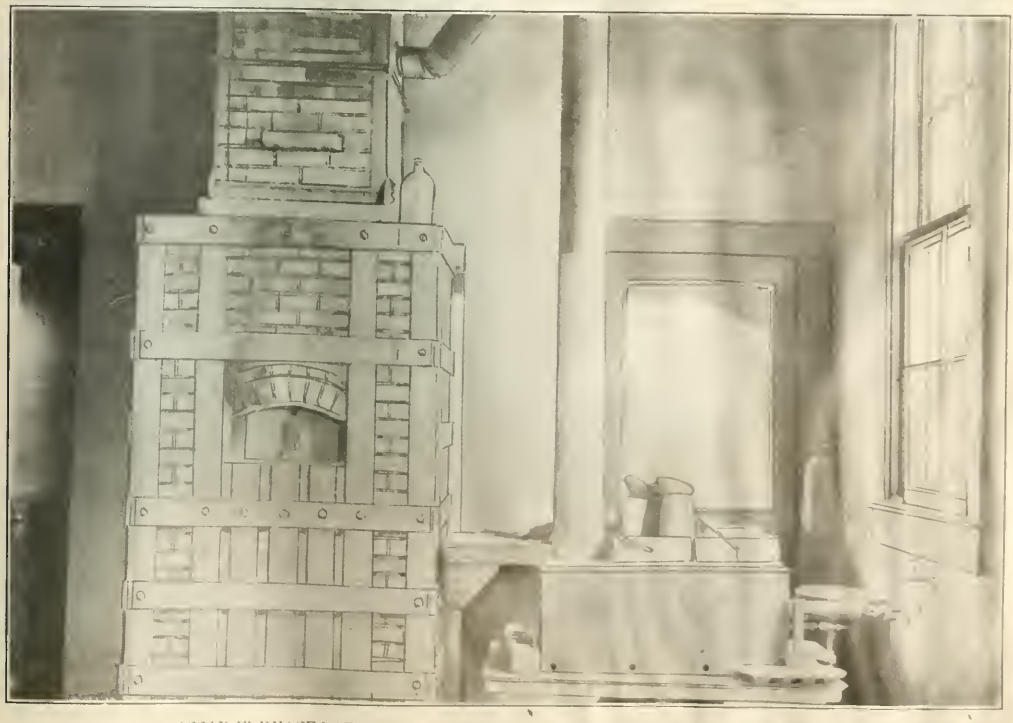


APPARATUS FOR ELECTROLYTIC COPPER DETERMINATIONS

WET DETERMINATION LABORATORY, ARIZONA COPPER CO.'S SMELTER, CLIFTON, ARIZ.



ELECTRIC FURNACE AND HOOD AT THE LABORATORY OF ARIZONA COPPER CO



ASSAY FURNACES AT SMELTER LABORATORY, ARIZONA COPPER CO., CLIFTON

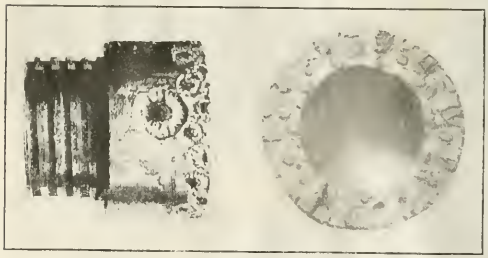
Diamond Drilling as a Means of Intensive Development

Output of Josie Mine, in British Columbia, Long Maintained at Moderate Cost by This Method of Exploration — Development of Several Veins Cut by Numerous Dikes Otherwise Costly

By Paul S. Couldrey and E. H. S. Sampson
Rossland, B. C.

Written for *Engineering and Mining Journal*

FEW mining camps owe as much to the diamond drill as Rossland, B. C. It would be no exaggeration to say that without this method of exploration anything in the nature of regular shipments would have been impossible, and it is extremely doubtful whether at present there would be any shipments at all. Continuance of operations has not been due, for the most part, to spectacular discoveries of new large orebodies, though such discoveries have been made, but rather to the continuous every-day use of the diamond drill in tracing out dislocated portions of known veins and in locating pay shoots or pay horizons in these veins.



CHIP BITS IN USE AT ROSSLAND CAMP

Previous to the detailed geological examination of this camp by Professor Brock, and more recently by Dr. Drysdale, at the instance of the Canadian Department of Mines, exploration work of all kinds was necessarily much more haphazard than at present, but the importance of diamond drilling was recognized even in the early days. It was felt that as diamond drill holes could be put in at a cost of $2 per ft., and at a rate of 20 to 30 ft. per double shift, as compared with ordinary crosscuts at $12 to $16 per ft., and at the rate of only 5 to 6 ft. per double shift, the advantage lay with the former method (in spite of its many inherent defects) in something like a proportion of 25 to 1 for exploratory work, even for comparatively short crosscuts. Taking into account, also, the complex geological structure of the camp, the adoption of what might be called intensive diamond drill methods followed as a natural sequence.

In the Josie mine of the Le Roi No. 2 Co. the diamond drill has been in almost constant use for nearly twenty years, and the experience gained in maintaining an output by this means may be of interest to others similarly placed. The characteristic ore of Rossland is a gold- and silver-bearing pyrrhotite associated with chalcopyrite. The gold content of the ore has always been the principal value, in fact of late years the copper percentage has dropped so low that direct smelting is very difficult. This ore occurs in veins more or less nearly parallel to one another, running roughly east and west. There are several veins in the Josie mine, but those referred to in this article are known as the Annie, North Annie, Hamilton and No. 1.

Numerous Dikes Cut Veins in Josie Mine

The formation in this section of the camp is, for the most part, a very hard augite-porphyrite, with patches of diorite-porphyrite and grano-diorite, giving place at the north end in depth to a silicified stratified rock, and at the south end to a porphyrite-monzonite. Numerous dikes running approximately north and south cut across this formation at frequent intervals, interrupting and in some cases faulting the orebodies. These dikes are roughly divisible into two classes, micaceous and non-micaceous. The former are distinguishable by the prevalence of biotite mica associated with orthoclase or plagioclase feldspar (minettes and kersantites). The largest and most important of the micaceous dikes is known as the Josie (kersantite). This varies from 60 to 100 ft. in width. It faults the ore a distance of 350 ft. horizontally and probably about 200 ft. vertically,

PARALLEL OR "FOLLOWING" DIKES IN HANGING WALL OF STOPE. A—MICACEOUS. B—NON-MICACEOUS

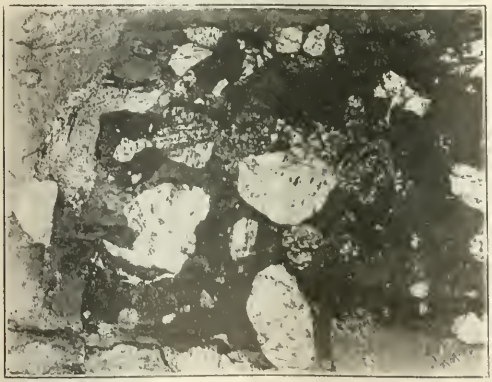
though the amount of vertical throw is not yet clearly established. Mineralized zones frequently occur at planes of contact of the various formations.

The non-micaceous dikes are usually hornblende associated either with orthoclase or plagioclase feldspar, and as a rule are much harder than the micaceous variety. An exception to this rule is the dike locally known as the Porphyry dike (pulaskite), which is traceable from the surface to the 1,300-ft. level, splitting into four or five branches as it goes downward and northward. Accompanying this dike is another one known as the Vitreous dike. Where these two dikes cut across the Annie and North Annie veins the values immediately west of the intersection are invariably poor as compared with those to the east, but with the other veins no such change is noticeable, although an enrichment between the forks of the dike has been observed on the Hamilton vein. The Porphyry dike interrupts all veins without faulting any.

"White" Dike an Underground Landmark

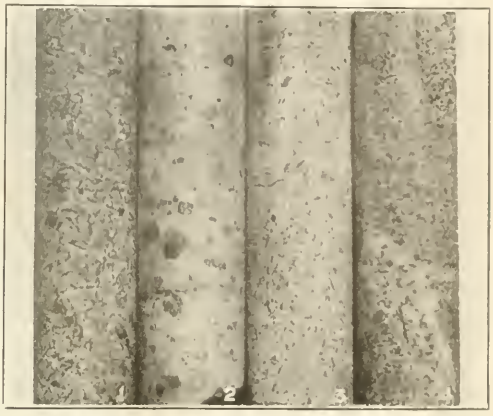
A very interesting dike of the non-micaceous variety, and one which forms a veritable underground landmark, is locally known as the White dike (conglomerate). This has very much the appearance at first sight of a brecciated vein running north and south. It is traceable from the surface to the 900-ft. level, and it is noticeable that large boulders of the same material have been found several miles away. It consists of characteristic angular fragments of white quartz associated with other rocks (such as quartzite, gneiss, and syenite, many of which are entirely foreign to the neighborhood), embedded in a dark olive-green or almost black matrix of spessartite in which large crystals of hornblende are often apparent.

In addition to the north and south dikes proper there are tongues of apparently altered diorite-porphyrite



"WHITE" DIKE, 500 LEVEL, SHOWING SPESSARTITE MATRIX

paralleling certain of the veins. These are usually spoken of as "following dikes," though this may be, geologically speaking, a misnomer. Two such "dikes" (one micaceous and the other non-micaceous) are found interlaced with the ore in the No. 1 vein, and though they are easily distinguishable the result is somewhat confusing, as the ore is found not only under or over but in both positions, and even between them. At the contact of the following dikes with the regular pyritic vein matter exceptionally high values in free gold are sometimes found, usually in the presence of crystals of arsenopyrite, antimonite, and, most noticeable of all, molybdenite. Precisely how this enrichment occurred, and whether of primary or secondary origin, is a matter for conjecture. Good gold values are sometimes found also near north and south mica dikes, for example, under the Tramway dike, in the under or western side of which both the Annie and North Annie veins have "bunched up" and widened out considerably.



DIAMOND-DRILL CORES FROM JOSIE MINE

1. Porphyritic monzonite, showing characteristic crystals of biotite and pyroxene. 2. Augite-porphyrite, showing prisms of augite. 3. Diorite-porphyrite, showing acicular crystals of hornblende. 4. Grano-diorite, showing granular, crystalline structure

The north and south dikes almost invariably dip at steep angles, sometimes being quite vertical, an exception to this being the "H" dike, which dips flatly to the west, interrupting all veins without faulting, but being itself faulted at certain points. The veins themselves dip in a northerly direction at angles varying from 50 to 80 deg.

Complex Formation Favors Diamond Drilling

Such a complex formation as the above therefore produces at once the opportunity and necessity for rapid exploratory methods. In drifting along any of the above veins a dike will be encountered and crossed. Provided pay ore is not immediately found at the crossing point, diamond drilling can at once be employed to discover either the faulted portion of the same vein, or in the case of a non-faulting dike, to explore for pay ore in the parallel vein. If this is successful the exploratory drifting can be transferred to the second vein, and when this work has advanced sufficiently far ahead a second hole can be put back across the track of the first vein, and *vice versa*. In this way the shortest distance to pay ore can be ascertained, and by inclining the holes upward and downward, and "fanning" them out horizontally, the extent of the shoots can be anticipated within reasonable limits. The majority of the holes drilled in the Josie are horizontal or nearly so, and very little drilling is done in the dikes themselves, as this would be both non-productive and difficult, on account of the broken nature of the ground. The augite-porphyrite, on the other hand, though hard, gives excellent cores.

For the flat holes an "E" Sullivan drill equipped with a Stone core barrel is used, the outside diameter of the bit being 1⅞ in. and the diameter of the core ⅞ in. This machine is not recommended by the makers for depths of more than 450 ft., but here it has drilled five holes over 1,000 ft. and at least a score over 600 ft.

For down holes an "S" Sullivan drill, also with a Stone core barrel, is used, the same sized hole being drilled as with the "E" machine. In both flat and down holes chip bits are used extensively, more particularly for short holes. These chip bits, however, are not suitable for broken ground.

The advantages of the above system of exploratory work would not be nearly so apparent in mines with a simple vein structure, but some such system, modified, for "spotty" mines having parallel veins might be well worth considering, provided, first, that the geological conditions are known, and, second, that the ground is not too soft or broken for rapid and cheap drilling operations.

COST OF DIAMOND DRILLING AT JOSIE MINE

Year	Feet Drilled	Total Cost per Ft. (Labor, Air and Supplies)	Year	Feet Drilled	Total Cost per Ft. (Labor, Air and Supplies)
1902	2,148	$2 37	1911	14,932	$1 65
1903	3,748	2 64	1912	14,185	1 69
1904	3,617	2 22	1913	15,075	1 60
1905	3,121	2 70	1914	12,249	1 63
1906	4,505	1 86	1915	2,799	1 73
1907	5,088	2 61	1916	5,065	2 23
1908	7,439	2 39	1917	807	1 84
1909	9,820	1 96	1918	3,995	1 66
1910	11,508	1 89	1919	3,535	2 04

The total footage is 120,762 and the average cost per foot $1.92 over a period of eighteen years. Of the above footage, 4,831 ft., or 4 per cent of the total, were down holes. The proportion of diamond drilling done to ordinary development is about 2 to 1. In 1904, a double-tube return water (Stone) core barrel was first used. During the last five years covered by the above table detailed costs per foot have been as follows: Labor, $0.99, being 51 per cent of the total; air, $0.28, being 14 per cent of the total; and supplies, $0.68, being 35 per cent of the total, which is $1.95.

The total cost will now probably be higher, on account of increased labor costs. All of the above work was done on day's pay.

Mineral Production of Former German Southwest Africa

The mineral output of Southern Africa, in 1913, according to *The Ironmonger*, was valued at £3,517,351. Of this sum, however, no less than £3,084,581 represented the value of the output of diamonds. The balance of £432,770 was made up mainly of copper ore and matte (including also lead ore) to the value of £396,436, tin ore to the value of £31,568, and other ores and minerals with an aggregate value of £3,316. Copper ranks second to diamonds in importance among the minerals of the Protectorate, the principal concern engaged in the copper-mining industry being the Otavi Mining & Railways Co., which was registered in Germany in 1888, with a capital of £200,000, in 200,000 shares of £1 each, all issued and fully paid up. Copper mining is conducted by this company at Tsumeb, Guchab, Great Otavi, Asis, and in the Otavi Valley, the principal mine being at Tsumeb.

Particulars of the total mineral output for the year 1918 are not available, but the Otavi Co. exported 7,358 tons of ore, with an assay value of 12 to 33 per cent of copper and 12 to 22 per cent of lead. On Dec. 31, 1917, the company had on hand 139,322 tons of ore, with an assay value of 2 to 41 per cent of copper. The Otavi Exploring Syndicate for the year 1918 reported exports of 100 tons of ore, with an assay value of 43.5 per cent of copper.

The export of tin from the Protectorate began in 1911 with consignments of nine tons, valued at £470. By 1913 the exports had risen to 200 tons, valued at £34,500. Ninety per cent of the best tin claims have now been acquired by British companies. German prospectors were first in the field, but they appear to have found no support, either locally or in Germany. A considerable number of the claims in British hands appear to be payable, but the distribution of the ore is for the most part over the surface, with little depth. The development has, on the whole, been slow, and the companies will not erect their final plants until they have proved the capacity of their claims to their satisfaction. The output of tin in 1918 amounted to 65 tons, assaying on the average at 68 per cent. The quantity on hand at the end of the year, however, amounted to only 33 tons.

The following figures, however, relating to the chief exports of minerals for the years 1913 and 1918, and for the nine months ended Sept. 30, 1919, serve to indicate some of the recent effects of the war upon the export trade:

	Exports		
	1913	1918	Jan.-Sept. 30 1919
	£	£	£
Diamonds ..	2,945,475	652,628	395,955
Copper	10,002		
Copper ore	381,434	55,981	5,278
Tin	34,500	12,800	5,256
Lead	17,293		
Other ores	2,958	...	

Activities of Ontario's Nickel-Copper Refineries

During the half year Jan. 1-July 1, 1920, a total of 627,681 tons of ore was raised, and 520,705 tons smelted in Ontario, the total output of nickel-copper matte being 28,365 tons, containing 15,030 tons of nickel and 7,705 tons of copper, according to the Ontario Department of Mines. The British America Nickel Corporation and the International Nickel Co. of Canada worked the Murray and Creighton mines respectively, and the Mond Nickel Co. raised ore from the Garson, Levack, Bruce, Worthington, and Victoria No. 1.

As regards shipments of matte, 7,944 tons went to Canadian refineries at Port Colborne, Ont., and Deschenes, Que.; 16,323 tons to the United States; and 1,123 tons to Wales. During the period the new electrolytic refinery at Deschenes began operations and had 1,185 tons of matte in process on June 30, although no refined metals were ready for market at that date. The new plant, which permits recovery of metals of the platinum group in pure form, is reported to be working satisfactorily, as is also the smelter at Nickelton, one mile from the Murray mine, where the ore is smelted direct without preliminary roasting. In addition to metallic nickel, nickel oxide and blister copper, there was a byproduct recovery at Port Colborne of the precious metals, gold, silver, platinum, palladium, rhodium, ruthenium, osmium, and iridium. There was also a small recovery of copper in the United States from Ontario silver ores.

Gold Mining in British Guiana

Gold Production Has Been Decreasing Since 1895 and Is Now Only About One-Eighth the Maximum Recorded—A Few Companies Are Still Operating, but Mining Is Hampered by Lack of Transportation and High Costs

Written for *Engineering and Mining Journal*

IN 1595 Sir Walter Raleigh touched the coast of the Guianas and ascended several rivers in his search for El Dorado the mythical city, whose houses were supposed to be roofed with gold. The publication by him of "The Discovery of Guiana," with its descriptions of enormous serpents, one-legged men, and other freaks of nature, undoubtedly led other adventurous spirits to visit the region. Permanent colonization followed, with the usual changes of control from Spanish, French, and Dutch to English which was so common in the days of buccaneers in the West Indies.

LOW RIVER STAGE. HAULING A BOAT UP A SMALL RAPID

The first recorded instance of an organized search for gold was an expedition in 1720, which ascended the Berbice River. In 1740 the directors of the Dutch West India Co. sent an expedition under an engineer named Hildebrand to explore the Mazaruni, Cuyuni, and Essequibo rivers. These first attempts were failures, and it was not until 1863 that a well organized effort was made to find gold in paying quantities, when a company was formed consisting of local and English capitalists called the British Guiana Gold Co. Gold-bearing quartz was found at Wariri, on the Cuyuni River and work was started, including the erecting of a small stamp mill. The project was, however, abandoned, owing to a boundary dispute between Venezuela and British Guiana, which arose over the territory in question. In the early eighties, interest was again aroused in the possibilities of successful gold mining, and in 1884 a production of 250 oz. is recorded.

PICKING THE WAY BETWEEN SUBMERGED ROCKS

Until 1890 only placer mining was carried on. The Omai placers, on the Essequibo River were one of the most successful operations, about 24,000 oz. of gold, being obtained from claims in the first two and one-quarter years of work. In 1890 the numerous outcrops of auriferous quartz reefs in the gold-bearing areas began to excite interest. Engineers and gold miners from other parts of the world were attracted to British Guiana, and an era of promotion started. Numerous companies were organized, and several large mills for crushing quartz were erected. The most notable among these operations were Kanaimapoo, on the Demerara River; Arakaka on the Barima River; Peter's mine, on the Puruni River (fifteen-stamp mill), and Aremu, on the Cuyuni. None of these mills are now operating. The total amount of gold produced by milling to date is 69,430 oz. The yearly production of gold since 1884 is given in the following table, which is taken from the annual reports of the Department of Lands and Mines:

THE LANDING PLACE AT ROCKSTONE, FROM WHICH THE START TO THE GOLD FIELDS AT THE ESSEQUIBO RIVER IS MADE

Year	Ounces	Year	Ounces
1884	250	1904–1905	95,864
1885	939	1905–1906	94,363
1886	6,518	1906–1907	85,504
1887	10,986	1907–1908	67,209
1888–1889	20,216	1908–1909	73,624
1889–1890	32,332	1909–1910	64,825
1890–1891	66,864	1910–1911	54,988
1891–1892	110,555	1911–1912	50,273
1892–1893	134,124	1912–1913	51,765
1893–1894	138,527	1913–1914	82,706
1894–1895	132,994	1914–1915	64,982
1895–1896	121,285	1915 Apr. to Dec.	39,793
1896–1897	127,479	1916	37,129
1897–1898	121,490	1917	29,538
1898–1899	113,114	1918	24,546
1899–1900	112,789	1919	16,216
1900–1901	114,102	1920, Jan. to Mar. 31	2,315
1901–1902	101,332		
1902–1903	104,526	Total	2,596,448
1903–1904	90,336		

It will be noted that the peak of production was reached in the year 1893-94 with an output of 138,527 oz., but that the industry has steadily declined, with little reaction, and lately, in common with gold mining all over the world. Production for 1919 was only about one-ninth of what it was in 1893. The gold mined in 1919 came from the following districts:

	Ounces
Barima River	1,321
Barima River	118
Cuyuni River	394
Puruni River	564
Mazaruni River	5,982
Potaro River	7,714
Essequibo River	71
Wani River	48
Total	16,216

HYDRAULIC MINING IN BRITISH GUIANA

The value of the 1919 production was $287,044.

The production to Dec. 31, 1918, was distributed according to sources as follows:

	Ounces
Quartz milling	69,430
Dredging	107,622
Hydraulic operations	38,367
Placer, by hand mining	2,362,498
Total	2,577,917

The following large nuggets have been found in the districts given:

	Ounces
Jumbo, Barima River, one weighing	333
Kanawaruk Creek, Potaro River, one weighing	274
Tiger Creek, Potaro River, one weighing	106
Puruni River, one weighing	90
Omai Placers, Essequibo River, one weighing	84

At present, two companies, the Guiana Gold Co., Ltd., and the Minnehaha Developing Co., Ltd., have six small dredges on creeks running into the Essequibo and Potaro rivers. These companies have been much hampered for the last few years by the increase in the cost of provisions and labor and the difficulty in getting supplies and renewals; so much so, that the government saw fit to remove the royalty of 70c. per oz. on Jan. 1, 1919, and charge, instead, a tax of 5 per cent on the profits.

The last hydraulicking outfit, that of the Tassawini Mining Co., on the Barima River, shut down in 1914 after reporting a production of 243 oz. for that year. Quartz milling in the colony stopped with the closing down of the Peter's mine in 1916.

By far the largest part of the production has been from small placer operations. In the balmy days of the industry, large, well-organized parties carried on the work. At present, however, most of the gold comes from what are known as "pork-knockers." These are negro or colored men, who are grubstaked by claim owners or shop-keepers, and who go up to the "bush" for six or eight months on a trip, dividing the profits on their return. They band together for mutual protection and help in getting boats up the rapids. Several Chinese firms maintain shops or trading posts in the interior, but the supplies from them are uncertain and expensive.

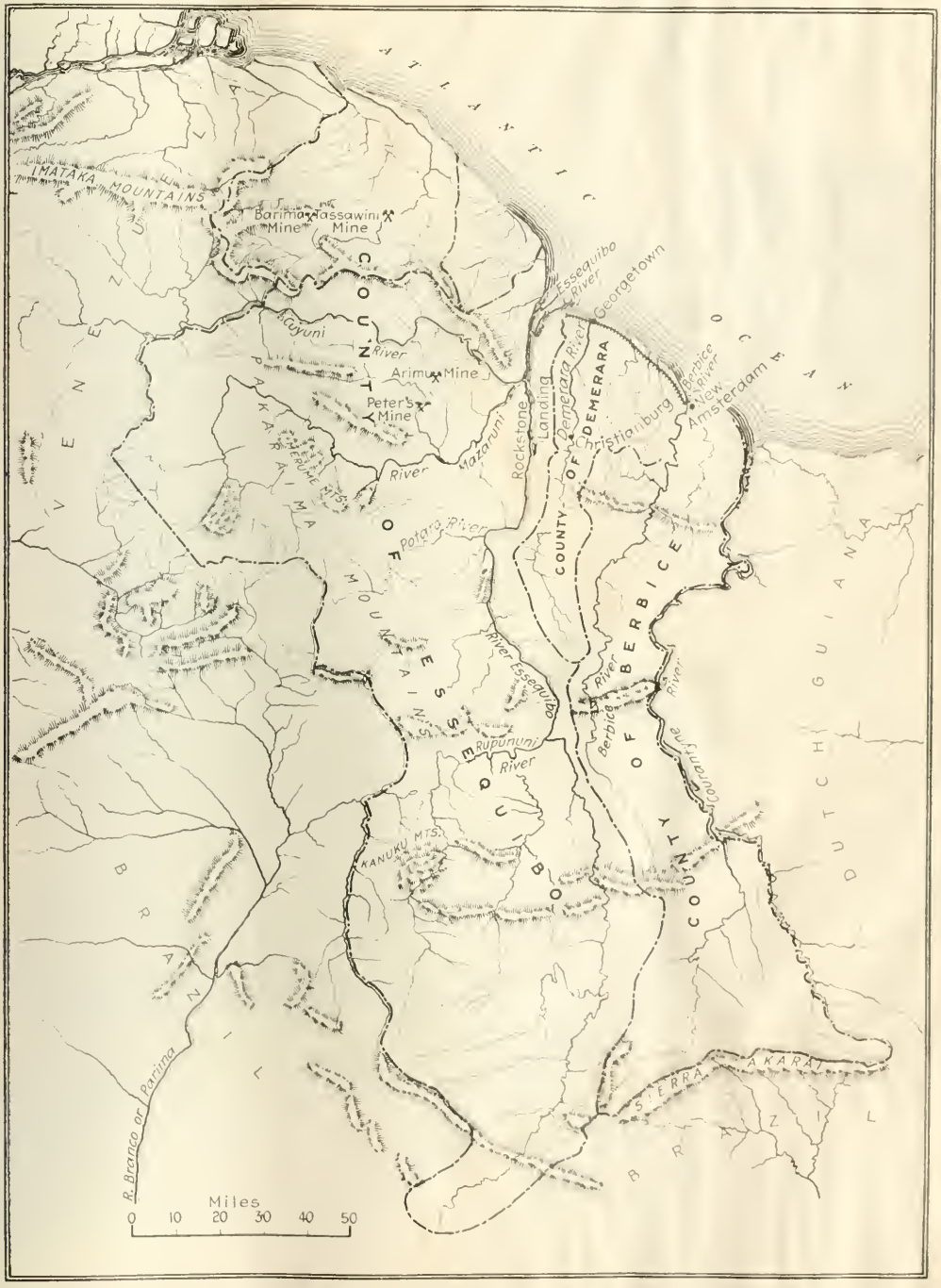
Practically all of the interior is still crown land. A prospecting license, costing $5 per year, allows a prospector to operate anywhere on government land not already leased in locating a claim. Claims measuring 1,500 ft. x 800 ft. for gold and 500 acres for diamonds pay an annual rental of $5 each, plus a royalty of 50c. per oz. on gold and a royalty of about 10 per cent on diamonds.

Mining concessions or leases for ninety-nine years can be obtained on any area by payment of $10 on application, and an annual rental of 20c. per acre. Dredging concessions on rivers or creeks pay 10c. per acre.

The decline of the gold-mining industry does not seem to be due to the working out of the field, as large areas are scarcely touched, but to the high cost of provisions compared to the more or less fixed price of gold and the diversion of the labor to the bauxite fields and the sugar plantations.

Prospecting is difficult, owing to lack of transportation and the denseness of the tropical jungle. Trails when cut are quickly overgrown and disappear in a few weeks. No railroads have been built into the interior, and the only two roads that have been cut have never been kept in condition to be of use, so the only method of getting into the interior is up the rivers. As soon as one leaves the alluvial belt along the coast the rivers are a series of rapids and low cataracts. Dragging boats up these is slow and laborious work. When the rivers are in flood they overflow into the jungle, and there is no shore on which to land or from which to work. In the dry season the reverse is true—a small volume of water is spread out in trickles over a large area and boats have to be dragged over sand and between boulders. The change from one condition to another is often quite rapid and a boat starting down with a flood may

WASHING FOR GOLD IN TIGER CREEK, POTARO



A MAP OF BRITISH GUIANA, SHOWING PRINCIPAL TOPOGRAPHICAL FEATURES

ground before reaching tidewater. The failure of the large companies seems to be due to poor organization, expensive transportation, and tropical diseases.

In a number of instances, companies that have tried to take machinery to the interior have expended their entire capital on transportation, and at several plant sites equipment is now rusting in the original crates.

LUNCH TIME ON AN ISLAND

It would seem that the transportation problem could be solved only with government aid.

With modern knowledge of tropical sanitation developed in Cuba, Panama, and elsewhere, there should be no great difficulty in combating the two principal diseases, malaria and dysentery.

Comparison of High- and Low-Grade Cyanide

Equally Good Metallurgical Results Follow Use of Product Containing 37 Per Cent NaCN By Tonopah Extension

By JOHN G. KIRCHEN

General Manager, Tonopah Extension Mining Co., Tonopah, Nev.

Written for *Engineering and Mining Journal*

UNTIL recently, the Tonopah Extension Mining Co. has used the ordinary cyanide, containing 97 per cent NaCN, in its mill at Tonopah, Nev. Calculation showed, however, that the low-grade cyanide now on the market could be delivered at a less cost per unit of NaCN, so it was decided to make some experiments to determinate the relative efficiency of the two products.

In preliminary laboratory tests, equal quantities of the same grade of silver-gold sulphide ore were agitated under parallel conditions with solutions of the same cyanide content, one using "Aero Brand" cyanide containing 37 per cent NaCN and the other solution using the 97 per cent NaCN product. One-half pound of lead oxide per ton of ore was added in each test to precipitate the sulphide ion liberated in the solution by the dissolving of the silver with NaCN. The gold and silver extractions after 60 hours of agitation were the same—93 per cent—and the consumption of NaCN and CaO was the same in both tests.

In a following test, the lead oxide was not added. Again, the extractions in both tests were the same, although 1 per cent lower than when the lead oxide was added; the NaCN consumption was higher but practically the same in both tests. After some additional work, which confirmed these results, it was decided to use the low-grade cyanide in the mill.

For the last seven months "Aero Brand" cyanide has been used exclusively. It has proved satisfactory as a dissolving agent for silver and gold contained in the company's sulphide ore and "reducing" matter has apparently not accumulated in the solution.

An analysis of this product, as furnished by the manufacturers, shows: CN, 19.10 per cent; Cl, 25.13 per cent; Ca, 28.13 per cent; Na, 16.40 per cent; SiO_2, 0.80 per cent; R_2O_3, 0.91 per cent; Graphitic C, 3.94 per cent; Carbide C, 0.36 per cent; S, 0.55 per cent; N (?), 1.14 per cent; Mg, 0.15 per cent; O & Undet., 2.80 per cent.

This cyanide is shipped in cylindrical steel drums weighing 380 lb. gross and containing about 360 lb. of cyanide product, which contains about 37 per cent NaCN. The material is in the form of small, brittle flakes of dark gray color, about $\frac{1}{32}$ of an inch thick and from $\frac{1}{4}$- to $\frac{1}{2}$-in. in diameter. The soluble portion dissolves readily, leaving a light, flocculent, black residue.

In mill practice solution is effected in a tank in which a mechanical agitator is installed. Agitation promotes the more rapid dissolving of the soluble constituents. On account of the CaC_2 present, acetylene gas is immediately generated, so it is advisable that good ventilation be maintained over the dissolving tank. Ammonia is also frequently liberated from the solution. The small amount of soluble sulphide present apparently oxidizes rapidly. The alkalinity (not including that of the NaCN) is about 12 per cent, in terms of NaOH, so it is of service in neutralizing acidity and consequently saves lime, where lime is used to promote alkalinity of the solution.

The following table gives a comparison of results covering one month's operation at the mill of the Tonopah Extension Mining Co., using 97 per cent NaCN exclusively; also one month's run at the mill, using the 37 per cent NaCN "Aero Brand" cyanide. The two months selected were July, 1919, and March, 1920, and were taken for comparison because the average silver content of the ore treated during each of these months was about the same. The solutions used were also of the same NaCN content.

COMPARISON OF RESULTS WITH HIGH- AND LOW-GRADE CYANIDE

Cyanide Content of Product, per Cent	Feed Assay, Oz	Tailing Assay, Oz.	Per Cent Extraction	Consumption NaCN per ton, Lb	Consumption NaCN per Oz. Bullion, Lb
97	1 1 63	0 90	92 26	1 64	0.142
37	1 1 34	0 82	92 77	1 71	0 160

The "reducer" in solution, in terms of N 10 $KMnO_4$ (Clennel test), was 4.2 cc. and 4.0 cc. respectively.

Ancient Rumanian Copper Deposits

The iron and copper deposits of the Oltenic region, Rumania, were known to the Romans, and traces of their workings are still found. Owing to the low percentage (2 to 4 per cent) of copper which the ore gave, the experiments recently made to re-establish the working of these deposits have ceased, according to *Commerce Reports;* but pyrites rich in sulphur (40 per cent) were being extracted as a means of continuing the manufacture of sulphuric acid.

Copper ore (5 to 7 per cent) has been found in the Dobrudja. In this area deposits of ore amounting to 250,000 tons are estimated.

Calculation of Unit Smelting Costs and Values

Effect of Sulphur—How and Why a Tariff Should Be Made Up for the Mine Superintendent—Lowering Cost by the Substitution of Different Ores and Fluxes—Fixed vs. Operating Expenses and Their Effect

BY C. A. GRABILL
Written for *Engineering and Mining Journal*

SLAG composition has been discussed in a previous article, but so far nothing has been said about what consideration should be given to sulphur in calculating a furnace charge and product. The question is by no means simple. In the first place, sulphur has three different effects causing a variation in its value. They are: fuel value, reducing value, and matting value, though the first two may be considered as one. This combined value for the first two properties may be considered separately from the third without interfering with the conclusions reached. It is difficult to give any formula representing the combined value, because it is dependent on many factors, but the subject may be considered in this way:

A good black-copper charge would smelt with 17 per cent of coke and 1 per cent of sulphur. With each added unit of sulphur, one unit of coke could be deducted until 10 per cent of sulphur is reached. From that point the value of the sulphur as fuel would decline rapidly until the sulphur becomes a source of expense. The reducing value is a part of the above effect, and I think most of the ferric oxide is reduced by sulphur. These interchanges represent merely a certain balance attained in actual practice. A change in the quality of the coke or its cost would alter the relative amounts involved.

The matting value and the fuel value are both recorded in the statistics covering the smelting cost. That is, if conditions are such that it pays to run with the lowest possible fuel, the amount of coke in the table of smelting costs will decrease, and at the same time and in proportion, the figure representing the recovery of sulphur in the matte will decrease.

MATTING VALUE INDETERMINATE

From an absolute standpoint, the matting value is indeterminate. Take a low-grade oxidized copper ore as an example. The first unit of sulphur is absolutely necessary to the smelting operation; the second not quite so important, and so on, in constantly decreasing value, until sulphur becomes an annoyance and source of expense.

The subject is complicated by the fact that the sulphur atom is bound to an iron atom with a fluxing value, but causing a copper loss in the slag. In any given operation, however, this is determinable, but it is necessary to avoid misconceptions.

Take the instance considered in the last article[1] with the sulphur in ore *B* as shown. It is clear that if the ore *D* can be purchased at a price at which the cost of a unit of Fe would be the same as that in the ore *B*, still, operations could not be maintained with *D* in place of *B*. The sulphur is the cause of the difference and must therefore have some definite value.

Now, 28 per cent CaO in the slag has been assumed as the most favorable amount; it will be assumed further that for the furnace operation it is immaterial whether the lime varies a few per cent or not, the injurious effect on the losses being protected by the charge against the iron. This being so, the fluxing value of the iron is limited by its equivalence to CaO, and is less than the value of CaO by the amount of copper loss caused by the equivalent of Fe.

What would happen if the lime limit were 28 per cent, making it necessary, in case of increased silica, to purchase sufficient iron to hold the CaO down to this amount is another matter, and does not enter at this point. It may be said, however, that the relative values would have to be determined for both iron and sulphur from the savings or losses incurred by unit changes in the charge.

Applying the reasoning stated above, and taking the data from Table I[2], the following quantities are obtained:

Cost of 1 ton of limestone	$2 00
Cost of smelting 1 ton and fluxing coke ash	4 12
2 units of SiO_2 require 1.185 units of base each, and 54 units CaO less 2.37 units leaves 51.63 units available, costing	$6 12
1 unit CaO costs	11.84c.
1 unit of SiO_2 requires 1.185 unit CaO at 11.84c	14.04c.
1 unit Fe = 9.7 unit FeO, and, therefore, of CaO, and is worth for fluxing, not allowing for the effect on slag loss	15.21c.
1 unit of copper in matte requires sulphur in the charge for matting purposes	4.665 units

With this data the cost of the sulphur in the sulphide flux may be calculated.

COST OF SULPHUR

Cost of 1 ton of sulphide flux	$9 00	
Smelting and ash of coke	4 12	
4 units of SiO_2 at 14.04c	56	
Cu loss, .48 units Fe at 0.3135 lb. 15.05 lb	3 01	
Credit 20 lb. Cu at 20c		$4 00
Credit 95 per cent of 1 oz. Ag		1 19
Credit 48 units Fe @ 15.21c		7 31
Fe for 4.95 lb. Cu in matte	04	
Credit for overcharge of Cu loss		.01
	$16 73	$12 51
	12 51	
44 units S, less 1.15 for matte for Cu recovered	$4 22	
Cost of 1 unit of sulphur	9.85c.	

The price of 15.21c. per unit for Fe denotes its equivalence to CaO in fluxing value, and to get its real value the copper carried into the slag by it must be deducted. Thus, 0.3135 lb. Cu at 20c. is 6.27c. Deducting this from 15.21c. leaves 8.94c., and correcting for iron and sulphur not carried into the matte, makes the cost of Fe 9.81c. per unit.

Much calculating may be saved by determining the value of the iron and sulphur in the matte per pound of copper and deducting the result from the works value, and also using the above cost as given for the iron contents.

4.665 lb. S per lb. Cu = 0.23325 unit S =	2.30c.
0.95 lb. Fe @ 9.81 =	4.6
Total deduction per lb. Cu	2.76c.

[1] Last of a series of three articles on the calculation of blast-furnace charges and costs. The first article was published Sept. 11, and the second Sept. 18, 1920.

[2] See our issue of Sept. 18, 1920, page 371.

[3] See our issue of Sept. 18, 1920, page 569.

Returning to the original ore

Smelting, etc.	$4 12	
50 units SiO_2 at 14.04c. per unit	7 02	
10 units Fe at 9.81c. per unit		$0 98
18 units CaO at 11.84c. per unit		2 13
1 unit of sulphur at 9.85c. per unit		10
2.7oc. deduction on 60 lb. Cu (not otherwise charged)	1 66	
	$12 80	$3 21
	3 21	
Cost of smelting one ton of A ore	$9 59	

The tools being obtained and tested it is possible to use them not only on the regular ores but also on others. Consider *D* ore:

SiO_2, 4 units at 14.04c. per unit	$0 56	
Smelting and ash	4 12	
Credit 65 units Fe at 9.81c. per unit		$6.37
	$4 68	$6 37
		4 68
Value of 1 ton		$1 69

Form for a Smelter Tariff

The metallurgist is now in position to make up a tariff for the mine superintendent:

Silver—Pay 95 per cent.
Copper—Market price less 5.26c. (2.5 marketing expenses plus 2.76).
Iron—Pay 9.81c. per unit.
Lime—Pay 11.84c. per unit.
Sulphur—Pay 9.85c. per unit.
Silica—Deduct 14.04c. per unit.
Treatment—$4.12 per ton.

All taxes and duties of whatever nature in force at the time of, or within sixty days subsequent to the receipt of the ore, and levied by Federal, state, or municipal government or other authority on the ore, substances contained therein or products thereof, whether levied on the production, extraction treatment, shipment, or sale, or on the documents covering these transactions, are for the account of the shipper.

This tariff may be suspended on due notice, or without notice, in case of force majeure.

conditions constant, such as percentage of coke on the charge, and sulphur recovery, the calculations are shown in Table III. It can, of course, be said that the higher silica slag would increase the requirement for coke, but my own experience leads to the belief that the demand for more heat is met largely by the increased percentage of sulphur oxidized on the charge, and that the practical effect is slower furnace running. That always tempts one to the use of more coke to speed up the smelting.

Taking the data from Table III, the cost of smelting a ton of ore would be:

Smelting 620 lb. ore at $4 00	$1 24
180 lb. sulphide flux	34
Smelting 180 lb.	36
Copper loss: 1.71 lb. at 20c	34
Total for 620 lb.	$2 28
Total for 1 ton of ore	7 36
Saving on silver in the slag	20
Net cost	$7 16

The saving over the other method in this operation would amount to $2.33 per ton of ore, which would seem to offer ample opportunity to pay interest on an extra furnace, or the cost of a little extra coke or compensation for considerable furnace trouble.

In the case mentioned, the extra furnace capacity was available and the effect of the higher silica showed in slower running and a little extra furnace trouble. The conditions demanding the higher silica lasted only a few weeks, and the practice was discontinued.

The difference in the character of the slag is to be noted. In the former case the lime almost reached the upper limit, whereas in the latter it is about the average and the Fe has increased but slightly. The copper lost per unit of Fe has decreased, as is forecast by the curve in Fig. 8.[1]

TABLE III. CALCULATION OF CHARGE

Material	Amount, Lb.	Ag — Assay	Ag — Oz.	Cu — %	Cu — Lb.	SiO_2 — %	SiO_2 — Lb.	Fe — %	Fe — Lb.	CaO — %	CaO — Lb.	Al_2O_3 — %	Al_2O_3 — Lb.	%	Lb
A	620	20.0	6.20	3.0	18.6	50.0	310.0	10.0	62.0	18.0	111.6	4.0	24.8	1.0	6.2
B	180	1.0	0.09	1.0	1.8	4.0	7.2	48.0	86.4					44.0	79.2
Coke	(80)	....	....	....	....	10.0	8.0	3.0	2.4	0.4	0.3	5.0	4.0	....	....
Total	800		6.29		20.4		325.2		150.8		111.9		28.8		85.4
Slag	664	0.82	0.27	0.257	1.71										

85.4 × 0.15 + 0.25 = 51.24 = Wt. of Matte
20.4 − 1.71 = 18.69 = Wt. of Cu in Matte
18.69 ÷ 51.24 = 36.5 = % of Cu in Matte
51.24 × 0.34 = 17.4 = Wt. of Fe in Matte
150.8 − 17.4 = 133.4 = Wt. of Fe in Slag
133.4 × 1.287 = 171.5 = FeO equivalent

Slag Content:	Lb.	%
SiO_2	325.2	49.1
FeO	171.5	25.8
CaO	111.9	16.8
Al_2O_3	28.8	4.3
Miscellaneous	26.6	4.0
Total	664.0	100.0

Slag: Base ÷ SiO_2 = 0.872
Silver:
Matte assay, oz 235
Slag loss, per cent 4.3

Copper:
Matte assay, per cent 36.5
Slag loss, per cent 8.38
Slag loss, lb. per ton of charge 4.275
Slag loss, lb. per unit of Fe in slag, 0.2563
Slag loss, lb. per lb. of Fe in slag, 0.01281

N. B.—Slag assay calculated from Fig. 6 and corrected for miscellaneous constituents to correspond with Fig. 2 and Table I, by deducting 0.035 from amount in Fig. 6.

Returning to the last article[1], the question naturally arises as to whether the assumed slag is the best possible one to use under the circumstances. The answer depends largely on local conditions; off-hand, I should say not. I think that in this case the silica should be increased to at least 45 per cent, though in one instance under nearly the same circumstances I was not able to run a slag containing more than 40 per cent silica, because of conditions not considered in this calculation. On the other hand, I once successfully used a slag containing over 49 per cent SiO_2, having very much the same analysis as will result in this case, by dropping the limestone from the charge. Keeping all the other

With iron and lime contents of the slag both in the middle of their range, it is proper, on the assumptions so far made, to consider the cost of fluxing a ton of silica as if the fluxing could be done with limestone alone: in this example it would cost 10.21c. per unit, because any moderate variation in the iron-lime ratio is taken up in the constants used.

If, however, the case as shown by Table I and the schedule offered to the mine is considered, and it is assumed that practical considerations limit the slag to 42 per cent SiO_2 and 28 per cent CaO, the situation is one of unstable equilibrium. Suppose ore *E* is offered. In this example it cannot be assumed that it can be

[1] See our issue of Sept. 18, 1920.

[1] See our issue of Sept. 18, 1920, page 571.

fluxed entirely with limestone, because doing so would raise the total lime in the slag to a prohibitive amount. Iron must be provided, either from *B* or *D*. To provide it from *B* would be to disarrange entirely the system which has been assumed to represent ideal conditions. If it is provided from *D*, then the cost of fluxing the silica in *E* must be determined on the basis of combining limestone, ore *D*, and ore *E* to form the standard slag, and not by recasting the standard slag and charge and recalculating the unit costs. This latter act is a mistake often made.

The figure correctly obtained should be checked by recasting the charge and calculating the increased cost, charging the whole of the increase to ore *E* and in that manner calculating the cost per ton of *E*. At this point the use of the curves becomes important, because a small inaccuracy in estimating the slag loss is greatly magnified, and individual assays are unreliable, or, rather, the demand for accuracy is greater than that attainable in practical work, and must be reached by following the laws that govern the averages.

It will be apparent that a rise in the silica contents of the mine ore will have the same effect as the purchase of outside siliceous ores; that is, *D* ore will have to be purchased for fluxing if the grade of matte is to be retained and the lime kept below 28 per cent.

The matter would have to be considered in several ways before deciding how to handle it. If *D* ore is expensive, it might pay to alter the base slag and matte. If the rise in silica is due to the mining of too much wall rock, for example, and the contract for the sale of the matte penalizes a drop in grade severely, then perhaps the best way would be to penalize the excess silica in the mine ore by an added charge, say, 14.04c. per unit up to 50 per cent SiO_2 and 20c. for all above that. This is the excess penalty clause seen so often in contracts. The exact method of handling the situation would depend largely on the mine and the mining methods.

Silver Loss Variation

That the copper loss is dependent on the silica in the slag, the grade of the matte, and the iron in the slag has been shown, and the tariff devised covers these points, but does not cover the silver loss. It has been indicated, also, that under certain circumstances the ratio between the silver assay of the slag and the silver assay of the matte is constant if the percentage of copper in the matte is constant, and for convenience in calculation it has been assumed that this is the case. In Table I, 18.3 lb. of copper is calculated as recovered, and the resulting matte assays 233 oz. per ton. If the copper assay of the ore *A* rises to the point at which the recovery of copper is doubled, the silver assay of the matte will drop to 116.5 oz. per ton, the slag assay will drop proportionately, and the loss will be halved. In this case, therefore, the silver loss is not a constant percentage loss, but varies inversely as the copper on the charge.

If *D* ore and *E* ore may be purchased in such amounts that it becomes desirable to add to a thousand pounds of the regular charge another thousand pounds of a mixture of *D*, limestone, and *E*, in proper proportions to form the standard slag, then, roughly speaking, the amount of slag produced on the total charge will be doubled. If ore *E* is a gold ore and contains no silver, the extra slag will be saturated with silver from ore *A*, and the silver loss will be approximately doubled.

The extra copper loss is taken care of by the charge against the iron of the new ores, but the percentage basis of calculating the silver loss again fails. It might be well to make a charge against the iron for part of the silver loss, and a credit to the copper for silver recovery, but this is not common in practice.

Several years ago a series of articles was published in the magazines on what constitutes an ore. Suppose the limestone contains silver. When does it become an ore? The answer is easy from the viewpoint of the metallurgist. As the amount of silver increases, the cost of a unit of CaO decreases until it reaches zero. The moment it passes this point the limestone ceases to be a flux and becomes an ore and will be smelted for its silver value rather than for its fluxing value.

Then, if it be understood that the supply of limestone is greater than the demand by the smelter (which has been understood to be the case, otherwise it would be the price of the limestone that did govern the costs), the situation has fundamentally changed.

The Importance of a Definite Nomenclature

In making these calculations it is essential to think definitely and to be careful not to apply the conclusions to situations to which they are not applicable. This is likely through the lack of a definite nomenclature for the quantities used by the metallurgist, and is particularly so with the words "cost" and "value." The terms "price," "cost," and "value" must be carefully distinguished.

Price per unit of an element, say, CaO, is the number of monetary units paid for the customary mercantile unit, divided by the number of metallurgical units of the element in the mercantile unit.

Cost is the price, plus all the other expenses that are incurred in the utilization of the unit.

Value is the monetary measure of the results obtained by the use of the element in question.

This is simple enough, but these three measures have negative quantities for which there are no adequate differentiating terms. In metallurgical slang it is customary to speak of a negative value as a "red" value, because in bookkeeping negative profits are often entered with red ink. Negative profits are losses, but a negative value is not necessarily a cost, nor a negative cost a value. This is where a misconception is likely to occur.

In Table I and the schedule based on it the cost of a unit of CaO is calculated to be 11.84c. This is the measure of the marginal value of the same unit under these conditions, because it was assumed that the standard slag was the most economical. If the cost were less than the value, another unit would have been added, or vice-versa, but the cost is not a measure of the average value, because then there would be no profits. Or, another small deposit of limestone costing less might be utilized for a part of the requirements and the difference between cost and value would be profit.

What term, then, represents the potential cost of the silica in the ore? What is the correct term for the monetary quantity attached to a unit of lime from a limestone with silver values in excess of the cost? What is the term of these same units when they are in excess of requirements? The terms unit, cost, and value are overworked, and it is necessary to keep in mind exactly what is meant each time they are used, or confusion results.

To return to the silver-bearing limestone. If it be assumed that the cost of a unit of CaO is zero, then the cost of fluxing a unit of silica becomes zero (basis of interchangeability of Fe and CaO), and the cost of a unit of sulphur under the conditions is as follows:

Cost of one ton of sulphide flux	$9 00	
Smelting	4 00	
Fluxing coke ash (Cu for Fe)	03	
Cost of fluxing SiO_2		
Value of Fe as flux		
Copper loss due to Fe at 0.3135 lb. per unit	3 01	
Credit for 20 lb. copper at 20c. per lb		$4 00
Credit for 95 per cent of 1 oz. of silver		1 19
Fe for matte		
Credit for overcharge for copper loss in Fe in the matte		01
	$16 04	$5 20
	5 20	
44 units of sulphur, less 1.15 in matte	$10 84	
Cost of 1 unit of sulphur	25 3c	

One pound of copper requires 4.665 lb. of sulphur, costing at the above rate 5.9c. It also requires 0.95 lb. Fe to make matte, and as the Fe so used does not drag any copper with it into the slag, there will be a credit to the 5.9c. equal to the penalty on the 0.95 lb. Fe. Estimating this penalty per unit of Fe at 4.5c., makes the credit per pound of Cu 0.21c., leaving the net deduction per pound of copper 5.69c. Adding this to the 2.5c. marketing expense, makes a total deduction per pound of copper of 8.19c., and a net value of 14.31c. (market price, 22.5c.).

The iron going into the slag has no fluxing value, but drags 0.3135 lb. Cu with it per unit of Fe. This, at 14.31c. per lb., is equal to 4.49c. per unit of Fe, which is the amount it should be penalized. The schedule would then be:

CaO, fluxing value	Nil
Fe, penalty per unit	4 49c
SiO_2	Nil
Sulphur, value per unit	25 3c
Copper, market price, less	8 19c
Treatment, per ton	$4 03

This is all based on the assumption that the 36 per cent matte is the most economical to use, and that FeO and CaO may be substituted for each other in the slag without inconvenience.

At first it may appear strange that the cost of sulphur has been increased by the presence of silver in the limestone, but a moment's consideration will show that such is actually the fact. The existence of cheap flux has taken away the fluxing value of the sulphide flux, leaving the whole expense to be borne by the sulphur. Although the price of sulphur has risen, the cost of treatment of the ore *A* has decreased. Also, as the cost of fluxing the silica has disappeared, most of the cost of treatment is directly referable to the pound of copper.

If it be assumed that 28 per cent CaO in the slag is the maximum permissible, the question of iron corresponding to the silica enters, and the costs must be calculated on that basis.

Practically, the sulphur usually brings the accompanying iron in sufficient quantity, although in practice I once met the problem just mentioned. The main supply was a siliceous ore, 60 per cent SiO_2, 20 per cent Al_2O_3, 10 per cent BaSO, and very little iron. The sulphide flux did not furnish enough iron, and the standard slag contained 25 to 28 per cent CaO and 3 to 5 per cent BaO; and to get even this it was necessary to buy oxidized iron flux. The marginal unit of cost was therefore regulated by the cost of a unit of Fe in the oxidized iron flux.

Practical considerations usually eliminate enough factors so that the problem is capable of solution.

Returning to the silver-bearing limestone: If the silver values are so great that the value of a unit of CaO is no longer a charge but is a credit, then the limestone is an ore, and the effect would be to change the standard slag so as to run with as great a percentage of CaO in the slag as possible, and presumably costs would be based on a unit of CaO rather than of SiO_2. Owing to the predominating amount of siliceous and irony ores, this is an improbable situation, though an entirely possible one, so the treatment of an ore with excess iron will be considered instead.

Assume ore *F* with 3 per cent Cu, 4 per cent SiO_2, 40 per cent Fe, 12 per cent S, 6 per cent CaO, 4 per cent Zn, and 2 per cent Al_2O_3. Quartz can be purchased at $2 per ton, delivered, and assume that it contains 100 per cent SiO_2.

Table IV shows a charge calculated from these materials. The slag loss has been calculated by interpolation from Fig. 4 and by using 80 per cent of the results so obtained after correcting for grade of matte by Fig. 2. Owing to the presence of bases other than FeO and CaO, results in practice will be lower than those shown in Fig. 6, and 80 per cent is merely an arbitrary figure. In actual cases, curves would be drawn to suit the results obtained, with due consideration to the source of the additional bases.

If it be assumed that the most advantageous slag is

TABLE IV. CALCULATION OF CHARGE

	Amount,	Ag		Cu		SiO_2		Fe		CaO		Al_2O_3		Zn		S	
Material	Lb.	Assay	Oz.	%	Lb.	%	Lb.	%	Lb.	%	Lb.	%	Lb.	%	Lb.	%	Lb.
F	1,000	1.0	0.5	3.0	30.0	4.0	40.0	40.0	400.0	6.0	60.0	2.0	20.0	4.0	40.0	12.0	120.0
Quartz	240					100.0	240.0										
Coke	(124)					10.0	12.4	3.0	3.7	0.4	0.5	5.0	6.2				
Total	1,240		0.5		30.0		292.4		403.7		60.5		26.2		40.0		120.0
Slag	933			0.597	5.56												

$120 \times 0.15 \div 0.25 = 72.0$ = Wt. of Matte
$30 - 5.56 = 24.44$ = Wt. of Cu in Matte
$24.44 \div 72 = 34.0$ = % of Cu in Matte
$72 \times 0.36 = 25.92$ = Wt. of Fe in Matte
$403.7 - 25.9 = 377.8$ = Wt. of Fe in Slag
$377.8 \times 1.287 = 485.7$ = Wt. of equivalent FeO

Slag Content:	Lb.	%
SiO_2	292.4	31.4
FeO	485.7	52.1
CaO	60.5	6.5
Al_2O_3	26.2	2.8
ZnO	30.0	3.2
Miscellaneous	38.2	4.0
Total	933.0	100.0

Copper:	
Matte assay, per cent	34.0
Cu loss, per cent	18.5
Cu loss, lb. per ton of charge	8.96
Cu loss, lb. per lb. of Fe in charge	0.01472
Cu loss lb. per unit of Fe in charge	0.2945

N.B.—The slag loss is calculated from Fig. 6, but only 80 per cent of the tabular values are taken to allow for effect of elements not shown in curves. See text.

The cost of treating a ton of *F* ore as in Table IV would be:

Smelting 1,000 lb. ore at $4 00	$2 00
Smelting 240 lb. quartz	48
Cost of 240 lb. quartz at $2.00	24
Copper loss, 5.56 lb. Cu at 20c	1.11
Total cost of treatment of 1,000 lb	$3 83
Total cost of treatment of 1 ton *F* ore	7 66

The cost of a unit of SiO_2 would be 6c.

that shown in Table IV, containing 31.4 per cent SiO_2, the cost of a unit of silica is its value under these conditions.

If another calculation be made using 1,000 lb. of *F* ore and 500 lb. of quartz, it will be found that under the same conditions as to sulphur recovery and other factors, the slag will contain 45.9 per cent SiO_2 and the cost of treatment of a ton of *F* ore, calculated in the same manner, will be $8.86. The difference of $1.20 is due to the addition of 520 lb. (two charges), of quartz, and measures the loss resulting from that addition, which amounts to $4.61 per ton of quartz. Then the value of a ton of quartz for raising the silica in the slag from 31.4 to 45.9 per cent would be negative in amount to $4.61 per ton if the cost price is included. Omitting the price paid it would have a negative value of $2.61 per ton; that is, the company would have to charge $2.61 per ton for smelting it to come out even.

I have shown the manner in which these figures are obtained, but the conditions which may exist at any given plant are infinite in their possibilities, and each case must be decided after a study of the whole situation.

In the examples cited conditions have been simplified by certain assumptions, because it is impossible in an article of this nature to allow for many of the important influences, such as furnace design, efficiency of the power plant, and general conditions, which affect the choice of a standard slag. In practice there are always conditions that permit of similar assumptions; otherwise there would be many indeterminate equations.

When Ores Are Purchased on Flat Rates

Take the case of a custom smelter operating on purchased ores which are available in such kinds and quantities that no fluxes are required, and which are purchased on flat rates, with no allowance for fluxing values. Here (as in all cases) the value of the marginal unit of each element will be determined by its effect on the metal recoveries or treatment expense and not by the cost of obtaining it. The fact that the smelter is not paying for the iron and lime does not affect their value (or vice-versa), but is merely a matter of business policy, which in this case is probably, but not necessarily, incorrect. Another plant may be buying ores on an elaborate schedule that has developed a similarly satisfactory ore supply, and yet the prices and deductions may bear no direct relation to the values, though entirely correct as to business policy.

The determination of the value of the marginal unit is no easy matter, and depends on both theory and practice. Furnace conditions vary so much from day to day that it is impracticable actually to test the effect of the addition of the marginal unit. The only way is to test the effect of substantial changes, so as to give points for plotting a curve from which the effect of minor changes may be deduced. This applies to theoretical calculations as well as to practical work, because few of these curves lie in straight lines, that is, ten units probably do not have ten times the effect of one unit.

Constant use of slide rules and approximate assays tend to make one a little careless in the use of such things as coke ash and 0.01 per cent in slag losses. In the calculations for daily furnace control they are of little importance, but in the determination of values they are very important if correct conclusions are desired. A rightly used graph is the micrometer which enables one to measure the value of the marginal unit and obtain results that are correct beyond the accuracy of the daily control samples and assays.

That these schedules of costs and values may be determined in more than one way has been demonstrated. They may be calculated to suit a general condition already existing, or for a prospective change in conditions. In either case, they are the means of measuring the cost of treating any ore the analysis of which is known. By their aid a company buying custom ores, or smelting ores from a number of different mines of its own, or a number of different ores from the same mine, is able, as a matter of routine, to calculate the profit and loss on each ore and thus find leaks that otherwise would escape notice. The mine superintendent will be able to recognize the exact value of each element, and so avoid those ores, or grades of ore, that do not yield adequate returns and to accomplish the mining so that the total profits from mining and smelting will be a maximum.

The schedule offers opportunity for graduating the charges and profits in accordance with the work done. Smelting a ton of neutral ore means just what it says, but smelting a ton of quartz when silica is in excess implies that three tons of limestone also must be smelted, or the treatment of four tons. The schedule also helps the ore buyer to develop and bring to the smelter at the most favorable terms the material required for operation. A miner may have an ore with 50 per cent excess SiO_2. The smelter, to cover treatment cost, adds to the treatment charge of a neutral ore a penalty of 15c. per unit excess SiO_2, a total penalty of $7.50 more than the charge on a neutral ore. If the smelter made a flat rate, this amount would have to be included in it, and there would be no recourse.

With the treatment charge in the penalty form, the miner may be able to sort out half of this excess silica at a cost to him of, say, 5c. per unit and save the difference. The world is better off because the cost of recovering the valuable elements from the ore has been reduced.

The schedule also enables two or more competing companies to go into a mining district and sort out the ores automatically in accordance with the cheapest total cost of smelting all the ores, and the greatest profit to the mining industry.

How To Apportion Fixed Expense

One phase of the matter is important and has not been mentioned; that is the fixed expense. Certain expenses at every plant will be incurred, whether the amount smelted is one ton per day or one thousand. These are the fixed expenses. The remainder for the sake of convenience may be called operating expense. Let it be assumed that the operating expense is $3 per ton and the fixed expense $1,000 per day and that there are no intermediate semi-variable expenses. The cost of smelting one ton per day would then be $1,003 per ton; the cost of smelting two tons per day would be $503 per ton, and for ten tons per day the cost would be $103 per ton, and so on until for 1,000 tons per day the cost would be $4 per ton. If the works are operating on a basis of one ton per day it is clear that the cost is $1,003, but the additional cost of smelting another ton is not $1,003, nor even $503, but only $3, and any price collected for the smelting of the second ton, if more than $3, will reduce the amount of loss in the $1,000.

Coming down to reasonable figures, if the works are

operating on a basis of 1,000 tons per day, and receiving $4,000 for the work, the company is neither losing nor gaining; it is costing it $4 per ton to smelt, and it is receiving $4 per ton. If, however, a contract for an additional thousand tons at $4 per ton is made, it receives $8,000 for the work done on the two thousand tons, and the cost is only $7,000; so it makes a profit of $1,000. This additional ore can be smelted, without loss, at $3 per ton, although the smelting cost is $4 per ton at the moment. It is to take care of this difference in effects between operating costs and overhead expenses that the various divisions of cost on this basis are required, and because the costs cannot be as sharply defined as in the example, the classification must be more extensive.

Therefore, in making up the schedules, charges, costs, and values of the different elements, it is evidently necessary to consider the purpose and manner in which they are to be used, before deciding on the bases to be taken in the calculations. It is the bank balance at the end of all the operations that is the final criterion of the correctness of the calculations.

Japan's Control of Chinese Iron Ores

The total known reserve of China's ores of such character and situation as makes them available for modern development amounts to about 416,000,000 tons, according to *North China Commerce*. Of this Japanese or Sino-Japanese companies own about 200,000,000 tons. The Chinese government retains its title to about 130,000,000 tons, including the Molingkwan ores.

The principal deposits owned or controlled by the Japanese are as follows:

Penshihu in Manchuria. Two grades of ore are found here, one containing 68 to 71 per cent iron and the other 35 to 40 per cent. No figures are available as to how much of the ore is high grade and how much of low grade, but the total tonnage is estimated at 80,000,000 tons.

Anshanshan. The tonnage here is estimated at 30,000,000, and the grade varies from 31 to 66 per cent.

Chinlingchen, in Shantung, where there are 37,000,000 tons and probably more of ore averaging 65 to 70 per cent iron. The Japanese government is retaining this deposit to supply the imperial steel works in Japan and seems to be planning to ship ore only.

Tayeh, nominally a Chinese company and actually dominated by Japan. The reserve is about 30,000,000 to 35,000,000 tons, which has already been contracted for delivery in Japan.

Tungkuanshan, at one time in possession of the British, now owned through the Sino-Japanese Development Co. by Japanese. This is an overrated deposit, having only about 2,500,000 tons of probable ore, but being well situated near the Yangtze.

Fangchanghsien, in Anhuei on the Yangtze, with 15,000,000 tons of ore containing 58-63 per cent iron. This is the main reliance of the new Oriental Steel Co., recently floated in Japan.

There is not one important deposit of iron ore in China controlled by foreigners except Japanese, and they now control about one-half the known reserve and are reaching for more. Much of the 86,000,000 tons in the hands of private Chinese firms may be expected to pass into Japanese hands.

The Molingkwan deposits are important because of their grade and situation. A steel works supplied by them would be in position to undersell any other works in China. The ore reserve is 30,000,000 to 40,000,000 tons and the grade is good. The deposits are situated about twenty miles south of Nanking.

China is not as rich in iron as was formerly supposed. The per capita reserve is less than one-seventieth of that of the United States, and the whole Chinese reserve, including that granted to Japan, amounts to only about six years' output from the Lake Superior region.

All these figures take no account of such deposits as those of Shansi for the reason that they are not available for modern industry. The individual bodies of ore there are so small that it is not feasible to mine enough ore in one day to keep a modern furnace running. These deposits are only available to feed small native furnaces which supply a limited local demand for pots and similar articles. From the point of view of modern industry they do not exist.

Gold in the Appalachians

As early as the sixteenth century, the Appalachian Mountains were known to contain deposits of gold, according to the U. S. Geological Survey. When the Spanish explorers came to southeastern North America the Indians showed them some rich nuggets and ornaments of gold that had been mined in the southern Appalachian region. In the seventeenth century the Spaniards mined for gold in Georgia. During the eighteenth century little gold mining was done anywhere in the Appalachians, although some writers have supposed that gold was found in North Carolina before the Revolutionary War.

Just at the close of the eighteenth century placer gold was discovered in Cabarrus County, N. C., and considerable prospecting was done in that region. The output of gold from South Carolina in 1829 was reported to be worth $3,500. From that time until the Civil War gold mining was a considerable industry in the southern Appalachians, and although the rich fields of California lured many miners from these lower-grade eastern deposits, the fever in California really stimulated gold mining in the East.

During the Civil War and for several years after it little gold was mined in this region, but in the seventies, eighties, and nineties gold mining there was more active. The gold-mining industry in the central Carolinas is not now flourishing, because the supply of free-milling ore is decreasing and because the gold cannot be extracted from the lower-grade sulphide ore at a profit.

"With Pitfall and With Gin"

"The oil-flotation process is to the mining industry of Yavapai County what the gin mill is to the great cotton business of the Salt River Valley in Maricopa County," says an article in the *Salt Lake Mining Review*. The gin mills of Arizona must then be more prosperous than those of New York and surrounding parts east, north, west, and south. At 75c. and up per "shot," the local mills doubtless make a considerable individual profit, but the overhead and underground are said to be high, and customers are not always what they seem. Neither are the beverages that the vintners sell (we hear). Curiosity as to the mysterious + habit + plain human cussedness are making the wake of Old John Barleycorn "some occasion"!

Geologists of Note

George Davis Louderback

AN ORDERLY MIND, imagination, and initiative, with an appreciation and love for humanity and nature, are basal elements in the make-up of a scientist. George Davis Louderback has, step by step, reached an eminent position as a geologist. The qualities which have contributed to this successful outcome have also endeared him to his associates and his students. At present he is professor of geology and dean of the College of Letters and Science of the University of California. His parents were pioneer residents of San Francisco, and he received his education in the California schools and University. On graduation he became an instructor in the University of California under Dr. Andrew C. Lawson. Soon after he became professor of geology in the University of Nevada. An incident will show the conditions that a new and, in this case, a youthful instructor has to face when installed in a strange place. On Dr. Louderback's arrival at the University of Nevada, and after meeting the president, he was turned over to the superintendent of buildings and grounds, to be shown his classrooms and facilities for instruction. The superintendent was gruff and direct. "Here's your place," he said, as he ushered the worthy professor into a small room. The walls of the room were the worse for wear, and the windows were covered with scratches where students had tested out minerals on the glass. In the center of the room was a heap of all the minerals of the department. It looked liked a sample ready for flattening and quartering. There was a battered table and four broken chairs. Dr. Louderback looked around at the superintendent—and smiled, to be met by an answering smile.

GEORGE DAVIS LOUDERBACK

After serving two years as research assistant of the Carnegie Institution of Washington, Dr. Louderback returned to the University of California in 1906, and was rapidly promoted until he attained the professorship of geology in 1917. The value of sound preparation in fundamentals rather than a high degree of specialization was demonstrated by his selection to take charge of a geological expedition into China for the Standard Oil Co. of New York. On the completion of his work in North China he conducted geological work for the Chinese government in Szechuan, and finished his Far East experience by three months investigations in the Philippines.

When the United States entered the war in 1917 the State Council of Defense for California organized a series of scientific investigations. Dr. Louderback was made chairman of the committee on geology and mineral resources. Under his direction a survey of the chrome and manganese resources of California was organized, with a corps of volunteer assistants, for the purpose of encouraging the mining of these minerals. In 1918, the U. S. Geological Survey placed him in charge of the investigation of chrome and manganese resources of California and the U. S. Bureau of Mines secured his services for similar work on the manganese resources of the same states. Dr. Louderback has marked organizing ability and possesses the faculty of getting others to work with him. His most effective work is in geological research and in the instruction of geological students. He made studies of Basin Range structure, the Truckee sedimentaries, and the oil-bearing formations and stratigraphy of the Pacific Coast. He discovered the gem-mineral benitoite. His methods are thorough, and mining and geological students from the University of California are well grounded in fundamental geology.

A wide field is covered by Dr. Louderback's activities. He served as secretary for the Cordilleran section of the Geological Society of America for a long time, and in this capacity stimulated research work on Pacific Coast geological problems. He assisted in founding the Seismological Society of America. He was secretary and later chairman of the Pacific Association of Scientific Societies. He is a fellow of the American Association for the Advancement of Science, member of the Washington Academy of Science, California Academy of Sciences, American Institute of Mining and Metallurgical Engineers, American Geographical Society, Geological Society of America, Mineralogical Society of America, the Committee on Sedimentation of the National Research Council, and many clubs.

Classifier Efficiency

Improvement Over Former Methods of Determination Suggested — Elutriation Preferable to Screening Tests

BY R. T. HANCOCK
Written for *Engineering and Mining Journal*

IN HIS recently published "Handbook of Ore Dressing," p. 214, A. W. Allen gives the following formula:

$$\textit{Efficiency of Classification} = \frac{100\,(t + t')}{F}$$

where t = tonnage of oversize in the coarse product, t' = tonnage of undersize in the fine product, and F = total feed tonnage. He gives an example of the performance of a Dorr classifier treating 1,100 tons, and producing a coarse-product discharge having 84.9 per cent of plus-65 mesh and 15.1 per cent of minus-65 mesh, the fine-product discharge consisting of 5.8 per cent of plus-65 mesh and 94.2 per cent of minus-65 mesh, the tonnage of coarse-product discharge being 790 and fine-product 310. The efficiency is given as 87.5 per cent.

The efficiency of a classifier cannot be obtained in this way. The problem is exactly similar to the obtaining of the efficiency of an operation of ore-dressing where what is desired is the separation of two substances of different nature, ore and waste, whereas in classifying the separation desired is of substances differing in size —coarse and fine. Therefore the same type of formula is applicable to both cases.

The formula which I have evolved for obtaining the necessary information (*Mining Magazine*, September, 1918, and *E. & M. J.*, April 10, 1920), may be written:

$$\textit{Percentage metallurgical efficiency} = \frac{\%\ \textit{recovery} - \%\ \textit{concentration}}{\%\ \textit{of waste in feed}}$$

or,

$$= \frac{\%\ \textit{concentration} \times (\textit{enrichment ratio} - 1)}{\%\ \textit{of waste in feed}}$$

In applying the formula to the classifier the percentage recovery is the weight of the plus-65-mesh material in the spigot or coarse products, expressed as a percentage of the weight of the plus-65-mesh material in the original feed, assuming that 65 mesh is the size at which it is desired to divide. The percentage concentration is the weight of the spigot or coarse product expressed as a percentage of the weight of the original feed. The enrichment ratio is the ratio of the percentage of plus-65-mesh material in the spigot or coarse product to the percentage of plus-65-mesh material in the original feed. The percentage of waste in the feed becomes the difference between 100 and the percentage of plus-65-mesh material in the original feed.

Calculated in this way the efficiency in the instance given by Allen is shown to be 68.1 per cent, and not 87.5 per cent, and it can further be shown that Allen's formula would give positive values of efficiency in cases where no segregation of the coarse sizes into the spigot product took place, but where the classifier merely split the feed into two parts of similar nature, in which case it would, of course, be operating with zero efficiency as a classifier.

In a classifier making only two products, spigot discharge and overflow, or in classifiers of the Dorr type, it is not necessary to know the weight of the products made, or of the feed. The efficiency can be calculated from the screening assays alone. In multiple-spigot classifiers it is necessary to know what percentage the weight delivered by each spigot is of the original feed. It is necessary, of course, to know the screening assays of feed, spigot discharge, and overflow in the former instance. A mere statement of the screen assays of the final products is useless, as Allen states.

Complete statements of the performance of multiple-spigot classifiers appear to be rare in technical literature. The only one I have seen is given in Richards' "Textbook of Ore Dressing" on p. 228. Where this table is reproduced in "Peele" (p. 1,662) the percentages which each spigot product and the overflow form of the original feed are omitted, as though the importance of this information had not been realized.

The data which Richards gives are as follows:

SIZING TEST OF FEED AND PRODUCTS FROM RICHARDS, DEEP-POCKET FREE-SETTLING CLASSIFIER

Size, mm.	Feed	1 Spigot	2 Spigot	3 Spigot	Overflow
On 0 907	0 41	0 0	1 49	0 0	0 0
0 566	20 55	52 5	17 90	0 40	0 12
0 427	14 84	24 62	19 90	1 50	0 31
0 351	12 39	14 30	23 60	3 70	0 43
0 277	9 87	5 22	18 19	6.90	0 81
0 206	9 05	2 61	9 60	12 09	0 43
0 137	10 03	1 00	8 20	29 50	3 67
0 130	3 59		0 79	8 21	0 62
0 107	4 08	0.38	1 81	37 75	0 31
Through	15 25				93 50
Totals	100 05	100 18	100 48	100 05	100 20
Weights	99 77	26 10	40 297	129	16.09

These figures require emendation, which has been attempted below, the figures being weights of sizes in each product.

ADJUSTED REPORT OF SIZING TEST

Size, mm.	Feed	1 Spigot	2 Spigot	3 Spigot	Overflow
On 0.907	50	0	50	0	0
0 566	2,064	1,339	716	7	2
0 427	1,477	644	802	26	5
0 351	1,314	352	895	60	7
0 277	991	134	726	118	13
0 206	786	70	454	244	9
0 137	962	27	343	531	61
0 130	271		47	209	15
0 107	573	8	57	504	4
Through	1,512				1,512
Totals	10,000	2,583	4,090	1,699	1,628

The result obtained will vary according to the particular mesh selected as a standard for the performance of the classifier, and to bring this difference out I have calculated the efficiencies for each size for all the products, as follows:

PER CENT EFFICIENCIES

Dividing on	1 Spigot	2 Spigot	3 Spigot
+ 0 907 mm		not computed	
+ 0 566	47 3	48 7	26 6
0 427	46 0	54 0	31 8
0 351	42 7	62 7	37 1
0 277	39 2	71 0	40 5
0 206	37 4	74 7	48 7
0 137	33 5	74 2	58 7
0 130	32 1	70 4	67 9
0 107	31 1	68 1	93 5

In calculating the efficiencies for the second spigot it must be remembered that its feed is the overflow from the first compartment, and not the original feed, and this overflow must first be calculated. The whole calculation is, in fact, exceedingly tedious, and anyone who thinks that the result obtained is of service in adjusting the classifier is welcome to that conclusion.

Taking the results as they stand, it is apparent that the maximum efficiency of the first spigot is associated with division on a comparatively coarse size; of the second spigot on a medium size; and of the third spigot on a fine size, which is as it should be. The high value obtained for the third spigot by dividing on plus 0.107 mm. mesh is unreliable, as much adjustment of the original figures was necessary here. The values obtained for the first spigot appear low.

In my opinion the grading assay of classifier products is best obtained by elutriation, and not by screening. By the latter what is found is the efficiency of the classifier as a screen, which it is not. Flaky particles present in the feed will be carried over to the later spigots, whereas by virtue of their size, as determined by screening, they should be found in the earlier spigot product. Perhaps this fact may be the cause of the poor showing made by the first spigot in this instance. The feed is stated to have been crushed by rolls through a 1-mm. screen.

Efficiencies for the overflow have not been calculated. Like the tailings of an ore, they would show the same efficiencies as the concentrate (here the third spigot product), but of minus sign.

Ice Formations Underground

By C. M. CAMPBELL

Written for *Engineering and Mining Journal*

FEW minerals crystallize in such beautiful forms as ice. The first illustration shows a view in an abandoned manway in the Granby mines at Phœnix, B. C. The manway is on an incline and contains a stairway. Along the roof run the electric wires, with drop lights where required. The upper part of the manway became blocked with ice, and, in the perfectly

FIG. 1. AN ICE CRYSTAL CLINGING TO AN ELECTRIC LIGHT GLOBE

quiet area below, crystals of large size have developed thickly along the walls and roof such as shown clinging to the light globe. Crystals almost a foot in diameter and of wafer thinness are quite common in the Granby mine.

Similar conditions prevail along old drifts, and in passing through abandoned stopes one occasionally comes among a congregation of ghost-like figures such as are shown in the second picture. These usually gradually disappear with the arrival of warm weather. Owing, however, to the working out of the deposit in recent years, the lower levels have been connected with the surface of large openings and permanent ice has gradually formed in the winter in the abandoned parts of the different levels, filling up, partially or completely, the drifts and stopes. The air currents in the summer take on the temperature of the ice, and one can now stand at the mouth of one of the tunnels,

FIG. 2. ICE STALAGMITES IN AN ABANDONED STOPE

on the hottest summer day, and face a blast of freezing temperature. No. 3 tunnel has an unobstructed opening 9 x 15 ft. in size; the ice on the floor is still dry 15 ft. from the portal, and has furnished a supply for the citizens all summer. Though the temperature may be 80 deg. F. outside, icicles are still forming on the timbers, and the tunnel is a veritable region of winter.

Ensenada's Mineral Resources

The Ensenada Consular District, Mexico, according to *Commerce Reports*, is rich in gold, silver, copper, lead, zinc, and iron. Magnesite is shipped from Magdalena Bay. The Mexican onyx quarries near Santa Catarina are the largest in the world. An immense surface deposit of iron ore at San Isidro gives much promise. Since 1911 mining has been on a decided decline, the one exception being the El Boleo copper mine, at Santa Rosalia, where a French company has produced steadily and successfully for a number of years. The company has its own smelter and operates its own ships, important considerations under the recent political conditions.

With the return of normal conditions and proper guarantees this will be a most attractive region for mining investments, for there are abundant surface showings and other indications that in Lower California important ore deposits await the pick of the prospector.

By the Way

Camille Industrielle

While conducting a research in polyglot technical literature, the consulting engineer observed that a report on the Alsatian potash field, by Monsieur Camille Binder, would soon be published by the *Societé de Chimie Industrielle*. Hastily jotting down the information on the back of an envelope, he continued on his special assignment. Late that night, Mrs. Babel conducted a little research of another character; technical only in its thoroughness. Being of a jealous disposition, next day she prevailed upon an ex-canteen-worker to assist her in a bit of translation. "H'm'm; let's see—*Industrielle* certainly means 'working girl.' Well! An affair of that kind may be all right for a Camille; but I tell you *we* never had such goin's on around *our* canteen!"

Some Salt

Under the heading "Some Salt" the U. S. Geological Survey informs the public, in Press Bulletin No. 455, that the volume of salt in the ocean is enough to cover the entire surface of the United States to a depth of 8,500 ft. Authorities on technical writing will agree that this use of the word "some" is not to be tolerated. It really looks as if the Survey wanted more people to read the bulletin and was descending to the use of levity to achieve its end. It would be, indeed, a whale of a lot of salt. This, we presume, is what the Survey would intimate. Besides "whale" is quite befitting a fish story and "lot" has been associated with sodium chloride ever since the days of Sodom and Gomorrah.

Quien Sabe?

A seeker after truth asks concerning a hypothetical zinc mine in the Joplin district: "What should be the average daily production of a vein, 3 x 5 ft., in a tunnel mine?" An open non-competitive examination will be held on this subject beginning at once. Both sexes may enter, but male eligibles will be preferred. A vacancy may be filled at a local sanitorium from the results of the examination.

Florida Water Preferred

The *Financial Times* of London recently published the prospectus, here given in full, of the Chemical Research Association, of Berlin, which purposes to extract gold from sea water. Unfortunately for us the term of subscription expired on Aug. 20. The announcement reads as follows:

THE CHEMICAL RESEARCH ASSOCIATION
Treasurer: O. A. SCHUESSLER
Berlin SW 19 (Germany).

BERLIN, April 20, 1920.

Dear Sir,

It is quite a well known fact, that the formerly richest gold mines of Transvaal and Alaska have become less productive and threaten to exhaust in time, as has already been the case with the goldfields of Australia and California. If no new goldfields are discovered, we shall surely steer into a gold famine.

In fact a scarcity of gold would certainly make its appearance, if it would not have been succeeded to discover new sources, the enormous abundance of which overshadows all previous wealth of gold and will cover the whole worlds demand for gold for ever!

This vast source of gold is—the ocean—the sea-water!

Careful chemical research of the sea-water brought forward the result, that it contains per ton about a grain of gold in solution. Conclusively there exists dissolved in the ocean a quantity of gold equal to 800,000 millions tons, that is to say 500,000 times as much as gold has been produced ever since the beginning of our chronology until this day!

THE CHEMICAL RESEARCH ASSOCIATION has set herself the task to secure these treasures from the ocean by a special extracting process. For technical and hydrographical reasons the South-East-Coast of U.S.A. would best serve the purpose. As soon as the preparatory work is done the works for the extraction of gold from the sea-water will be erected. In view to this THE AMERICAN GOLD EXTRACTING COMPANY with a share-capital of $1,000,000, divided into 10,000 shares, each to be $100 nominal, will be founded. The privilege to purchasing these shares will be reserved firstly to members of The Chemical Research Association. By subscription instalments of not less than 50% are to be made.

How lucrative the produce of gold is, show the gigantic profits of the gold producing concerns. The California Consolidated Virginia Mines for instance paid out in 1877 not less than $22,680,000 dividends to their shareholders.

With regards to the calculation drawn The American Gold Extracting Co. will be in a position to pour out a dividend of about $100 on each share by a years produce of only 4 tons gold already, i.e. 100%. As far as experience goes the rate of exchange of the share must then rise to at least the 15-fold. Each $100 share will then fetch $1,500 or more on exchange. As the raw-material—the sea-water—in any quantity is free of charge at our disposal, nothing can prevent us from extracting the ten-fold amount of gold and pouring out the ten-fold dividends, whereby the shares will rise to an unimaginable height!

The works of the American Gold Extracting Company will be erected on American soil and therefore is it important to get the American public interested in this enterprise and to admit English & American citizens into the Board of the concern.

From this point we beg to apply to you with the request to join the membership of The Chemical Research Association. The annual contribution for membership amounts to $10 only; by this means the membership entitles you to the privilege of purchasing 10 shares of The American Gold Extracting Company at par. Further shares are to be had at the rate of $130, whereby the Funds for International Scientific Research of our Association will be benefited with the residues and the members' fees. You will thus have the satisfaction to aid science and to increase your money as you can easily make at least $1,500 to $2,000 out of $100.

But the less wealthy who could not even afford to secure $100 for a share, shall have the opportunity to become patron of science and to earn money at the same time. He needs only become member of The Chemical Research Association and subscribe a sum divisible by 10 (at least $10). He will then receive the amount of dividend corresponding to his share.

Do not let this never returning opportunity slip by without securing a membership and shares and thus increasing your fortune! Please fill up and sign the enclosed form and kindly return it to the Treasurer of The Chemical Research Association.

Speedy dispatch is entirely in your own interest as the term of subscription expires on Aug. 20, 1920.

Warning

We warn our readers that one of these days they are going to read something like this in the *Engineering and Mining Journal:* "The limestones lie uncomfortably on the quartzite beds." Our compositors are not geologists and they have not yet learned that there is such a word as "unconformably." So far, we believe, we have always caught the error but we feel it in our bones that sometime it is going to slip in.

CONSULTATION

A Mining Agreement

"What share of profit is it customary to receive from a mining company when the ore fields belong to one party who locates the ore, and is sole owner, and the other party being a company who furnish the equipment, machinery and attend to the operating, mining, handling, treatment and commercial disposition of the product; the owner party acting as superintendent and actively engaged in directing the enterprise?

"This is identified in two classes:

"A—Owner party who owns the ore and works in any capacity.

"B—Equipping and operating party, who furnishes the money for machinery and labor, but none of this party does any actual labor and only supplies necessary money for equipment and operating.

"I believe the profit divided equally between A and B would be commensurate until B receives the amount of B's investment and 20 per cent annually for the time it took to return B's amount in half the entire profit. If B invested $10,000 and it was paid back to him in his share of profit in two years, then he would receive 20 per cent on the $10,000 for two years. Time being specified as that in which the mine is in operation, Sundays and legal holidays considered same as working days if in a time when the mine is in operation, but if operation should be suspended for a specified time, winter months, or indefinitely, interest to discontinue.

"Individual conditions vary according to the circumstances to be taken into consideration, but A having valuable copper bearing ore, is located near railroad with labor and supplies convenient, is favorable to B's operations.

"I would like your opinion here, and to learn if I can, what is generally customary."

The sum and substance of your statement indicates that one party is to be sole owner of the property and is to be actively engaged as superintendent directing the enterprise, while the other party is to furnish the equipment and attend to the financing of the operation, for which arrangement profits are to be equally divided between the two parties with interest at the rate of 20 per cent annually paid to B, the party contributing the finances.

This strikes us as an unusual arrangement. In the first place all A is virtually doing is raising a certain amount of money to operate the property, paying an unusually high interest rate *until all of B's money is returned* and hoping to pay back the principal in short order. All business connections between A and B will presumably be severed when this condition has been fulfilled. The provision that the interest discontinue during the time that the mine operations are suspended is a peculiar restriction, as an unsuccessful attempt to work the property, followed by a shutdown, would free party A from paying interest on the borrowed funds. Although this arrangement is unfair to B there are other considerations manifestly unjust to A's share in the agreement.

It should not be forgotten that in the proposed development of the property A has nothing to lose financially and everything to gain, but B's position is just the reverse. No provision has been made for a possible failure in the enterprise, something which is the rule more than the exception in the run of mining ventures.

As to what arrangement is generally customary in working mineral deposits, no hard and fast rule can be laid down. Frequently a bond and lease are taken upon the property with the intent of working, and paying for the land at regular intervals. Such a plan ordinarily contemplates complete purchase of the prospect or mine. If the owner desires to retain an interest in his property an agreement whereby he is to retain part possession in return for privileges granted to the operating parties might be consummated, but a plan such as you have outlined provides that one party act purely as a financier and does not become part owner of the property.

An important consideration and one which is not included in your statement is the condition of the mine. Its prospective value depends chiefly upon the profits to be won from ore exposed and the possible profits to be obtained from the extension of ore beyond exposures disclosed by development.

Is it assured beyond a shadow of a doubt that the enterprise will be successful? Have the risks incident to mining operations been carefully considered? The unwisdom and impracticability of laying down any general rule to follow is due to the difference between mining and other business ventures.

Ability to raise sufficient capital to work a mine alone would depend upon the owner's credit and a showing of the property sufficiently satisfactory to induce capital to finance the operation.

The arrangements that can be made are largely dependent upon individual circumstances and no generalization can be made. There should be concessions on both sides, and a willingness for both parties to cooperate in deciding upon what are fair and business-like terms.

The sale of a mining property or a prospect and a mutally satisfactory arrangement to purchaser and seller has been a bone of contention in the mining industry ever since mines were first operated. The vendor frequently lets his imagination picture the value of his property and its possibilities unduly great whereas the purchaser ordinarily adopts a Missourian attitude. An inability to reach an agreement has hindered the development of many promising mining prospects.

With the thought that perhaps some of our readers may care to contribute their experiences in arrangements for purchasing, selling, or operating mining properties, we are publishing your letter and our reply in these columns.

Highest Quicksilver Average Price

"What was the highest monthly average price of quicksilver during the war?"

The highest monthly average price of quicksilver during the war as indicated by *Engineering and Mining Journal* quotations was attained in February, 1916, with an average quotation of $283.50 per flask of 75 lb, which is almost four times the current quotation of about $75 per flask.

THE PETROLEUM INDUSTRY

Financial Record of Scotch Oil-Shale Companies

Details of the Amalgamation, Effective in November, 1919, by Which Practically All the Going Companies Were Merged Under the Control of the Anglo-Persian Oil Co., Ltd. Attractive Dividends Heretofore Paid

Written for *Engineering and Mining Journal*

IN VIEW of the serious endeavors now being made to inaugurate in the United States commercial operations in oil-shale treatment, the financial records and results of the companies which have been engaged in this special industry in Scotland for more than half a century become of special interest. Data on the subject have been accorded critical consideration abroad, incidental to a large merger plan which has just been effected, in which practically all of the going Scotch companies have been amalgamated and united to the interests of the Anglo-Persian Oil Co., Ltd., a world-wide organization in which the British government has a large financial interest and a dominating control.

The records indicate that the Scotch operators in oil shale have not always had clear sailing financially, even in recent years. Financial data of the early stages of the business are not available, but records of corporate readjustments, and the fact of the practical merging of a large number of small companies into five large companies reflect the earlier financial history of this Scotch industry. Even in recent years, after the technical difficulties incident to the infancy of any industry have been overcome, all of the companies except one, the Pumpherston, experienced financial embarrassments, as is evidenced by the varying and in some cases consistently low dividends declared. In fact, some of the companies report "nil" dividends as late as 1910 to 1914. The dividend record of the Pumpherston company, the premier of the Scotch oil-shale companies, is, however, as satisfactory as anyone could reasonably expect, and the general valuation placed on all of the securities of these companies in the financial plan of the new merger, which was only effective late in 1919, is evidence of the substantial soundness and large potentialities of the business.

In May, 1919, the Anglo-Persian Oil Co., Ltd., after a long and thorough investigation, submitted a proposition to form and adequately finance a merger of the Scotch oil-shale companies. This plan was obviously in pursuance of the expansion program of that powerful organization in the oil industry, but it was also opportune for the oil-shale companies, for they were having some difficulty in maintaining sufficient production to keep the refinery installations, incident to the development, going at full capacity. Trouble was also threatened because of the demand of the miners for increased wages equal to the greatly ascending scale of the British coal miners, and general conditions rendered it unlikely that the Scotch shale oil companies could maintain separately the large earnings made during the war. The proposal of the Anglo-Persian company was duly accepted by the requisite number of shareholders, and the change in control and policy and the unification of the shale-oil companies became effectual in November of 1919.

SHARE DISTRIBUTION OF THE NEW COMPANY

The new company, known as the Scottish Oils, Ltd., has a capital of £4,000,000; shares, £1. Of the total shares 3,000,000 are 7 per cent (non-cumulative) participating preference shares and 1,000,000 are ordinary shares. After the payment of 7 per cent on the participating preference shares the ordinary shares will be entitled to receive 7 per cent, and of the remaining distributable profits, the participating preference shares will receive 25 per cent before further distribution of profits to all shares alike are made. It is expected that the new company will be able to pay 7 per cent on the preference and ordinary shares and to leave a surplus for both classes of shares equivalent to at least a like dividend return.

The basis of the acquisition of the several unit companies and a record of their capital and of their dividends follows:

THE PUMPHERSTON THE LEADING COMPANY

The principal of the Scotch companies, the Pumpherston Oil Co., Ltd., registered 1883, capital £450,000, shares £1, has a very good dividend record. In addition to paying 6 per cent on £150,000 first and second preference shares, the distributions on the ordinary shares, of which £285,000 were issued, have been as follows: For 1900, 20 per cent; 1901, 15 per cent; 1902, 7½ per cent; 1903, 20 per cent; 1904 and 1905, 30 per cent; 1906 to 1910, inclusive, 50 per cent annually; 1911, 30 per cent; 1912, 35 per cent; 1913, 35 per cent and a bonus of £1 3s.; 1914, 25 per cent; 1915, 10 per cent; 1916, 25 per cent; 1917, 40 per cent; 1918, 40 per cent; 1919, 40 per cent; 1920, 30 per cent. In the report of April, 1919, a credit balance of £221,324 is shown, which, after deducting dividends on preference and ordinary shares, and transferring £14,000 to new plant account, and writing off £3,064 for improved plant and £3,000 for reserve fund, left £36,059 carried forward. The reserve is given as £110,000.

The £1 shares have the following recent market quotations: 1917, highest, £4 25/32; lowest, 79s.; 1918, highest, £5⅜; lowest, £4¼; 1919, highest, 98s.; lowest, 81s. 9d.

This company was taken into the merger on the basis of £5 for the ordinary shares, payable in fully paid 7 per cent (non-cumulative) participating preference

shares of a par value of £1 each in Scottish Oils, Ltd.

Young's Paraffin Light & Mineral Oil Co., Ltd., registered in 1886, had a capital of £700,000, made up of 175,000 shares of £4 each, and 113,202 shares were issued. In addition, the company had an issue of first and secured bonds totaling £300,000. The issue of £150,000 of second-charge bonds, in addition to 6 per cent, carried a right to interest at twice the dividends payable on the ordinary shares. The dividends on ordinary shares from 1919 average about 4 per cent only. The data are somewhat complicated by the preference interest payments made on the second-charge bonds of £150,000. The financial showing is not good, a fact which is mirrored in the offer of the merger to purchase the whole issued capital at 63s. per share, payable in preference shares in Scottish Oils, Ltd.

The Broxburn Oil Co., Ltd., registered in 1877, had a capital of £335,000, of which £100,000 was represented by preference shares, entitled to a cumulative dividend of 6 per cent. The dividends on the ordinary shares since 1900 have averaged better than 10 per cent (free of tax). The merger paid £2 each for the whole of the ordinary shares, the £2 being payable in preference shares in Scottish Oils, Ltd.

The Oakbank Oil Co., Ltd., registered in 1886, had a capital of £300,000—£100,000 preferred and £200,000 ordinary shares. The dividends from 1900 have ranged from 7½ to 15 per cent; since 1915 they have been 15 per cent (free of tax). The company had reserve funds of £61,940. This company was taken into the Scottish Oils, Ltd., at 37s. 6d. for the ordinary shares, payable in preference shares.

James Ross & Co. (Phillipstown Oil Works, Ltd.), which had a capital of £135,000 in £1 shares, was taken over by the Scottish Oils, Ltd., at 25s. per share.

In the same financial program, the Scottish Oils, Ltd. purchased for £150,000 cash the British Petroleum Co. and the Homelight Oil Co. Both of these companies were oil-distributing organizations, the latter already controlled by the Anglo-Persian Co. The inclusion of these companies in the merger is significant of the general program to broaden the Scottish Oils by finding facilities to distribute not only the products from the shale but crude oil products as well.

Will Get Crude from Anglo-Persian Company

The Anglo-Persian Co. has made a contract, effective January, 1923, to supply the Scottish Oils, Ltd., with crude oil to keep its refineries going to full capacity, a factor which will tend greatly to insure maintenance of dividends for the new company by removing one of the drawbacks, which was inherent under the plan of independent companies, of depending principally on oil from shale for the refinery supplies. It is expected that a shale will also be made from the unification of management and of equipment and facilities. The marketing organization and facilities of the strong parent company will also be of great advantage to the new operations.

It has long been known that the Scotch shale companies found it advisable and profitable to mix part of their oil product with refined oil bought in the market from the producers and refiners of crude oil. It is presumed that this practice will be continued with increased advantage under the new close financial relation with a strong producer and refiner of crude oil.

The plans of the new company, or its parent organization, the Anglo-Persian Co., with regard to the extension of the engagements in the oil shale business are not yet known. The Anglo-Persian Co. recently has made investigations of the oil shale of New Brunswick, and an agent of the company has been negotiating with some of the owners of oil-shale land in the Colorado-Utah field. It is not likely that the Scotch operations can be largely expanded because of the limits of the shale deposits which are available for cheap mining. Other deposits in the British islands have been investigated, and it is reported that they will be made the basis of new operations soon, but whether by the interests allied with the Scottish merger or not is not disclosed. It is expected that extensive improvements in equipment will be installed at the Scotch plants at an early date.

Polish Oil Industry Important, But Faces Many Difficulties

Oil is, at present, the chief reliance of Polish export and the principal means by which the Minister of Finance hopes to bring about a real stabilization of the valuta (exchange). Just now there is a crisis in the Polish oil industry according to *Commerce Reports*.

When the Polish administration of Eastern Galicia began, foreign capital rushed into the oil fields. Before the war British (chiefly Canadian), French, Belgian, German, and Dutch capital was invested, although the majority control was in Austrian hands. After the close of the conflict more British, French, and Belgian money was brought in so rapidly that during the last year practically the entire industry has changed hands, refineries as well as oil fields. French capital now predominates. One of the largest French companies is the Mugeot, which acquired its lands by direct purchase from the proprietors. There is very little American capital, only one company being recorded.

The oil situation in Galicia has developed rapidly. New wells are being constantly discovered and brought in. By June 15 the owners of oil-bearing lands in Galicia would no longer give options. They would consent only to sell outright.

The crisis in Polish oil dates back to 1909. It was accentuated during the war, particularly after the Russion invasion of Eastern Galicia. For several years no search was made for new wells and no oil extracted from the old ones, and only recently has the oil business been revived. The industry was greatly in need of organization and equipment. Former Austrian restrictions had to be removed, and war devastation repaired. A peculiarly irritating difficulty arose because, before the war, practically all technical materials used in the Polish oil industry were imported from Bohemia, Upper Silesia, and Sweden. Independent Poland found all these sources of supply closed, which occasioned great delay in production.

For the year 1919 the total production of oil in all Poland was slightly over 83,000 tanks of a capacity of 10,000 kg. each. These figures do not compare favorably with the total of 107,000 tanks produced in 1913 (the last pre-war year) and the 205,000 tanks produced in 1909.

The Panstwowe Urzad Naftowy (State Bureau of Oil Control) has had many labor, production, and price troubles. For instance, the coal supply of Upper Silesia, which is necessary to the full development of the Galician oil wells, is as yet not assured to Poland.

Relation of the Bureau of Mines to the Oil Shale Industry

Activities Should Be Devoted to Technologic Rather Than to Economic Factors—Problems Include Standardization of Testing Methods and Retorts as Well as the Securing of Much Fundamental Data

By J. O. Lewis
Chief Petroleum Technologist, U. S. Bureau of Mines
Written for the *Engineering and Mining Journal*

IN THE opinion of the United States Geological Survey, with which opinion the Bureau of Mines is in accord, the future petroleum needs of the United States cannot be supplied from domestic oil fields. Three alternatives are possible: Curtailing the consumption, going abroad for petroleum supplies, or developing other home resources for petroleum and its products.

The first choice is obviously not acceptable. The second is not the most desirable, in that the United States would no longer be self-sustaining, and might be forced to face unpleasant possibilities of foreign complications. Furthermore, there is no assurance of continued adequacy of such supplies. Although the country is now drawing upon importations, and must continue to depend upon that source of supply, it is highly desirable that the development of every possible domestic resource be promoted; and of the home resources, the oil shales constitute the most promising potential reserve of raw material from which petroleum products or substitutes can be derived. It seems inevitable that this latent resource must be drawn upon for at least a large part of the future needs of this country.

At present the oil-shale industry can be termed an "industry" by courtesy only. It is struggling to establish itself, but as yet is not on a demonstrated commercial basis. It is endeavoring to work out the technique of mining the shale, of recovering the oil, and of refining the products almost without precedent or example as a guide, for the Scotch shale industry can hardly be considered a satisfactory source of technical methods and practice, because of dissimilar conditions, particularly economic, and shale oil cannot be refined in precisely the same way as petroleum.

Promoters' Methods Hamper Development

The industry is faced with a host of problems, both technical and economic, which demand solution. Much of the money now being spent in endeavoring to prove the commercial feasibility of oil shale is being wasted because of the lack of fundamental data. The pioneers in the industry, upon whom falls the brunt of the struggle, are largely groping blindly, duplicating efforts or spending money in unproductive experiments. The larger and more conservative interests, although fully believing in the future of the oil-shale industry, are for the most part hanging back before risking their money, until the data necessary for the engineering appraisal and development of the industry become available. The industry, moreover, is beset with a plague of promoters who are mulcting the public and who threaten to discredit the future of the business by their extravagant claims or dishonest methods. Both the public and the legitimate interests should be protected by the Federal Government's making available reliable and impartial technical information from which correct opinions of the possibilities of the industry may be formed.

The Bureau of Mines has given much thought as to what part it should take in this development, and has sought the opinions and advice of most of the responsible engineers and men concerned. There are two broad phases, one the economic and the other the technologic. Under the economic may be grouped the cost factors, which include the cost of mining, of crushing, of extracting the oil from the shale, and of refining the oil products or recovering the byproducts. The other economic factors are the value of the products and byproducts and their present and future markets. Upon the favorable balance of cost against sales value of the products is dependent the profit, and this, of course, is the key to the situation, for the industry will attract capital only when it can be demonstrated that a reasonable probability exists that it can be put on a profitable basis. The margin between costs and values of products is the most important factor to be learned in the oil-shale industry.

Government Financing of Commercial Operations Not Recommended

The technologic factors include the richness and extent of shale deposits, methods of mining, methods of crushing, methods of extracting the oil to get the largest yield of the best quality oils at the least cost, how to refine the oil, and how to recover byproducts. Obviously, the economic and technologic factors are intimately associated, one controlling the other, but the main concern of the Bureau of Mines must be with the technologic rather than with the economic factors. This is particularly true of the strictly commercial aspects, for although estimates may be made of the various costs, and of the values of the products, only commercial operations will establish these factors definitely.

The Bureau of Mines holds that it must concern itself mostly with the technologic factors, and that the industry, through private enterprise, must answer the commercial questions. The Bureau therefore does not recommend that the Government finance commercial operations, because it believes private interests rather than the Government should make such a commercial test, but believes that investigations by the Bureau of Mines of the technologic factors will yield information of the utmost value to private enterprises in working out the economic factors.

What experimental and investigational work the Bureau undertakes must necessarily be controlled by the means at its disposal. At present its means are meager, and it has been unable to take up the many opportunities for service which await its attention. What it does in future is largely contingent upon the

appropriations it receives. The Bureau has plans prepared which are outlined in a general way in the paragraphs following. All of its plans are predicated upon the central idea that the chief asset and the greatest faculty for service of such a Federal agency as the Bureau of Mines is its disinterested position, which enables it to perform functions which no private concern, no matter how wealthy, can fulfill. It is in position to get information which a private concern would hold as a trade secret. Thus it can become a clearing house of information for the industry.

Much data of a fundamental nature should be supplied by the Bureau. This information will be necessary before the design and operation of retorting and refining plants can be undertaken intelligently. These fundamentals include such factors as the rate of heating of the oil shale, transmission of heat through oil shale, the effect of size of particles of shale, the effect of vacuum or reduced pressures, the effect of high pressures, the effect of steam atmospheres under various conditions of temperature, and the effect of atmospheres of other gases, such as carbon dioxide, carbon monoxide, hydrogen, and illuminating gas. Better ways even than retorting the oils from the shales may be found, such as the use of hot solvents.

Some of the Refining Problems to Be Solved

Investigations should also be conducted on the quality of products. An important problem is how to refine shale oils with the least loss and expense, for it is not generally appreciated that in the Scotch shale industry, which produces an oil superior to any so far examined from American shale retorts, there is a refining loss, including the coke, of 25 per cent. Unsaturated hydrocarbons, olefines and diolefines, are formed in retorting the shale, which are removed in ordinary refining processes. Investigation should be made as to how to minimize the formation of such undesirable compounds, or how best to treat them in refining.

Promotion literature emphasizes the large values in lubricants derived from shale oil. The information of the Bureau of Mines is to the effect that the lubricating values are likely to be very disappointing, as all lubricants examined so far indicate a quality of small value. It is possibly inherent in the breaking down of the organic materials in oil shale that only lubricants of low viscosity will be formed, and therefore they will be of small value, but the conditions under which these compounds are broken down will have an important influence on the final products, and a way to make good lubricants may possibly be discovered.

Testing Methods Should Be Standardized

The Bureau of Mines can serve a useful purpose by standardizing testing methods. Test methods which are reproducible, so that one can obtain comparable results, are always needed; otherwise there is no way of fitting together the odds and ends of information gained from all sources. These should go further than mere laboratory testing methods, and the Bureau of Mines contemplates the acquisition of a shale deposit of approximately average constitution, which will be used as a standard shale so that such shale can be sent to various plants to be tried out or to be tried out under various conditions, or to be used in research, that results, wherever obtained, will be comparable, inasmuch as all will be conducted on the same material. This will permit of a comparison of various methods, of differing conditions, and of many types of retorts; also it will provide a basis of comparison of different varieties of shale.

The standard shale should be supplemented by a standard retort which can be established at some convenient point by the Bureau of Mines. Such a standard retort should be a one-unit Scotch retort, not because the Scotch retort is believed necessarily to be the retort ultimately to be adopted by the American industry, but because it is one well understood, both as to design and operation, and in which reproducible results can be obtained. It is therefore the most suitable for establishing a present standard.

Byproduct problems are sure to be an important feature of investigation. One of the big questions today is whether to construct and operate the retorts to treat the maximum tonnage of shale, or to reduce the tonnage in order to recover ammonia. Prevalent opinion in the United States is that it will not be profitable to recover ammonia. The Bureau of Mines has seen no convincing facts supporting this contention, and it is one of the subjects which should be investigated.

Other byproducts have been mentioned. Not only should study be made of possible byproducts, but of prospective markets for them. Such markets may be already established, or they may be established by substituting oil-shale products for other materials.

Materials of construction should also be studied. For example, the capacity of the byproduct coke oven has been increased by two or three fold since its adoption in the United States, largely through the employment of silica brick, with a high rate of heat transmission, to replace the firebrick used in Europe, which has a much lower rate of heat transmission.

Although mining does not lend itself readily to investigations, the Bureau of Mines can be of great service on this subject also. The Bureau publications contain no data that can serve as a precedent for mining American oil shales, as shale is not entirely similar to any other material. In open works it is perhaps most similar to the handling of cement rock, limestones, and like substances. In drift mining it is more similar to mining coal, yet with certain differences. The Bureau investigations might well include the best kinds of powder to use, the best system of mining and breaking down the rock, safety devices, mine timbering, and all allied and complementary subjects.

Oil Shale in Esthonia

The use of oil shale in Esthonia is increasing rapidly, according to a bulletin of the Guaranty Trust Co. The Esthonian Ministry of Commerce sells several thousand poods every day, and receives about 500 orders of about 225 poods each. The small purchasers burn the shale in their dwellings, and several large factories also have adopted this fuel. Experiments in heating ships' boilers with oil shale are planned.

Oil Exploration in Ensenada, Mexico

Considerable exploring for oil was done in 1919 in the Ensenada consular district, Mexico. Concessions have been granted and some geological surveys made, but no drilling operations were conducted. More active prospecting is expected in 1920, and Canadian interests are reported as planning to drill near Rosario.

Oil Shales and Petroleum Prospects in Brazil

Suitable Processes of Extraction Will Make Available Large Petroleum Resources That Are Abundantly Distributed Throughout That Country

By Horace E. Williams*

BRAZIL has extensive petroleum resources in oil shales, which are found in different parts of the country. Although many of the shales are rich, suitable processes for the extraction of the oil are lacking, and at present only a few small experimental plants are producing oil by distillation from shales. The regions including the Upper Amazon, the Acre, the Rio Negro and the Peruvian frontier have received little investigation, although they appear to be the most promising fields for explorations in the country.

Information as to the detailed structure and distribution of the rock formations in the State of Maranhão is very meager. The Permian beds are exposed along the Rio Parnahyba for over 1,000 km., and, generally, over the southern and eastern half of the state. These beds are covered largely by thinner Triassic and Cretaceous formations. Although the Permian rocks have undergone considerable folding in a minor way, the material in hand seems to indicate a general synclinal structure across the state, with the main axis bearing northeast-southwest. On the middle reaches of the Itapicurú and Mearim rivers, bituminous shales are found together with calcareous sandy and marly beds associated with limestones.

Shales Overlain by Boghead Coal

At the occurrence on Rio do Inferno, the beds strike east and west with a dip of 30 deg. south. The lowermost bed consists of a boghead coal, somewhat similar to the Marahú beds of Bahia, overlying a thick bed of well-laminated bituminous shales. In the bed of the Rio Mearim, the bituminous shales are covered by a limestone with siliceous and gypsiferous intercalations. These beds have a southerly dip and are covered by over 50 m. of flaggy sandstones. At Grajahú, farther southwest, the same gypsiferous limestone occurs, but without the bituminous shales, which, if present, are below the water level of the river. The limestone dips northeast with the strike N. 60 deg. W. and it is covered by a red conglomeratic sandstone. Similar beds are found in the extreme southwest of the state and in northern Goyaz, on the Rio Tocantins.

The plains and lowlands of central Maranhão are covered by the lateritic formation, and observations on the underlying rocks are difficult, especially as regards character and structure. Samples of the oil shale from this region gave the following results on analysis: Bitumen, 36.5 per cent; clays, 22.6 per cent; soluble carbonates, 40.8 per cent; and on slow distillation 450 l. of oil (about 100 gal.) per ton.

Shales rich in oil are found at several places along the coast of Alagôas. The series of rocks to which the oil shales belong are found along the coast about Cape S. Agostinho, Rio Formosa, Tamandaré, Abreu da Una, and in some other localities, but at these places the unweathered shale does not appear. Farther along the beach, in latitude 9 deg. 3 min., at Maragogy, the oil-bearing shales appear at and a little above tide level. At this place they show a wrinkled synclinal structure and outcrop frequently from this point south, as at São Bento, Camaxó, Japaratubá, and in front of Pitinguy, in latitude 9 deg. 7 min., where they are exposed at low tide.

At Barreira do Boqueirão, north of the Porto das Pedras, the shale exposed has a thickness of 2 m., with a probable thickness of 3 or 4 m. in all. At Camaragibe, the shales form a wave-cut terrace about 150 m. wide, the dips observed were from 5 to 10 deg.

Shales are exposed at Barra do Santo Antonio and at Riacho Doce, in latitude 9 deg. 36 min. The exposure at Riacho Doce is quite similar to those already mentioned. Several pits were sunk, and the shales were found to be richer than those at Camaragibe.

Bituminous Beds in Bahia Have Appearance of Asphalt

The better-known occurrences of bituminous rocks in the state of Bahia are those found in the vicinity of Marahú and southward along the coast. These rocks occur along the coast in the flat region for considerable distances and widths. The Marahú deposits are about 30 km. long by about 15 km. wide. The beds contain both fresh-water and marine fossils. Resting up against the old crystalline rocks is a fresh-water series of rocks containing plant remains, which is largely impregnated with bituminous matter. This is characteristic of the western inland part of the basin. Farther east, resting on these beds, are found limestones containing marine fossils and also with impregnations and masses of asphalt. The beds are of Cretaceous age. The appearance of the bituminous and carbonaceous material everywhere is notable. These materials occur in the most varied forms. In the beds are found large solid impregnations having the appearance of asphalt; and at some points the bitumen is viscous like pitch. At Taipúmirim, cavities a meter or more in diameter and quite deep are filled with black bituminous matter. An analysis of this material gave the following: Volatile matter, 30 per cent; non-volatile combustible matter, 14 per cent; ash, 56 per cent. The material contains much pyrites. Alcohol dissolves little of it. On evaporation, it gives a brown rosin. Ether dissolves most of the material and benzol dissolves it almost completely.

Composition and Products of "Turfa de Marahú" Similar to Bituminous Coal

Resting on the Cretaceous beds, a clayey lignite is found in the lower beds of the Tertiary bluff formation of this coast. In the lowermost beds, almost at tide level, the boghead coal known as the "Turfa de Marahú" is found. This is different from other known bitumens, and is light yellow in color, with brown and gray veins, which appear as stratification planes. An analysis gave the following: Water (at 110 deg.) 2.75 per cent; volatile matter, 71.65 per cent; non-volatile combustible matter, 9.75 per cent; mineral residue, 15.85 per cent. The residue consists principally of silica, much alumina, lime, and grains of quartz. Horizontal beds of this material are exposed for a depth of 3 to 4 m. at the mouth of the Rio Arimembeca, and are said to continue in depth for over 15 m. On slow distillation, this coal yielded 430 l. of crude oil to the ton. The density of this oil varies between 0.870 and 0.880. Neither in

*Abstract of a paper presented at the St. Louis Meeting of the A.I.M.E., September, 1920.

color nor aspect does the rock have any resemblance to coal, but the composition and the products are those of the bituminous coals. It is not a bituminous schist, because the organic material greatly predominates over the mineral. The great mass of the rock is composed of yellowish-brownish humic material.

Farther south from Marahú, in the vicinity of Ilhéos, oil shales similar to those of Alagôas are found in several places. These are small exposures of beds that appear along the coast between the granite points, which hereabouts frequently extend down to the ocean. The area of these seems to be relatively small; and, although they are rich in oil content, their value remains to be determined.

Shales in São Paulo

The Tertiary basin in eastern São Paulo, on the upper reaches of the Rio Parahyba, is perhaps 150 km. long by 15 to 20 km. wide. Over a considerable part of this basin, oil shales have been found. They outcrop 10 to 15 m. above the Parahyba near Tremembé and Pindamonhangaba, where they are being mined. Quantities of these shales have been used at the gas works in Rio and in São Paulo at various times, especially during the war, on account of the shortage of coal. There exists at Taubaté a small plant for the distillation of oil from these rocks. An analysis of the shales gave the following composition: Crude oil, 13.08 per cent; water, 23.36 per cent; gas and loss, 4.02 per cent; mineral residue, 58.64 per cent. On slow distillation these shales yielded 27 gal. of crude oil per ton.

Extending through São Paulo, Paraná, Santa Catharina, Rio Grande do Sul, and into Uruguay is a persistent bed of black petroliferous shale in the upper Permian series of rocks, which is known as the "Iraty Black Shale." At places, the petroleum of these shales has been oxidized into albertite or other substance resembling coal, as about Piracicaba and Rio Claro, in the State of São Paulo. Material rich in oil is found between São Pedro and Piracicaba in beds of considerable thickness. A company has been formed recently in the city of São Paulo for explorations in this region. Near Rio Claro, several miles farther north, some drilling has been done during the last few years in an effort to find oil.

At about the same geological horizon as the above outcrops, but at a much lower level deposits of asphalt occur along the Rio Tieté near Porto Martins. Farther south, in the foothills of the Serra de Luiz Maximo, between Tatuhy and Botucatú, a heavy bed of bituminous sandstone is found some distance above the black shale. Recently a plant has been installed near São Gabriel, in Rio Grande do Sul, for the distillation of oil from these shales.

Though extensive faulting and fissuring of the strata of this region may have allowed the escape of contained petroleum in the vicinity of faults and fissures, but these are neither so numerous nor so extensive in area as to preclude its existence in other places. If one may judge by many examples known today, important deposits may still be present in the strata even in the vicinity of the eruptive dikes. Be this as it may, with regard to petroleum the fact is abundantly demonstrated that, in these shales, Brazil has an inexhaustible supply which only requires suitable processing to become available.

Oil Possibilities in Cuba

By E. R. Suarez Murias

Written for *Engineering and Mining Journal*

Petroleum indications are numerous in the Island of Cuba and consist of asphalt deposits, oil seepages, gas exudations, veins of native bitumen, pitch pools, bituminous limestones and inclusions of petroleum in igneous intrusions in the rock formations of the country.

On several occasions during the latter part of the last century attempts have been made to locate oil deposits, but without success. In the last four or five years oil has been struck at two points, one in the province of Havana, at Bacuranao, the other one in the province of Matanzas, at Cantel. At the latter place oil was found recently, whereas at the former they have been pumping it for the last two or three years. Close to the boundary of Santa Clara, at a place called Motembo, where several shallow wells were sunk years ago, two wells were sunk last year to a depth of approximately one thousand feet which produce naphtha. The owners assert that they will place this product on the market as soon as they can erect containers. Gas flows from the above mentioned relatively shallow wells at the estimated rate of one hundred thousand cubic feet per day.

Some forty wells have been drilled in Cuba during the last four or five years, although the work done has been conducted in a haphazard way. Little is known about the structural conditions of the subsoil, for geology has rarely been taken into account. In selecting sites for drilling more attention, perhaps, has been given to easy access for prospective purchasers of stock than to other more important factors governing the success of the enterprise. No conclusions should be drawn, therefore, from results thus far obtained in the attempts to locate oil. It is not surprising that the work done should have practically extinguished local interest in oil.

The oil showings above enumerated extend over miles of territory, appearing more or less conspicuously parallel to the strike of the long axis of the island over a distance of six hundred miles, covering an area of at least six thousand square miles.

Petroleum Never Considered a Metal

In reply to an inquiry as to whether petroleum ever has been classed as a metal or a semi-metal, the Director of the United States Geological Survey has made a reply which negatives any such assumption. Besides being unaware of any classification of that nature the Director does not know of it ever having been used. His reply follows:

"Neither any of my associates in the U. S. Geological Survey nor myself knows of any scientific or other classification of minerals and mineral substances published since 1867 in which petroleum is placed with the metals or semi-metals.

"As you probably are aware, oil, asphalt, and other bitumens of similar nature and origin were associated with coal even by the early mineralogists and metallurgists of the sixteenth and seventeenth centuries, and in many works were therefore placed in the stone and earthy groups, rather than with the metals. I doubt if extended research of early literature will reveal a mineral classification of any date in which these substances are put with the metals."

NEWS FROM THE OIL FIELDS

Oil Men Meet at Denver

From Our Special Correspondent

The Independent Oil Men's Association will hold its twelfth annual convention and exhibition in Denver beginning Sept. 28. The exhibition will be held in the Auditorium, and the different types of oil-producing and drilling machinery and equipment will be shown. A four-day session for papers and discussions is planned. A special train left New York on Sept. 24 for Denver, going by way of Chicago and Kansas City.

Frantz Pool, in Cat Creek, Wyo., Field Shows Enlargement

From Our Special Correspondent

Measurement of the flow of the well of the "56" Co., in the Cat Creek field, so-called because there are 56 units in the corporation, shows an output of 1,400 bbl. daily, with the sand drilled into only several feet, and it was believed that this production might be further increased. The significance of the bringing in of this well is the suggestion of the proving of the large Frantz pool for a distance at least of 3,000 ft. The Frantz No. 2 well continues production at a rate of 2,000 bbl. daily with the neighboring well, 440 ft. distant, owned jointly by the Frantz and the Midwest, showing an output of 3,500 bbl.

Walker Brothers' well, being drilled for interests idenified with the Anaconda, situated in the Cat Creek field, has an oil showing in a shale bedding above the sands, more than six barrels of oil being baled daily. This well is in what is known as the West Mosby structure, where are found the Frantz wells. Another Walker Brothers well is situated in the Kootenai dome, also in the Cat Creek field, 30 miles distant from the Frantz wells, and this well also is reported in, but the report lacks confirmation.

The Department of Oil and Gas of the California State Mining Bureau reports for the week ending Sept. 4, 1920, 16 new wells (587), 26 tests for water shut-off (859), 26 deepening or redrilling jobs (606), and 5 wells abandoned (146). The numbers in parantheses are the totals for the year to date.

More than 150,000 acres of public lands in California and Wyoming were classified during August by the U. S. Geological Survey as being within known oil and gas structures. This brings the total acreage thus classified under the Mineral Leasing Act to 340,000 acres.

Increase in August Kentucky Production

From Our Special Correspondent

Production showed up better during August than the preceding month. Wells that were completed number 255, an increase of 66. New production was 9,479 bbl., an increase of 1,950 bbl. Work under way totals 1,075 bbl. Runs of the Cumberland Pipe Line Co. for the week just closed, in eastern Kentucky, show a total of 76,808 bbl., or a daily average of 12,801 bbl. Activity in new business is again in the western part of the state. No. 3 on the C. E. Wilson lease in Warren County, rated at 50 bbl. when it was brought in a month ago, has been shot and is now good for 200 bbl. daily production. Whittle No. 1 on the Bailey farm, Warren County, was shot Thursday at 440 ft. The well started flowing at once, and production is rated at 300 bbl. Whittle No. 4 also has been brought in, rated at 125 bbl. Two others are going down on this lease.

Butler No. 1 was drilled in four miles south of Franklin in Simpson County, rated at 19 bbl. an hour. The well is only 150 ft. deep. It is the first shallow well in the county and has boosted the value of leases.

Phillips & Stewart recently brought in No. 3 on the Willoughby lease, Allen County, estimated at 200 bbl. a day. No. 1 and 2 are small wells. No. 4 is going down.

New Wyoming Pipe Line in Operation

Other News from Wyoming Fields

From Our Special Correspondent

The thirty-nine-mile pipe line of the Illinois Pipe Line Co. from Rock Creek oil field to the Midwest Refining Co.'s plant at Laramie is in successful operation. About 160 bbl. per hour are being transported.

The Bolton Creek Oil Syndicate recently brought in a 1,200-bbl. well in the Bolton Creek field, 20 miles southwest of Casper, Wyo. This is the largest producing well in the district.

The Riverton-Wyoming Refining Co. plans to raise capital for improvements and enlargements on its Riverton refining plant. The plant in treating Dallas field (Lander County) crude oil must now market the heavy residue which could be converted into lubricating oils at a considerable profit.

Part of the Graybull plant of the Midwest Refining Co. will be altered to treat oil from the Hamilton field. This oil is heavier than that treated heretofore and a different handling is required. About 40 per cent of the plant's capacity will be employed on the work of obtaining the new supply.

Texas Oil Transportation Agreement Ended

Empire Pipe Line Co. To Transport Oil in Cars

From Our Special Correspondent

The oil transportation agreement between the Texas Co. and the Empire Pipe Line Co., a Cities Service subsidiary, regarding crude petroleum transportation between Burkburnett and Healdton, has been cancelled by mutual agreement, to take effect Oct. 1. Hereafter all oil gathered at Burkburnett by the Empire Pipe Line Co. will be transported in tank cars.

The Empire Gas & Fuel Co. filed suit in the federal district court at Dallas on Sept. 7 against the Lone Star Gas Co. for $450,000 for alleged breach of contract. The suit arises from failure of the defendant to comp'y with the terms of a contract to buy 17,000 acres of land near Mineral Wells.

The Manhattan-Texas Petroleum Co., of Dallas, has acquired the property of the United Petroleum Trust Co. for a consideration said to be about $1,000,000. The Manhattan-Texas Co. will also purchase, if possible, producing areas in the Breckenridge field in accordance with its policy of expansion. The fourteenth consecutive monthly dividend of 2 per cent was paid recently by this company.

Breckenridge, Stephens County, is probably the most active and most interesting oil field in Texas today. The discovery of oil within the city limits has caused the formation of many small companies and partnerships, and drilling on many of the city blocks is now under way. Few, if any, dry holes have been drilled in Breckenridge, it is reported, and a big increase in production is expected in a few months.

Hull, Liberty County, was the field of chief interest on the Gulf coast during the second week of September. Five wells were completed with a total initial production of about 9,000 bbl. The largest well was the Morris-Phillips No. 11 of the Gulf Production Co. flowing 7,000 bbl. from 3,100 ft.

At West Columbia, Brazoria County, the No. 1 Abrams well of the Texas Co. is flowing about 8,000 bbl. through the drill stem after having sanded up due to a cave in the open part of the hold. Several wells in the immediate vicinity of this big well are being rushed to completion, including those of the Gulf Production Co., Humble Oil & Refining Co., Monarch Oil Co., Crown Oil & Refining Co., and Texas Company's offset wells. The deep well of the Gulf Production Co., which was completed recently at 3,700 ft., making about 700 bbl. has increased its flow so that nearly 2,000 bbl. are now being obtained.

ECHOES FROM THE FRATERNITY

The Federated American Engineering Societies

The Organizing Conference held in Washington on June 3 and 4, 1920, was attended by 140 delegates representing over 71 organizations, having an aggregate membership of over 110,000, or over 80 per cent of the aggregate membership of all of the organizations that were invited. The questions have been asked: "Who are these men?" "Who were invited?" and "Who should be interested in this movement?"

The Federated American Engineering Societies is constituted of engineering and allied technical organizations, whose chief purpose is the advancement of the knowledge and practice of engineering and allied technical arts which are not organized for commercial purposes. It includes the individual engineer and the allied technologist, who is represented through the society or societies of which he is a member which have membership in the organization. It includes civil, mining, metallurgical, mechanical, electrical, testing, railway, highway, municipal hydraulic, sanitary, water works, bridge, agricultural, illuminating, heating, ventilating, refrigerating, safety, radio, fire protection, automotive, industrial, military, marine, naval and chemical engineers, and architects, naval architects, chemists and geologists. These branches of engineering and allied sciences cover the whole range of activity in this country upon which is dependent its economic success. It has been said that

"Everywhere you look you see the work that the engineer has done."

FORMATION OF THE FEDERATED AMERICAN ENGINEERING SOCIETIES

Engineers and allied technologists have been content to perform their work without notoriety. Dating from a period considerably before the war, the engineer was gradually developing class consciousness, and a desire to be of public service. This desire was intensified as a result of the World War and led to the formation of Engineering Council by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. In the effort of these societies to determine in what way their activities could be improved and rendered of greater value, committees were appointed by each, and these committees in turn appointed conferees, who met and organized the Joint Conference Committee. As a result of this intensive desire for service, it was the unanimous opinion of the Joint Conference Committee that a comprehensive organization was desirable that could speak for the engineering and allied technical professions wherever engineering experience and technical training are involved, as well as in matters of common concern to these professions. This recommendation was accepted by the constituent societies who authorized the Committee to call, without delay, a conference of representatives of national, local, state, and regional engineering organizations and affiliations for the purpose of bringing into existence the comprehensive organization recommended. The Committee issued a call to 110 engineering and allied technical organizations for the thoroughly representative Organizing Conference of June 3-4, 1920, which has been characterized as the greatest event in the engineering history of this country.

This Organizing Conference, without a dissenting vote, created The Federated American Engineering Societies and authorized the Joint Conference Committee to act as the Ad Interim Committee between its adjournment and the first meeting of its governing body, American Engineering Council.

PROGRAM

First Meeting
of American Engineering Council
of
The Federated American Engineering Societies

Washington, D. C.

November 18-19, 1920.

All Sessions in Small Ball Room
New Willard Hotel

THURSDAY, NOV. 18, 1920.

MORNING SESSION

8:30 A.M. *Registration.*

10 A.M. *Opening Session of American Engineering Council of Federated American Engineering Societies.*

1. *Call to Order by Richard L. Humphrey, Chairman, Joint Conference Committee.*
2. *Election of Temporary Chairman.*
3. *Election of Temporary Secretary.*
4. *Appointment of Temporary Committees:*
   (a) *Program.*
   (b) *Credentials.*
   (c) *Constitution and By-Laws.*
   (d) *Nominations.*
   (e) *Plan and Scope*
   (f) *Budget.*
   (g) *Resolutions.*

AFTERNOON SESSION

2 P.M. Address, *"Engineering Council," J. Parke Channing, Chairman.*

2:30 P.M. *Discussion of the field of activity for The Federated American Engineering Societies.*

FRIDAY, NOV. 19, 1920.

MORNING SESSION

9 A.M. 1. *Report of Committee on Nominations.*
2. *Election of Permanent Officers.*
3. *Report of Committee on Constitution and By-Laws.*
4. *Formal Ratification of Constitution and By-Laws.*
5. *Report of Committee on Plan and Scope.*

AFTERNOON SESSION

2 P.M. 1. *Report of Committee on Budget.*
2. *Report of Committee on Resolutions*

EVENING SESSION

8:30 P.M. 1. *Introductory remarks by the President of American Engineering Council.*
2. *Address by Herbert C. Hoover, President, A. I. M. E.*

9:30 P.M. *Informal Reception and Smoker.*

SATURDAY, NOV. 20, 1920.

9 A.M. *Organization Meeting of the Executive Board of American Engineering Council.*

PUBLICATIONS OF THE JOINT CONFERENCE COMMITTEE

Immediately following the Conference, the Joint Conference Committee prepared an abstract of the proceedings of the Organizing Conference in Washington, copies of which were mailed to each of the organizations originally invited to participate and to the technical papers. The Committee was instrumental in securing the co-operation of the technical press and through the courtesy of McGraw-Hill Company, Inc., published and distributed a sixty-four page booklet entitled "Engineers Unite," setting forth "The High Spots in the Washington Organizing Conference, June 3-4, 1920, as Reported and Interpreted by the Editors of the Technical Press," in the issues immediately following the Conference. The Committee issued a formal invitation to each organization, originally invited to the Organizing Conference, to become a Charter-Member of The Federated American Engineering Societies, and to appoint delegates to the first meeting of American Engineering Council to be held in November of this year.

The Joint Conference Committee also edited and published in pamphlet form, the Constitution and By-Laws of The Federated American Engineering Societies which have not only been distributed to the organizations invited to participate, but also to the technical press, and to others, and copies are available for general distribution

The Joint Conference Committee received communications from the participating organizations and others asking for interpretations of the constitution and by-laws, or for explanation of matters pertaining to the movement, and as it was of the opinion that

there were doubtless many others to whom the same information would be helpful therefore decided to issue bulletins contining the information requested, which would be available to the organizations invited to participate, as well as to the technical press. Nine bulletins have so far been issued. These bulletins first make announcement of Society action in the matter of membership in, and then answer mooted points in connection with, The Federated American Engineering Societies. Copies may be obtained by any engineering organization not already supplied, on request to The F. A. E. S., Engineering Societies Bldg., 29 W. 39th., New York.

Joint Conference Committee Organized by A. I. M. E. and Mining Congress

A conference called by Herbert Hoover, president of American Institute of Mining and Metallurgical Engineers, and comprising representatives appointed by the governing bodies of American Mining Congress and American Institute of Mining and Metallurgical Engineers, was held at the Engineers' Club, New York City, Monday evening, Sept. 13, 1920. Those present were Herbert Hoover, Bulkeley Wells, Edwin Ludlow, Walter Douglas, J. R. Finlay, B. B. Thayer, A. C. Morrison, E. P. Mathewson, Walter R. Ingalls, J. F. Callbreath and Bradley Stoughton.

The purpose of the conference was to formulate plans and establish a committee to co-ordinate the activities of the Mining Congress and the institute in respect of legislative work relating to the mining industry. As examples of work needing to be done were mentioned: The co-ordination of government work at Washington so as to place the appropriate work within the field of the United States Bureau of Mines the Geological Survey, and other bureaus relating to mining; the formulation of a revenue-producing tax which shall supply the deficiency resulting from the expected reduction in excess profit taxes; the maintenance of adequate statistical service to the mining industry; assistance to gold mining; making possible an appeal to the Court of Claims by claimants who fail to secure relief from the commission established by the Minerals Relief Bill.

By unanimous vote Herbert Hoover, James F. Callbreath, Bulkeley Wells and Bradley Stoughton were added to the conference committee.

The committee then organized by the unanimous election of Walter Douglas, chairman, and Bradley Stoughton, secretary, and on motion adopted the title "Joint Conference Committee of Mining Congress and Institute."

The joint conference committee is made up as follows: Walter Douglas, chairman, 99 John St., New York; Bradley Stoughton, secretary, 29 West 39th St., New York; James F. Callbreath, secretary American Mining Congress, Washington, D. C.; J. R. Finlay, 170 Broadway, New York; Herbert Hoover, 115 Broadway, New York; Walter Renton Ingalls, 115 Broadway, New York; Edwin Ludlow, 149 Broadway, New York; E. P. Mathewson, 42 Broadway, New York; A. C. Morrison, 30 East 42nd St., New York; Henry M. Payne, 50 Church St.; W. L. Saunders, 11 Broadway; J. E. Spurr, Tenth Ave. and Thirty-sixth St., New York; B. B. Thayer, 42 Broadway, New York; Bulkeley Wells, 201 14th St., Denver, Col., and care of H. Payne Whitney, 120 Broadway, New York; Daniel B. Wentz, Land Title Building, Philadelphia, Pa.

Labor Conditions in Central and South America Resemble Our Own

Analysis of Mental and Physical Conditions of Peoples by V. L. Havens—Cures Suggested Emphasize Engineers' Chance for Service

The Editor of *Ingeniería Internacional*, Verne L. Havens, has returned from a seven-months' trip through Panama, Peru, Chile, Argentina, Brazil, and the Windward Islands. Nearly everywhere he has found that, though each people believe their problems are peculiar to themselves and their locality, the reported troubles were always of the same nature.

The inhabitants throughout the Americas are in a highly nervous state, he finds. They are groping for new ideals and standards on which to base their lives. No doubt this is due to the excitement and emotions released by the war, and the remedy lies in the hands of the leaders, who should and must teach peace, co-operation, and calmness.

The second great fact is the actual shortage of labor, and specially of skilled men. The millions who have died by land and by sea, the more millions that today will not or can not work, are the cause of a world-wide deficit. For example, men are scarce in São Paulo, because those who in Europe formerly made cloth and pottery and leather for the Paulistas no longer do so. The Paulistas must and do make it for themselves; but those who make cloth cannot also build the railways, or plant coffee, or load ships. The resulting establishment of the small new industries at home has drawn men from other home labor, and they have not been replaced. Buenos Aires has now to furnish farm and ranch hands to the Argentine to replace Spanish and Italian "golondrinas" whose flying trips are at an end. They stay at home, or visit France, at harvest time.

The shortage of men and lack of production have forced up wages and prices. In general wages have risen 50 per cent throughout South America; but the number of working hours has decreased 20 per cent, and productivity has fallen to about 75 per cent of the standard of a few years ago. No doubt the latter is due, in part at least, to the general nervous tension. In the worst cases these conditions have combined to make the cost of production today 250 per cent of that of 1913.

Two Ways to Improve Conditions

Mr. Havens finds there are only two ways to improve this existing state of affairs. His first cure, which will require years for completion, is to train the boys of today to take the places of the skilled labor of yesterday. Much quicker help is promised by the second solution, the introduction of machinery wherever possible to reduce the labor of the men still working. This would include the greater development of waterpower, and stopping the unnecessary mining, transportation and burning of fuels.

Peru is perhaps the first South American country to recognize and act on the immediate necessity of sanitation as essential to the preservation of the children and the future manpower of the nation. At Paita the government has ordered the incineration of all but six houses to destroy the centers of infection there. Sanitation is no longer only a humane issue but has become a crucial national economic problem, and its neglect involves definite monetary loss to family, nation, and the world at large.

It is evident, that, as Mr. Havens remarks, "The work of the engineers of this generation will decide whether we are to progress or retrograde; and perhaps at no time in all the centuries to come will the engineers and industrial executives of all the Americas have the opportunity to build for the future, that lies before them today."

The Story of Petroleum

Bureau of Mines Offers a Very Complete Film Survey of the Oil Industry

A new four-reel motion picture film telling the story of petroleum has just been completed by the United States Bureau of Mines in co-operation with the Sinclair Consolidated Oil Corporation, and will be loaned for educational purposes to those desiring the same. Applications should be addressed to the Director, U. S. Bureau of Mines, Washington, D. C. In this film the entire story of the petroleum industry, including prospecting, production, refining, distribution and its ultimate uses, is shown in such a way as to be readily understood by the layman as well as the engineer student.

The Bureau of Mines has recently completed films showing various phases of the mining and metallurgical industry, and it is hoped that the borrowers of these films will treat them with the same care that has been taken in preparing them. Those requesting the loan of any films belonging to the Bureau of Mines are expected to pay the cost of postage both from the Washington office and return.

Technical Papers

Petroleum in Alabama—The most that can be said of Alabama as an oil-producing state is that prospects are promising. The "structures," so dear to the heart of the true oil man, are favorable in several parts of the commonwealth. The discoveries in Texas and Louisiana have caused many to wonder if the neighboring state of Alabama did not also have some petroleum possibilities, and the State Geological Survey (University, Ala.), has prepared Bulletin No. 22 (p. 230, free), which is a compilation of all existing information on the subject. The first forty pages form a very readable account of the manner in which oil occurs and how to go about finding it, information which is of general application.

Educating Miners—The number of mining employees in this country considerably exceeds a million, about 74 per cent of whom are engaged in coal mining. Mississippi is the only state in the Union in which the work of extracting minerals from the earth is not a recognized industry. The problem of educating mine employees is a branch of vocational education which is extremely important, and a thorough discussion of the subject is contained in "General Mining," Bulletin No. 38 (p. 168), issued by the Federal Board for Vocational Education, Washington, D. C., from which it may be obtained free of charge. All executives who seek increased efficiency of mine, mill, and smelter employees, and freedom from accidents will find much of interest in this book.

Electro-deposition — *The Mining Magazine* (London, price 1s. 6d.) published in its July and August issues a discussion of the late Prof. S. B. Christy's work on the electro-precipitation of gold and silver from cyanide solutions. The article is by J. E. Clennell, and occupies, in all, twelve pages.

Petroleum Research—A seven-page article in the Sept. 8 issue of *Chemical & Metallurgical Engineering*, by Martin J. Gavin, tells the story of the technical development of oil-shale retorting in Scotland and indicates the necessity of research work on domestic shales.

Talc—A new use for talc has been found as an ingredient in fire-resistant paint. A three-page mimeographed report on the subject is contained in the U. S. Bureau of Mines *Reports of Investigations* for August, Serial No. 2,150. (Free from the Bureau on request.)

Compressed Air Blasting—Rock which is easily split and in which joint planes are absent may be "blasted" with 100 lb. compressed air, inserted through a drill hole, after starting the fracture with a spoonful of black blasting powder. The method is explained in *Reports of Investigations*, Serial No. 2,154, issued by the U. S. Bureau of Mines, Washington, D. C. (Free.)

Petroleum—The A. I. M. E. (29 W. 39th St., New York, N. Y.) has published three papers to be presented at the September petroleum meeting of the Institute in St. Louis: "Petroleum Industry of Trinidad," by G. A. Maccready; "Application of Taxation Regulations to Oil and Gas Properties," by Thomas Cox; and "Oil Shales and Petroleum Prospects in Brazil," by H. E. Williams. Brazil has enormous undeveloped oil resources in her areas of rich shales.

Gold and Silver.—"Gold and Silver in 1918" (pp. 60), a separate chapter of "Mineral Resources," has been issued by the U. S. Geological Survey.

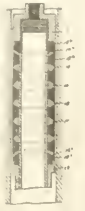
Iron in Europe—A discussion of the condition of the iron industry, a short description of the principal iron districts, and a tabulation of the iron-ore reserves in the new states of Europe are contained in a four-page article in the Sept. 9 *Iron Trade Review*. (Cleveland, Ohio; 25c.) Austria and Hungary have been shorn of their coal and iron resources, to the profit of Czecho-Slovakia.

Petroleum Bibliography—The U. S. Bureau of Mines is publishing periodically a list of recent important articles on petroleum and allied substances. It forms part of the *Reports of Investigations* series and may be obtained as issued upon request to the Bureau.

Recent Patents

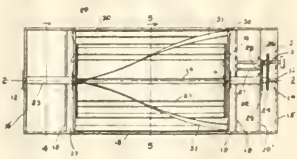
1,350,553. Oil-Well Packer. Patrick H. Mack, Bradford, Pa., assignor to Oil Well Supply Co., Pittsburgh, Pa. Filed Nov. 23, 1915.

In packing structures for wells, a tubular body member, opposing recessed end members carried thereon, an upper expansible member entered in one end member, a lower expansible member entered in the opposite end member, a series of expansible members intermediate the upper and lower expansible members, and a series of rigid members alternating with the intermediate expansible members.



1,350,509. Sand and Slime Separator. James D. McDonald, Hayden, Ariz. Filed Aug. 5, 1918.

In a slime and sand separator, the combination with a casing having an inlet at one end, a slime outlet at the other end, and a sand outlet at one side; of an outer reel rotatably mounted within the casing and having blade moving past said sand outlet, and an inner reel mounted within the outer reel



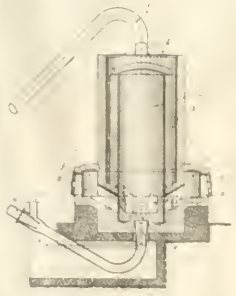
and rotating in the opposite direction, both reels having skeleton heads.

1,351,003. Well-Drilling Bit for Oil, Water, or Gas. Jefferson D. Pace, Shreveport, La., assignor to Acme Oil & Drill Co., Inc., Shreveport, La. Filed July 19, 1919.

In a well-drilling tool, a hollow drill rod, a coupling sleeve screwed upon the lower end of the drill rod, a block received within and screwed to the sleeve but spaced from the end of the drill rod, said block having a flared extension at its lower end, said extension having a circumferential series of slots, bits held upon the tool, said bits having beveled edges conforming to the flare of the extension, lateral extensions on each bit and adapted to fit said slots for holding the bits against longitudinal movement, said coupling sleeve being internally beveled to co-operate with the beveled edges of the bits to hold the bits in clamped position with their lateral extensions received within the slots.

1,315,551. Smelting of Ores in Suspension. F. H. F. Hampton, Sewell Chile, assignor of one-half to W. W. Stenning, London, England. Filed March 30, 1916.

A smelting process which comprehends projecting a finely divided self-fluxing material upwardly into a zone sufficiently heated to cause the formation of melted slag; permitting the



melted globules to coalesce to form a bath of slag and valuable products, and causing all the gases to escape at the base only of said zone.

MEN YOU SHOULD KNOW ABOUT

Edwin Higgins has returned to San Francisco from Virginia City, Nev.

D. M. Liddell has returned to New York City from Joplin, Mo.

O. C. Davidson was on the Gogebic range the week of Sept. 13.

Messrs. Condit and Howell are working in northwestern India, and not in Idaho.

A. W. Newberry of New York City, is in Canada. He expects to return early in October.

A. E. Holmberg has joined the mechanical engineering staff of the McKinney Steel Co.

J. B. Umpleby, who is now doing oil geologic work in Oklahoma, is in the East on a business trip.

David G. Kerr and a party of friends and associates are on a vacation in the woods of northern Michigan.

E. C. Dyason, of Victoria, Australia, was recently re-elected president of the Chamber of Mines of Victoria.

C. M. Weld, mining engineer, has returned to New York City after an absence of two weeks in West Virginia.

Arnold Jere Noerager, chief electrical engineer of the Braden Copper Co., Rancagua, Chile, is in San Francisco, Cal.

Prof. Robert M. Raymond, of the Columbia University School of Mines is in Santa Fe, N. M., this week on private business.

C. W. Purington, mining engineer, left Hakodate, Japan, about Aug. 7, for an examination of the coal fields of northern Sakhalin.

B. C. Yates, superintendent for the Homestake Mining Co., at Lead, S. D., is in Denver attending the First Aid and Mine Rescue contests.

H. A. Jenison of the U. S. Geological Survey is in San Francisco. He is completing a trip through the copper producing sections of the West.

O. U. Bradley, oil and gas inspector on the lands of the Five Civilized Tribes, Oklahoma, was in Washington, D. C., at the end of August on official business.

J. C. Kinnear, smelter superintendent of Nevada Consolidated Copper Co., McGill, Nev., stopped in San Francisco recently on his return from Bully Hill, Cal.

W. P. Woodring has sailed for Haiti in charge of a U. S. Geological Survey party to continue geologic examination of the mountainous area of that republic.

Professor Henry Leighton, of the University of Pittsburgh, has been examining pyrite and iron ore deposits in northern Ontario for Pittsburgh interests.

C. J. Diebel, of Spokane, Wash., president of the United States Silver Lead Mines Co., has returned from inspecting the company's property in the Coeur d'Alenes.

Ira B. Joralemon, assistant general manager of the Calumet & Arizona Mining Co., Bisbee, Ariz., has been elected commander of the Bisbee American Legion post.

M. Poncet, mining engineer and a graduate of Saint-Etienne in 1902, was recently appointed chief engineer of the mining company of the Loire (la Société des Mines de la Loire).

Fred H. Moffit and **Herbert Insley** have completed the geologic work which they were doing on the west coast of Cook Inlet, Alaska, and are now working in the Copper River region.

L. C. Graton, geologist to the Calumet & Hecla Mining Co., of Calumet, Mich., is in Cambridge, Mass., temporarily. His address at present is: Foxcroft House, Oxford St., Cambridge. 38, Mass.

Julien Raick, recent graduate of Liege, Belgium, is studying the electrometallurgy of copper, zinc, and lead, at Leland Stanford, Jr. University. Mr. Raick is an exchange scholar of the Commission for Relief in Belgium.

H. C. Wang, vice-president of Chinese-American Industrial Corporation, Ltd., left New York on Sept. 16, and is returning to China by way of Montreal and Vancouver. He expects to sail from Vancouver on Sept. 24.

Wilbur A. Nelson, state geologist of Tennessee, has been conferring with War Department officials in connection with the survey which is to be made by the War Department of the resources of the upper Tennessee River basin.

Jacques Heuhgen, who recently graduated in geology from the School of Mines at Mons, Belgium, is spending a year in graduate study at Yale University under the exchange scholarship arrangements organized by the Commission for Relief in Belgium.

Dr. Francis B. Laney, of the United States Geological Survey has been appointed professor of geology in the University of Idaho School of Mines. Dr. Laney has done considerable work for the Geological Survey in co-operation with the Idaho Bureau of Mines and Geology.

G. F. Loughlin, head of the division of mineral resources of the U. S. Geological Survey has returned to Washington after having done some geologic work on the stratigraphy of the Narragansett basin. He also made some study of the igneous geology of the surrounding islands.

Lewis A. Parsons has severed his connection with the *Mining and Scientific Press* and is recuperating at El Paso, Texas. Mr. Parsons was formerly engineer of mines for the International Nickel Co. and also did some valuable work estimating the ore reserves of the Dome mines.

Alfred H. Brooks, who has been studying the general mineral situation in Alaska with the idea of advising the Secretary of the Interior as to the adoption of measures to stimulate the mining industry there, reached Ketchihan on Sept. 17 and will spend the remainder of the month examining the copper deposits near there.

Lapsley W. Hope, mining engineer, who has been superintendent for the Eureka-Holly Mining Co., Eureka, Nev., for the past three years, has resigned from that position. Mr. Hope took charge of the Eureka-Holly after four years spent operating mines in British Columbia, but first went to Eureka in 1912 when he was connected with the Credo-Eureka Mines Co. and later with the Adam Hill Corporation. His present address is Eureka, Nev.

OBITUARY

J. J. Welch, general manager of the Majuba Silver, Tin & Copper Co., Reno, Nev., died in San Francisco, Cal., on Sept. 10, following a major operation. Mr. Welch, who was in his sixtieth year, was long associated with the Gunn-Thompson interests.

Henry Berry, vice president and general manager of the Canadian Asbestos Co., died at Montreal Sept. 13 after a long illness at the age of 54 years. He had been engaged in the asbestos industry for many years, was a member of the Montreal Board of Trade and belonged to the Masonic Order. He leaves a widow and three sons.

SOCIETY MEETINGS ANNOUNCED

The American Electro Chemical Society meets at Cleveland, Ohio, Sept. 30 to Oct. 2.

Institute of Metals Division of A. I. M. E. will hold its customary joint sessions with the **American Foundrymen's Association** at Columbus, Ohio, during the week of Oct. 4. The technical sessions will probably be held on Tuesday, Wednesday and Thursday of that week.

Independent Oilmen's Association holds its 12th annual national convention, and a petroleum exposition at Denver, Col., Sept. 28 to Oct. 1. Headquarters will be at the New Albany Hotel and the sessions will be held in the Denver Auditorium Building.

California Metal & Mineral Producers Association will hold its regular annual meeting at its offices in the Merchants National Bank Building, San Francisco, Cal., on Oct. 27, 1920, at 10 o'clock a. m. The annual reports of the president, secretary-treasurer and engineer of the association will be submitted, three directors elected, and a special delegate elected to attend the annual convention of the American Mining Congress at Denver, Col., Nov. 15.

THE MINING NEWS

LEADING EVENTS

WEEKLY RÉSUMÉ

The hearing in the Minerals Separation-Miami Copper Co. flotation case that was to have been resumed on Sept. 15 before the master in Philadelphia has been postponed two weeks. Likewise the Federal Trade Commission has put off until Sept. 30 the inquiry into the conduct of Minerals Separation that was scheduled for Sept. 20 in Washington. In Colorado metal mine operators have conferred with the traffic agents of the various railroads in an effort to secure the re-establishment of the old freight rates on low-grade ores and concentrates. In the Coeur d'Alenes the Federal Mining & Smelting Co. has been denied a rehearing of the Star apex case. The Consolidated Virginia and other mines under Alex Wise on the Comstock lode in Nevada have given their men the $6 wage recently demanded.

At Butte the Anaconda and Davis Daly companies are reported each to claim a body of rich silver-zinc ore recently opened in the Nettie workings. The new tramway of the Walker Mining Co. at Portola, Cal., has been placed in commission. In Arizona the tax commission has cut the valuation of forty-three producing properties. The Swansea property is running again, this time under lease to Consolidated Arizona. During the week the petroleum section of the A.I.M.E. met in St. Louis.

Hearing in Miami Flotation Case Postponed

The hearing before the master in the Minerals Separation-Miami Copper Co. suit, which was to have been resumed on Sept. 15, has been deferred for two weeks. This was done in order that counsel may have opportunity to prepare the papers in an appeal which Minerals Separation, Ltd., has made, seeking to have the U. S. Circuit Court of Appeals, at Philadelphia, review Judge Morris' recent orders dismissing Minerals Separation's contempt proceedings. Minerals Separation sought by these proceedings to have the Miami company punished for contempt of court for continuing to use its present flotation process. Miami claims this is not the process described in any one of the patents of Minerals Separation.

Federal Appeal for Rehearing of Star Case Denied

The application of the Federal Mining & Smelting Co., of Wallace, Idaho, for a rehearing in the case of the Star Mining Co. against the Federal has been denied by the U. S. Court of Appeals at San Francisco. This was a case involving the apex of the Star-Morning (Federal) vein. The Federal won the case in the United States District Court for Idaho, from which the Star appealed to the appellate court and secured a reversal of the lower court. It is expected that the Federal company will now appeal for a writ of *certiorari*.

Ninety-Eight Teams Compete at Denver First Aid and Mine Rescue Meet

Homestake Mining Co.'s Team Takes Third Place in Mine Rescue Contest, All Other Prizes Going to Coal Teams—Several Mid-Year Conventions Held During Meeting

The International First Aid and Mine Rescue Meet, which convened in Denver, Col., September, 9, 10 and 11, was participated in by seventy-three first aid teams and twenty-five mine rescue teams, representing twenty different states of the Union.

The meeting was held under the auspices of the U. S. Bureau of Mines, co-operating with the American Red Cross, the Rocky Mountain Coal Mining Institute, the Colorado Metal Mining Association, the Colorado Chapter of the American Mining Congress, the Colorado, New Mexico and Utah Mine Operators Association and the Colorado Society of Engineers.

During the meet the Rocky Mountain Coal Mining Institute, the Colorado Society of Engineers, the Colorado Metal Mining Association and the Colorado Chapter of the American Mining Congress held their mid-year meetings, their sessions convening during the morning hours and the first aid and rescue contests taking place in the afternoon. Joint meetings of the various organizations were held on the evenings of Sept. 9 and 10.

The mine-rescue contest was conducted on the afternoon of Sept. 9, and was participated in by teams from Illinois, Indiana, New Mexico, Pennsylvania, South Dakota, Utah, Washington, West Virginia, Wyoming and Colorado. J. F. Bailey, assistant director of the U. S. Bureau of Mines, and J. D. Parker, chief of the division of safety cars and stations, were in charge.

In the mine rescue work a wooden gallery 50 ft. long, with straight runways, rock obstructions, falls and two pitches of 45 deg. was filled with formaldehyde and sulphur gas. Each rescue team consisting of four men and a captain, equipped with oxygen-breathing apparatus, worked out "problems" in this chamber.

In connection with the mine rescue program was a new feature, an airplane rescue stunt. Lieut. Kenneth L. Walker with his mechanic, Staff Sergeant Moore, flew from the U. S. Aviation Station at Ft. Sill, Okla., to take part in the event. An imitation mine entrance had been erected and at a signal Lieut. Kenneth L. Walker, in a De Haviland army plane, came swooping over the field with a member of the mine rescue squad. With the gallery filled with smoke, a mine rescue team penetrated the chamber and rescued the supposed victim of the explosion.

Assistant Director Bailey of the U. S. Bureau of Mines in speaking of the airplane as a factor in mine rescue work said:

"The wonderful development of the airplane within the last five years has been so rapid that though it has serious limitations, it is bound to become an important factor in rescue work. The time element is often the deciding factor in this work and airplanes are the fastest mode of travel known to-day. The greatest drawback to their use is the lack of suitable landing fields.

"A preliminary survey has indicated that airplane service might be effectively used in the flat-lying coal fields of Illinois and Indiana and a co-operative agreement has been made whereby McCook field, Dayton, Ohio, will maintain in readiness planes for assisting the bureau of mines safety station at Vincennes, Ind., in its rescue work."

Another feature of the meet was an explosion of coal dust which wrecked an artificial gallery from which the teams were supposed to rescue an entombed miner.

In addition to miners, mine inspectors and operators from practically every state in the country, there was in attendance from Pachuca, Mex., three underground safety inspectors from the Cia. de Real del Monte y Pachuca, and three others from the Cia. de Santa Gertrudis. These men were desirous of obtaining information as to methods in first-aid, mine rescue and general mine safety work and were furnished guides and interpreters by the Bureau of Mines during their stay in Denver.

There were entered a total of seventy-three first aid teams from twenty states, of which sixty-eight teams from eighteen states actually participated; in the mine rescue contests twenty-one teams from ten states entered, and seventeen teams from ten states actually competed.

First place in the first-aid contest went to the New River Company, Scarbro, W. Va., with Louis Roncaglione as captain, thus winning the silver cup donated by the National Safety Council, the silver cup donated by *Coal Age*, and still a third silver cup donated by the Coal Mining Institute of America, as well as numerous other prizes.

Second place in first aid work went to Team No. 1 (Captain James L. Bisch), St. Louis Rocky Mountain & Pacific Coal Co., Raton, N. Mex.; and third place to the DeBardeleben Coal Co., Sipsey, Ala., (Captain L. Shores).

First place in mine rescue work was won by the H. C. Frick Coal Co.'s team from its rescue station at Leisenring, Pa., (Captain S. Cominsky), taking a silver cup donated by *Coal Age*, a silver cup donated by the *Rocky Mountain News and Denver Times*, of Denver, a gold cup donated by *Coal Industry* of Pittsburgh, Pa., and several other prizes.

Second place in the mine rescue contests was won by the Wadge team of the Victor-American Fuel Co., Routt County, Col., (Robert Halbert, captain); and third place by the Homestake Mining Co., Lead, S. Dak., (L. B. Wright, captain).

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FRONT OF U. S. ASSAY OFFICE, WALL ST., NEW YORK, DAMAGED BY BOMB EXPLOSION OF SEPT. 16

The best combination standing of any team performing both first aid and mine rescue was made by the team from the Wadge mine (Robert Halbert, captain), of the Victor-American Fuel Co., Routt County, Col.

The silver cup donated by the Ironton Engine Co. for the best rating in first aid for teams from Rocky Mountain states (Colorado, New Mexico, Arizona, Utah, Wyoming, Montana, Idaho, North and South Dakota), was won by the St. Louis Rocky Mountain and Pacific Team No. 1 of Raton, N. Mex., (J. L. Bisch, captain).

Mining Association Discusses Ousting of Golden Station

More Space Needed for Students, Says Skinner, in Addressing Members—Committee Named To Assist Trustees

The action of the trustees of the Colorado School of Mines in refusing to extend the lease of the U. S. Bureau of Mines on the Engineering building at Golden, Col., which resulted in the removal of the Federal station from Colorado, came up for discussion at the meeting of the Colorado Metal Mining Association which concluded its session in Denver, Sept. 13.

Louis F. Skinner, president of the board of trustees of the School of Mines, addressed the meeting and stated that the action of the trustees in refusing to renew the lease was based upon the pressing requirements of the school for more room for the students. He stated that the attendance was increasing from year to year and that already they were crowded for suitable class rooms, and that with the increased attendance this year it was imperative that additional accommodations be provided. Other phases of the administration of the school were discussed at considerable length.

A committee was appointed consisting of Bulkeley Wells, of Telluride, George M. Taylor, of Colorado Springs, and three other members, to be appointed by the president of the Metal Mining Association, which was instructed to consult with the governor and trustees of the School of Mines and to tender to them the good offices of the Association in the upbuilding of the institution. The committee was instructed to make its investigations and report at the annual meeting of the Association which will be held early in January.

It is reported that samples of iron ore from a field near Onundar Fjordr, in the west of Iceland, which have been sent to Sweden for analysis, have been found to contain 70 per cent of iron of unusually good quality. A company is to be formed to carry on mining operations.

U. S. Assay Office Exterior Damaged in Wall Street Explosion

Powerful Bomb Kills Thirty-five at Noon Hour in Heart of Financial District

On Sept. 16, at three minutes after noon, when the financial district of New York was at its worst period of congestion, a bomb of great power exploded at Wall and Broad Streets, in front of the new building of the United States Assay Office and directly opposite the J. P. Morgan Building. Thirty-five people were killed and 200 to 300 injured. The remains of a horse and fragments of a truck point to the fact that the explosive was conveyed to the district by these means. Nothing has thus far been learned as to the perpetrators of the crime but that it is a Red outrage seems unquestionably accepted.

The Assay Office and the Morgan Building were badly damaged and many other buildings in the vicinity suffered heavily through broken windows. No one in the employ of the Assay Office was killed. The stone façade of the building is badly pitted from the force of the explosion and the windows damaged as seen in the accompanying photograph.

It was likewise at noon, on July 1, a little over a year ago, when the district was similarly congested, that the cornerstone of the new Assay Office was laid with fitting ceremony, William G. McAdoo and Carter Glass, Secretary of the Treasury, taking part. Five of the building's eight stories are below the street level and three of them above.

Chemists Discuss Potash Problems

At the recent meetings of the American Chemical Society at Chicago several important reports were presented by the division of fertilizer chemistry. Potash problems were discussed by two speakers. S. W. Parr, of the University of Illinois, described several potash shales of Illinois which were recommended as suitable for cement manufacture with potash by-product recovery. These shales having more than 5 per cent of K_2O would yield, if properly handled, over 5 lb. of potash per barrel of cement, equivalent to 70 or 80c. per barrel of by-product income.

H. A. Huston who has investigated the potash situation in Germany personally gave a full report on the situation. He says a complicated organization has resulted from the socialization of the industry. Labor is available in sufficient quantity but is very high. Transportation is difficult and very expensive. The fuel supply is short and costs are very high. This fuel situation has been particularly aggravated by the interruption of Silesian coal supplies by the fighting between the Poles and Reds. Incidentally the shortage of fuel has also resulted in the shortage of ammonium sulphate for fertilizer use.

The claim that discrimination had been made against the United States

purchasers of potash is believed contrary to the fact by Mr. Huston. He states that contrary to general belief there were no large stocks of potash available either at the end of 1918 nor at any time since then. There were certain portions of production reserved for the United States purchasers through the arrangement of the inter-allied agents who controlled these matters. However these agents were notified by someone that the United States did not need these supplies. They were, therefore, quickly disposed of elsewhere. As a consequence when purchasers from this country attempted to secure potash there was none available except at excessive prices. This has naturally led to the conclusion that the American purchaser was being discriminated against. Mr. Huston states, however, that the American purchaser has at all times been able to purchase as favorably as others who are in the market at the same time.

Special London Letter

By W. A. Doman

London, Sept. 7—Embracing as it does world wide interests in mining, it is rather surprising that the department of the London Stock Exchange in which dealings in mining shares take place has remained so long neglected. In the main, of course, this is due to the fact that finance houses and speculative jobbers of the old-fashioned school are afraid to give a lead. The public would come along with support if it were convinced that any movement would continue, but after the experience of so many false starts, it has naturally become shy. Of course, partaking of a speculative character mining shares do not appeal to investors as a whole, despite the handsome dividends paid by many companies and the substantial profits that are made on dealing. Labor troubles have created a good deal of nervousness, and mining securities naturally feel the influence at once; they are the first to fall, and not always the earliest to recover. Whether we look at gold, silver, diamond, lead or tin descriptions conditions are to a certain extent the same, though causes are not in each case of an identical nature. Just at the moment there seems to be a rift in the labor clouds, and as the gold producing companies continue to realize a substantial premium upon their output the public is turning its attention to Kaffir shares again. Unfortunately, while the position of these companies has improved to a very remarkable extent in consequence of the gold premium, some mines being enabled to convert a loss into a surplus, it is not possible to make an effective comparison of outputs to-day with those of previous years.

Formerly the Rand production was given in fine ounces; now results look better in pounds sterling. It is regrettable from a statistical and comparative point of view, seeing that the Rand is the world's greatest goldfield. Output and profits are calculated upon gold at a certain price, though it is not clear that this price is the one at which the metal will be actually sold. It may be mentioned that this year the estimated price per oz. has been: January, £5. 7s. 6d.; February, £5. 10s.; March, £5. 5s.; April, £5. 2s. 6d.; May, £5. 5s.; June, £5. 2s. 6d.; July, £5. 5s.; August, £5. 12s. 6d. The New Modderfontein is still the world's premier producer and for August had an estimated working profit of £152,000 as compared with £135,000 in July. Similarly Government Areas report £140,000, or £6,000 more, and City Deep £73,000 for last month, an increase of £20,000. Prices of Kaffirs generally seem to be on the up grade again without much sign of activity. The influence of the gold premium can be seen in another way. The Globe and Phoenix, formerly the premier mine of Rhodesia, but now approaching its end unless additional orebodies can be discovered, has just declared a dividend of 1s. per share out of gold premium.

Diamond shares are affected by erratic movements in exchanges in the same way as certain Kaffirs shares in which free dealings take place on the Continent. De Beers Deferred are down to £19, purely on exchanges. The diamond trade has ruled quiet for some weeks, partly owing to over-speculation and partly owing to exchange vagaries. The intrinsic position, however, is perfectly sound. The Diamond Syndicate has outlined a policy from which they will not deviate; consequently, whether people buy diamonds now or later there will be no cheapening per carat. The tin world is still smarting from what is regarded as bad treatment on the part of the British government when dealing with the United States during the war, and fears are entertained that at present prices many Cornish mines cannot be profitably worked. Efforts are being made between Nigerian, Cornish, Far Eastern and Dutch interests to stabilize the price of tin.

National Mining Corporation shares were quoted during the week at *nil* to 1s. owing to a further call of 5s., making the shares 10s. paid. The Corporation is sound enough and exceptionally well managed, but has to develop its interests, the latest of which is a participation of 25,000 shares in British Equatorial Oil Corporation with a capital of £200,000 in £1 shares.

Although Utah is not a zinc producer of importance, its position as one of the far-western states producing this metal makes the recent rise in freight rates of importance particularly to small producers here, who for the most part ship to Kansas and Oklahoma. The Judge Mining & Smelting Co., of Park City is the largest producer of zinc in Utah treating its zinc ores, which are sulphide in its own electrolytic plant, but taking no custom ores.

Salt Lake Convention Discusses Mine Taxation

Committee's Report Presented by R. C. Allen—Paper Read by Paul Armitage

The National Tax Association, which began its annual convention in Salt Lake City on Sept. 6, held its closing meeting, consisting of a short business session at which officers were elected, on the evening of Sept. 10. Zenas W. Bliss, formerly governor of Rhode Island, and now chairman of the state board of tax commissioners of Rhode Island, was chosen president of the association, being succeeded as vice-president by Samuel Lord, of Minnesota. A. E. Holcomb was re-elected secretary and treasurer. William Bailey, secretary of the Utah board of equalization, was appointed a member of the committee on a model tax system, of which Prof. Chas. J. Bullock of Harvard is chairman.

The closing day was occupied with the subject of mine taxation, and the speeches were of especial interest in this community where mining is the chief industry. R. C. Allen, vice-president of the Lake Superior Iron Ore Association and chairman of the especial committee on mine taxation, presented the report of the committee, which was unanimous, being in favor of an *ad valorem* system of valuation of mines, it being held that such a method of valuation, although not easy to arrive at, was entirely practicable. Mines, it was stated, should be taxed according to the same system as other property, and not according to some system of multiple taxation, the actual value of a mine to be arrived at by taking into consideration all of the data available, including income.

A paper by Paul Armitage, attorney, and director of the United Verde Extension and a former chairman of the mine tax committee of the American Mining Congress, was read entitled "Income as a Factor in Mine Taxation," which discussed the various problems in determining what a mine's income really is. Stock prices were held to be deceptive, and the ability of an expert to fix valuation was strongly called into question, it being laid down that "the final and determinative factor in all mine taxation is the income received, and in using this for mine taxation, the principle that the base of all systems must be broad, not narrow, requires that the entire income, past, present, and future, be taken into consideration."

The Guyana Gold Placer Co., on whose estates in Suriname, Dutch Guiana, extensive iron-ore deposits are said to have been discovered at the Donderbariberg, now announces that manganese ore has been found in two places in the same field, accompanying ore in quartz veins. The ore occurs in the veins as a thin layer or as an irregular string between the quartz.

Gold Dredging Started at Dayton, Nev.

Operations of Gold Canyon Dredging Co. Begun With 9-Cu.Ft. Bucket Dredge on Alluvial Deposit — Governor's Wife Throws Switch in Presence of Two Thousand Onlookers

By George J. Young

About seventy years ago, prospectors and miners traveled on foot and packed their meager equipment upon horses. They scratched the surface and made their important discoveries but there were definite limits beyond which they could not go. On Sunday, Sept. 5, over three hundred "machines" brought over 2,000 people to a flat area just south of Silver City, Nev., near where the early miners had washed all the gold they could from the alluvial material filling the canyons and then had gone to other fields. The speed and promptness with which this assemblage was brought together reminds one of the way that Mark Twain brought his celestial audience together in describing Captain Eli Stormfield's adventures in heaven.

William Prouse is said to have been washing a milk can in the creek near Dayton when he discovered glistening particles of gold in 1850. He must have worn the conventional miner's costume of the period, which was very unconventional. If 2,000 miners of Prouse's time could have been assembled alongside of the 2,000 or more who patiently waited for the switch to be thrown that started the newly constructed dredge of the Gold Canyon Dredging Co., there would have been perhaps some mutual embarrassment, but on the whole there would have been two greatly astonished and amused groups of people. The group there on Sunday were dressed in their best. There were ladies present and silk gowns and smart hats. Only the legerdemain of modern times could have assembled such an audience in such a place. There was the same blue, cloudless sky, the bright sunshine, the brown hills thinly covered with silver-gray sagebrush that William Prouse looked upon in moments free from milk-can washing and gravel sluicing. The dredge occupied the center of the picture. It floated in a small pond at the head of an alluvial plain which sloped towards the distant Carson River. People swarmed all over it and walked around the pond. Throughout the excitement the 900-ton dredge maintained its equilibrium and waved its American flag.

After the public inspection the gangplank of the dredge was drawn up and used as a speaker's platform. R. H. Elliott, assistant general manager, represented Bulkeley Wells and was master of ceremonies, being assisted by Gerald H. Hutton, engineer in charge of the dredge construction and operation. Edwin Higgins, staff engineer of the Metals Exploration Co., was the first speaker. He gave a brief sketch of the historical development of gold dredging and explained the operation of the dredge, also giving a brief summary of the features of the dredge which will be found in the last paragraph of this article. In concluding Mr. Higgins said:

"The men behind this organization are good sports. Their policy is human treatment of their men. The latest safety devices will protect the workers. This is a record job, completed in about four months of actual work. The conditions remind me of a stiff grade of a certain railroad in Arizona where to an old-timer listening to the laboring engines trying to make the grade the pistons seemed to say, 'It can't be done—it can't be done,' but when the moguls came along puffing upgrade the pistons sang, 'It's got to be done—it's got to be done,' and in a little while they would go over the top snorting, 'I knew I could do it—I knew I could do it.'"

President Clark of the Nevada State University, the next speaker, spoke of the mining industry of Nevada and of the advance made in mining engineering in relation to the University. Dr. Aurelia Rhinehart, president of Mills College, captivated the audience by a witty address in which, among other things, she pointed out that women had a considerable interest in an enterprise like gold dredging because the greater part of the gold of the country is spent by women. Governor Emmet D. Boyle concluded the addresses by describing the part played by the engineer in developing natural resources and making the production of metals a profitable business. He pointed out the relation of both capital and labor in initiating enterprise.

Dredge Started by Mrs. Emmet D. Boyle

The dredge crew, as soon as the speakers were out of the way, went to their stations and Mrs. Emmet D. Boyle started the dredge in operation. The people swarmed around and took even greater interest in watching the wheels go around than they did in getting acquainted with the motionless machine before. The dredge crew had a hard task to keep the enthusiastic spectators out of the machinery, but everything went well and afterwards all departed homewards in clouds of dust and the roar of many machines, happy in the thought that they had participated in the historic event.

The dredge was constructed by the Bethlehem Shipbuilding Corporation, the dredging department of which corporation is managed by George L. Hurst. The hull is 108 ft. long, 52 ft. wide and 8 ft. deep. It is built of steel, the main deck being of welded steel plates $\frac{5}{16}$ in. thick. The well-hole plates are $\frac{1}{2}$ in. thick, and extend through the length of the dredge, giving great stiffness to the hull. All of the framing of the superstructure is steel. The digging ladder weighs 55 tons and is equipped with 9 cu.ft. manganese steel buckets, each weighing 2,500 lb. The speed is 20 buckets per min. The steel spuds are 55 ft. long, are built of steel I beams and weigh 20 tons each. The buckets discharge into a receiving hopper and this in turn to the revolving screen 6 ft. in diameter by 38 ft. long, revolving at 15 r.p.m. and provided with $\frac{3}{4}$-in. round holes. The stacker is equipped with a 34-in. conveyor belt, 120 ft. long. The stacking height is 30 ft., the digging depth 40 ft. and the arc of swing 175 ft. approximately. The sluice and riffle area is 3,000 sq.ft. The principal water supply is provided by a 10-in. centrifugal pump, the pressure water being under an 80-ft. head. The electric motors aggregate 500 hp. and work at 440 volts. The power line receives current at 22,000 v. from the line of the Truckee River General Electric Co. This voltage is stepped down to 4,400 and then to 440 volts. The total weight of the dredge is 900 tons. The material for it was transported to the building site by motor trucks from Dayton and erected in about four months working time. Its capacity is 5,000 cu.ft. per day. The proved dredging area is 200 acres with the possibility of further extension. It is expected that five years operation is assured. The investment is reported to be approximately $350,000.

Colorado Operators Want Old Rate on Low-Grade Ores and Concentrates

Meet Traffic Agents of Ore-Carrying Roads—Industry in State in Critical Condition, It is Claimed

At the request of the Colorado Metal Mining Association, a joint meeting of the traffic agents of railroads serving Colorado metal mining districts convened with mine operators in Denver, Sept. 13, to consider conditions brought about by the recent increase in freight rates, as authorized by the Interstate Commerce Commission.

Colorado operators assert that this increase, if maintained, will result in the closing down of at least 50 per cent of the mines now operating. The increase means an average boost in production costs of smelting grades of ore of more than $1 per ton, in addition to the 50c. advance in smelting charges announced by the smelters. On concentrates the advance in many instances absorbs the small margin of profit in milling the lower grades of ore, and several of the largest milling plants in the state, according to the management, will close down unless relief is afforded.

Operators assert that the metal mining industry in Colorado is in a critical condition and that the old freight rates were, in many instances, more than the industry could bear and that the present increase means absolute disaster. They contend that the increase in rates

will not only fail to increase the revenue of the railroads but will actually reduce receipts, as there will be much less ore to handle and a corresponding decrease in incoming freight to mining camps. They ask that the old rate be restored on low-grade ores and concentrates.

They point to the fact that during the first half of 1919 the smelters treated 194,031 tons of ore and concentrates as against 152,496 tons for the first half of 1920, and assert that any further increase in operating costs will result in a much larger falling off of production for the last half of 1920.

At the meeting, the foundation was laid for an appeal to the Interstate Commerce Commission for a readjustment of rates on interstate shipments. The 35 per cent increase in these rates has stopped all shipments of manganese ores from Colorado as well as absorbed practically all profit in producing zinc bearing ores or concentrates. The advance in bullion rates also seriously affects the industry and a determined effort will be made, in co-operation with the shippers in other mining states, to secure a readjustment of bullion rates.

At the conclusion of the hearing, the carriers announced that the appeal of the shippers would be taken under advisement and that a decision would be announced within a very short time. It is believed that very substantial relief will be granted.

Recent Production Reports

Cie. du Boleo, Santa Rosalia, Baja California, produced 618,390 lb. copper in August against 781,613 in July.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Government Smelter for Alaska Not Favored

Present Situation Being Studied by Survey and Bureau of Mines—Anyox Plant a Factor

There is an insistent demand in Alaska for a Government smelter. Although officials in Washington are lending no encouragement to the idea of the Government entering the smelting business they are receiving the plea sympathetically as they recognize it as the outgrowth of a very unsatisfactory situation in the territory. Since they do not favor a Government smelter they they hope to be able to offer some constructive alternative suggestion.

The most thorough study that ever has been made of the smelter situation in Alaska is now in progress. The work is being done by A. H. Brooks, of the U. S. Geological Survey, and O. C. Ralston, of the U. S. Bureau of Mines. Among other things they will report as to whether or not the policies of larger interests in Alaska handicap in any way the smelting of ores of the smaller producers. There is a custom smelter at Anyox, B. C., just below the Alaskan boundary. It is on tidewater and apparently is well adapted to the handling of Alaska ores. The smelter is not being operated to capacity. That situation also is to be reported on.

Anaconda To Start Making Fertilizer Soon

The Anaconda Copper Mining Co., the Bureau of Mines is informed, expects to begin quantitative production of a super-phosphate fertilizer in the near future. The company intends to enter actively into competition for a fertilizer market in the middle west. By manufacturing a fertilizer containing 48 per cent of the available phosphoric acid, the company's engineers are of the opinion that the high transportation charge can be absorbed and still be able to compete with the eastern-made fertilizers, most of which contain 16 per cent of available phosphoric acid.

Complex Ores of Nevada Studied by Bureau of Mines

Experimenting on Yellow Pine Ores Since February—Also on Ruby Hill Ores

In view of statements to the effect that research on the complex and oxidized ores of Nevada is being neglected the U. S. Bureau of Mines calls attention to the work which is now in progress on these ores. Experiments are being conducted on two kinds of ores which are being obtained from Goodsprings and Eureka, Nev., respectively. The work on the Goodsprings ore has been in progress for a year. Several months will elapse before a final report can be made on that work. It can be said, however, that the work is being conducted under a co-operative agreement with the Yellow Pine Mining Co. The ores contain approximately 5 per cent lead, 5 oz. of silver and 38 per cent zinc. The lead and silver content of the 1,500 to 1,800 tons that is shipped monthly is being lost. The object of the experiments has been to volatilize the lead and silver from the zinc and to raise the grade of zinc. Thus far in the experiments it has been possible to recover in excess of 90 per cent of the silver and lead with a small zinc loss.

The work has been in progress almost continually since February. Tests are being conducted in a fifty-foot kiln. The experiments have been sufficiently encouraging to the company so that it is anxious to put in a commercial plant to carry on the method of treatment.

Work on the ores containing gold, silver, lead and copper, mostly of the oxidized variety, has been in progress for six months. This work has been in co-operation with the Ruby Hill Development Co. High extractions have been obtained from the methods employed in these experiments. Some of the work has been done on a large scale. One of the more recent tests was run on a 3,000 lb. lot. The results obtained from such tests are more to be relied upon.

Arizona Smoke Farmers Appeal to Bureau of Mines

Latter Willing To Co-operate Where Both Parties to Dispute Request It

Vigorous claims are being made by farmers in the Verde Valley in Arizona that their crops are being damaged by smelter smoke. The U. S. Bureau of Mines has been requested to advise how relief can be obtained. In reply, Dr. F. G. Cottrell, the director of the Bureau, has explained that his Bureau has no authority to take the initiative in smelter smoke cases, but that it has co-operated in technical investigations on smelter smoke difficulties where each party to the controversy requests the Bureau's co-operation. Attention was called to the fact that since crop damage is caused largely by sulphur dioxide (compared wih other gases), which is not recoverable by electrical precipitation or baghouse installations, the only effective solution is the use of the sulphur dioxide in the manufacture of sulphur acid, as is being done at Copper Hill, Tenn., by the Tennessee Copper Co. It was pointed out that this is not feasible unless the sulphuric acid can be utilized. It cannot be discharged on the ground or in the streams, even if the companies would stand the expense of its manufacture without having a market for the product. Very high stacks also may decrease the smoke nuisance.

Products of mines to the extent of 143,323,954 tons were carried on the Class 1 railroads for the three months ended March 31, 1920. Class 1 roads are those having annual operating revenues above $1,000,000. Bituminous coal occupied first place with 90,600,000 tons, in round figures. Anthracite coal ranked next with 17,300,000 tons. Clay, gravels, sand and stone, which are classed together, came next with a total of 15,700,000 tons. Iron ore furnished 3,200,000 tons of revenue producing freight while all other ores and concentrates produced practically the same tonnage. Base bullion and matte provided 195,000 tons of freight.

NEWS BY MINING DISTRICTS

MEXICO

Big Increase in Mine Taxes Collected Expected This Year

Mexico City—The secretary of the department of commerce and labor of Mexico has recently issued some interesting figures on the mining and metal industry of the Republic. According to his statement, there are 60,569 mining claims now under title of which less than half, or 30,990, are in arrears with their taxes and subject to default. Of these properties 3,868 are actually being worked at this time.

The government collected from direct taxes on mines last year only 1,891,467.66 pesos due to the fact that conditions throughout the country kept most of the mine owners either out of the country or away from their properties. A big increase will be shown for this year. Aside from the direct *pertenencia* (claim) tax, the government got 11,988,329.22 pesos out of the miners as a metal tax, which income will likewise be greatly swelled for the year 1920.

Of the sixty odd thousand mining properties now on the books only 2,017 date further back than 1892.

The Alvarado Mining & Milling Co., operating in the Parral district, Chihuahua, has asked for *amparo* in the suit which has been pending for sometime over the Elvira claim, which was denounced sometime ago and patent issued by the secretary of commerce and Industry. The Alvarado people claim the Elvira as one of their properties of long standing. In a previous denouncement, the Alvarado people won their suit but a second time the matter has come up and the parties contesting the title of the Alvarado company have begun to drive a tunnel into the Elvira, backed by a specific permit from the mining authorities at Mexico City. A suspension has been granted by the local courts and work on the disputed property must be held up until the ownership is definitely decided.

CANADA

British Columbia

Litigation Over Molybdenum Properties at Alice Arm Before Victoria Court

Victoria—There is now before the Supreme Court, Victoria, B. C., an action involving title to molybdenum properties of Alice Arm, B. C. The suit is brought by Robert M. Stewart, manager of the Stewart Land Co., of Victoria, and the defendants are the Molybdenum Mining Co. H. A. McLean, counsel for the latter, in his summing up of the situation, explained that the purpose practically was to obtain judgment as to the ownership of the property.

Stewart—It is reported that the present bondholders of the Big Missouri Group, Salmon River, Portland Canal district, do not intend to continue development work. Operations have been under way for some time by a syndicate known as the Pacific Coast Exploration Co. prominently identified with which is Sir Donald Mann, of Toronto, Ont. Both diamond drills with which exploration work has been in progress have been withdrawn. The only information made public, and it is unofficial, is that the Big Missouri presents an unusual problem, that the small amount of drilling done has not given satisfactory results, and that the complete exploration of the entire mineralized zone is a work of such magnitude that the company does not feel disposed at present to continue.

Alice Arm—There now are 230 men employed at the Dolly Varden mine, on the Kitsault River, and the output of ore for July totalled 5,600 tons, all of which was sent to Anyox. In addition a quantity of high-grade ore was forwarded direct to the Tacoma smelter. The force indicated has been divided during the summer equally between the mine and the railroad and if the snow of the coming winter makes the continued operation of the railway impossible, only about 65 men will be kept on, and that on development work. At present power for the air compressors is secured from oil engines but a hydro-electric plant is being installed on the Wolf claims which will be used for all purposes. It will be capable of providing 500-hp. for operating a 12-drill compressor. The Wolf, which is situated three miles up the river from the Dolly Varden, is reported to have given gratifying indications in diamond drilling, and tunnelling is to be started without delay.

Trail—Ore shipments received at the Consolidated smelter during the week ended Sept. 7 totaled 7,718 tons, from the following shippers:

Mine	Location	Gross Tons
Emerald, Salmo		45
Josie, Rossland		170
Mandy, The Pas		371
North Star, Kimberley		125
Nettie L., Gerrard		18
Payne, Sandon		9
Taltapin, Taltapin		4
Velvet, Velvet		27
Company mines		6,949

Yukon Territory

Dawson—The placer camps of the Yukon Valley, it is estimated, will yield $4,485,000 for the season of 1920. Practically every camp in the North suffered a heavy decline for the reason that it has been a very dry season. Hydraulic operations consequently have been much curtailed. Yields by camps of the interior of Alaska and the Yukon for the season drawing to a close are estimated by competent authorities as follows: Dawson, $1,500,000; Fairbanks, $750,000; Tolovana, $750,000; Iditarod, $500,000; Tacotna and Ophir, $500,000; Hot Springs, $100,000; Ruby, $100,000; Koyukuk, $75,000; Circle, $70,000; Marshall, $50,000; Forty Mile, $50,000; Rampart, $20,000; Chandler, $20,000. Total, $4,485,000. In commenting on the situation thus disclosed, the Dawson *Daily News* observes that if the decline in gold production is to be arrested, it will be necessary to restore the purchasing power of gold by bonus or otherwise as low grade alluvial gravel cannot be worked under present conditions.

Ontario

Labor More Abundant—Excavation for Ontario-Kirkland Mill Started

Labor conditions in the Northern Ontario mining camps are beginning to improve. During the summer many laborers were attracted by the high wages paid by the automobile manufacturers in Detroit and Windsor, and later on the call of the West for harvesters was answered by many employed in the mines. The latter are returning in considerable numbers and the dullness in the automobile industry has resulted in a movement back to the mines, which is likely to increase very shortly. Many Italians, who left as soon as the war was over, are said to have written asking for jobs and a large influx from that country is anticipated.

Kirkland Lake—Excavating for the new 100-ton mill of the Ontario Kirkland has been started. The heavy equipment will be brought in over the winter roads for installation early in the spring.

The Lake Shore main shaft is being sunk to 800 ft. and conditions on the property are very satisfactory.

The final payment on the Murray Mogridge property has been met, and title to the property is now vested in the company. It is expected that extensive development work will be done.

The Thackery Mines have recently acquired two new properties, a gold prospect in the township of Lebel, and a silver prospect in Elk Lake.

Cobalt—The McDonald Syndicate, which has a lease on the Ruby Silver Mines, is making regular shipments of high-grade mill rock to the mining corporation.

Porcupine—The 84 vein of the Hollinger has been caught on the McIntyre by diamond drills below the 1,000-ft. level. This vein system is one of the most important on the Hollinger and will mean a great deal to the McIntyre. The values as shown by the drills are higher than the average of McIntyre ore.

ALASKA

Water Shortage in Interior Curtails Placer Output

Seattle—The production of placer gold in the interior camps of Alaska has been curtailed by the shortage of water with which to carry on sluicing operations, according to Volney Richmond, general manager of the Northern Commercial Co., who has just completed an inspection tour of the interior. This condition has been brought about by the unusually light precipitation. Dredges operated this season in the Iditarod, Ophir-Tacotna and Fairbanks districts but the Berry dredges in the Circle district have been shut down all season. In the Kantishna two big hydraulic plants have been installed, one by the Mount McKinley Gold Placers Co. and another by Fairbanks capital. Mr. Richmond estimated the total gold production for interior Alaska this year at $2,985,000, and the total for Dawson district at $1,500,000.

Considerable activity in lode mining is anticipated for the winter months. The Alaska Endicott Mining Co. will carry on active development work at their Windham Bay property according to Charles W. Mason, president, who has just returned to Seattle from a tour of inspection. Mr. Mason states that 3,000 ft. of development work has been completed to date and a five-stamp mill is now running on the tailings. The company expect to finish 4,500 ft. of pipe line and also a tram line to connect the mine and mill. Machinery for a 30-stamp mill is now on the ground and will be erected in the spring.

The Crystal Group at Snettisham are operating a five-stamp mill. The Chichagof Mining Co. is preparing to install a stamp mill on the Lisianski Group next spring. A considerable amount of underground development work has been completed on this property. The Admiralty Gold Mining Co. in the Funter Bay section has also been carrying on development work during the summer months.

CALIFORNIA

New Walker Tramway in Commission —New Level Opened by Plymouth Con

Portola—The Walker Copper Co., a subsidiary of Anaconda, has completed the aerial tramway to Spring Garden and is using it to ship its concentrates to the railroad station. The tramway eliminates the motor trucks formerly used.

The Gruss copper mine has developed several new and important orebodies and the management reports that in the next few months the mine will be firmly placed on a dividend paying basis. The mill continues to work on ore formerly blocked out. Assays of concentrates two weeks ago assayed as high as $250, with none lower than $232 per ton.

Sutter Creek—The South Eureka has installed additional pumping equipment and other improvements have been made by the Central Eureka company. Under an agreement made several months ago the Central Eureka is keeping both its own mine and the South Eureka free from water. Lack of electric power is hampering operation of the pumps and the mill is limited to half its capacity every sixteen hours of each day.

Plymouth—Profitable operations continue at the Plymouth Consolidated, near Plymouth, and at the Carson Hill, at Melones, according to the report recently made by the Loring Syndicate. A new level has just been opened in the Plymouth and the extension of the orebody uncovered. The Carson Hill group is now yielding excellent ore.

Oroville—The Cherokee hydraulic mine, in the Table Mountain district, plans to resume operations. The Cherokee formerly ranked among the largest hydraulic gold producers in California and under the new management a series of crosscuts will be driven to reach the channel believed to run under Table Mountain.

MILL AND TAILINGS POND AT ANACONDA COPPER MINING CO.'S WALKER MINE, PORTOLA, CAL. TRAMWAY TO UPPER MINE IS SEEN IN CENTER. SNOW SHED ON RIGHT BEYOND MILL LEADS TO LOWER TUNNEL.

NEVADA

Comstock Miners Get Wage Advance— Machinery Company Sues Gold Pen Mines Co.

Rand—The Western Machinery & Engineering Co., of Reno, has started suit against the Gold Pen Mines Co., alleging that machinery bought is not paid for.

Virginia City—The 250-hp. electric hoist which the Goldfield Consolidated had at its Clermont shaft has been bought by the Con. Virginia to replace its steam hoist. The Con. Virginia and the other Comstock mines under Alex Wise have met the demands of the miners for a $6 per day wage.

Tonopah—The latest bullion shipments from the Tonopah district, representing about fifteen days operations in the Tonopah Belmont and West End mines were $86,000 and $60,000 respectively. Regular development and production at the principal mines are reported with no important changes. Construction work at the Belmont milling plant in Millers is progressing, the plant being remodeled to treat the accumulated tailings at that point. In the North Star mine a discovery of promise has been made on the 1,050 level which may be the downward continuation of the rich orebody discovered on the 950 level in 1912. The ore was worked both below and above the 950 level but became low grade on the 1,050 where worked. The vein at present shows a width of 5 ft., all of which i ore of excellent grade.

Divide—In the Tonopah Divide mine good progress is being made in cutting the station on the 1,000 level preparatory to crosscutting. Values and widths are holding out well in develop ment faces on the upper levels and the future appears bright. The Gold Zone and Brougher Divide both report continued development in ore of milling grade. The management of the East Divide and Alto Divide have announced that operations will be resumed at once.

Broken Hills—Official announcement from the Broken Hills mine states that the shaft at 225 ft. depth shows the vein to be 8 ft. wide and to contain ore of good grade. The vein in the south drift on the 150 level is 4 ft. wide and the ore of good grade, two feet averaging over $100 per ton. On the 80-ft level the east drift on the Belmont veir shows two feet of high-grade ore.

Pioche—All ore shipments from the Pioche district are billed on the increased freight rate schedule which went into effect on Aug. 26. The shipments for the week ended Sept. 9 were as follows: Prince Consolidated, 1,950 tons; Virginia Louis, 350 tons; Bristol Silver Mines, 150 tons; Black Metals, 150 tons; Combined Metals, 100 tons; Ida May, 40 tons; total, 2,740 tons.

The Bristol Silver Mines Co. operating the Tempest, Hillside, Gypsy, May Day, Great Eastern and National Territory, are producing a large tonnage of silver-lead-copper ore, this ore being carried over Bristol Mountain by aerial tramway to the terminal bins at the Jackrabbit, whence it passes over the Pioche Pacific Ry., a distance of fourteen miles, to connect with the Salt Lake Route at Pioche.

Last month over 1,000 tons of ore was shipped to the Salt Lake smelters. The average analysis of this tonnage was 0.02 oz. gold; 23.2 oz. silver; 12.5 per cent lead; 3.3 per cent copper; 6.7 per cent zinc; 10.5 per cent iron; 23.5 per cent insoluble; 1.7 per cent manganese; 10.2 per cent lime, and 1 per cent sulphur, making a most desirable smelting product and bringing a handsome profit to the company.

This ore is being mined principally from the Lloyd Bent winze, which is situated about 200 ft. in a southerly direction from the Gypsy shaft, and about 800 ft. from the surface. The Lloyd-Bent winze was originally sunk to develop the Gypsy ore shoot, the famous orebody from which W. M. Christian, John R. Cook and the late William Lloyd took out a small fortune during their short lease in 1905.

At a later period the Uvada Copper Co. followed the ore down and made a satisfactory production from this section of the mine. At the time when the Bristol company started operations, examination disclosed the presence of good ore in the bottom of this winze, and since then the winze has been sunk to a point 800 ft. from the surface. At this depth a station has been cut and laterals will be run to prove up the extent of the orebody. The ore is soft and easily mined.

The management plans, in the near future, to improve the accommodations at the mine, and the boarding house will be enlarged and renovated. Twenty-five men are at present employed and it now seems certain that the former wonderful production by the Bristol mines will be materially added to in the future.

ARIZONA

Tax Commission Cuts Valuation of Forty-three Producers—Swansea Again Running

Phoenix—Mining circles are stirred at present by the situation resulting from the suspension of assessment work requirements during the war. It is expected that many claims will lapse and that there will be much trouble over re-locations. During the last three years many claims have been located by prospectors and miners who have done practically no work, hoping to sell before the usual Governmental demands again might be enforced. Individuals are known to hold over 100 claims in a single name. Naturally, there can be no fulfillment of the assessment requirements in such cases. Another class, including men of means who really want to comply with the law, are now finding it almost impossible to get miners, or even laborers, to do the necessary work, even at wages higher than ordinarily paid.

The State Tax Commission has cut down by $25,000,000 the valuation of forty-three Arizona producing mines, not including reduction works. The gross assessment on producing mines has been dropped from $414,236,000 in 1919 to $329,030,000. This has been done in consideration of the fact that the mines are working at only 35 to 60 per cent of normal and upon the relatively low price of the output, much of it unsold at this time. United Verde's valuation has been dropped about $3,000,000, Extension about $2,000,000, Miami over $4,000,000, Inspiration, $8,000,000, New Cornelia, $4,000,000. Copper Queen was raised about $2,000,000, to $65,394,000, thus taking place as the mine of highest assessment, somewhat overtopping Inspiration, which has been leader in the last few years. Calumet & Arizona also was raised the same amount to $42,163,000.

Bouse—Swansea is again in operation, shipping fluxing ores to the Humboldt smelter at the rate of 70 tons a day. The property is under lease to the Consolidated Arizona Smelting Co. of Humboldt and is being operated largely by Mexican labor. The Clark lease latterly found little or no profit in operating the new mill.

NEW MEXICO

Lordsburg—Ore shipments from this district for August amounted to 79 cars or 4,369 tons, of an approximate value of $87,000. The bulk of this ore went to the C. & A. smelter at Douglas, Ariz.

UTAH

Park City—Shipments of ore and concentrates for the week ended Sept. 11 amounted to 1,722 tons: Silver King Coalition shipped 636 tons; Judge M. & S., 429; Ontario, 333; Daly West, 115; Daly, 111; Naildriver, 50; and J. B. Ireland, leasing on Scott Hill, 38. In general, operations at the camp are hampered by lack of labor.

Eureka—Tintic shipments for the week ended Sept. 10 amounted to 142 cars.

MONTANA

Anaconda and Davis-Daly in Dispute Over Promising Ore in Nettie Workings

Butte—A large body of silver-zinc ore has been opened in what are known as the Nettie workings, but under the surface of the Horseshoe claim, adjoining the Hibernia mine of the Davis-Daly. Anaconda is laying claim to the orebody. Davis-Daly is endeavoring to prove an apex. This orebody shows for a width of ten posts, all of milling grade with the exception of 30 ft. which is sulphide ore without any waste.

Several days time were lost recently at the Black Rock mine in consequence of an air explosion in the engine room.

WASHINGTON

Zinc Ore Discovered Near Northport Proves Interesting

Northport—During April, 1920, a deposit of smithsonite was uncovered on land owned by Gust Maki, a rancher, six miles east of Northport, Stevens County, Wash. It was purchased by John Gorien, of Minneapolis. By August, 1920, six cars of ore averaging 40 per cent zinc had been shipped to Wisconsin for treatment. The deposit, which occurs along a shear zone through limestone, has been explored for 90 ft. along the strike and 100 ft. vertically. The ore is crystallized zinc carbonates with only minor amounts of the sulphides so far present. The orebody will no doubt prove of limited size but it can be expected to develop a reasonably good tonnage of shipping ore. The property is situated in an active mining district but 100 ft. from a well travelled road. Its earlier discovery was prevented by the fact that the outcrop was masked by considerable hillside wash.

MICHIGAN

Gogebic Range

Ironton Mine's New Hoisting Plant in Operation

Bessemer—The new hoisting plant at the Winona shaft of the Ironton mine has been put into operation, but has not as yet been tested with full loads. The two Nordberg hoists each have two drums 10 ft. in dia. by 72 in. face clutched to the shaft, and have rope capacities of 4,500 ft. of 1⅛-in. rope wound in three layers. The cage hoist is driven by a 400-hp. induction motor with herringbone gears, and the ore hoist is direct-connected to a 1,650-hp. 525-volt d.c. motor with a rated speed of 80 r.p.m., which gives a rope speed of about 2,500 ft. per min. The flywheel-motor-generator set which carries the peak of the ore hoisting load runs at 514 to 505 r.p.m. So far the installation is giving satisfaction, but until the regular ropes come and the hoists are operated under full load and speed their real performance can not be determined.

Ironwood—Erection of towers on the Pabst-Davis-Puritan transmission line has been started. There will be over thirty steel towers in the line varying in height from 40 to 80 ft.

The Copper District

Calumet—The Seneca shaft has now reached a depth of 2,223 ft. and laterals have been driven 2,722 ft. from the 1st to the 4th levels. It is estimated that 361,000 tons of shipping rock is ready for mining. When the present development campaign is completed (about April 1, 1921) the shaft will have reached the 8th level at 2,640 ft. with a total of 7,961 ft. of lateral stope drifts from the 1st to the 6th level. The tonnage of rock that will be ready for stoping then is estimated at something over 1,100,000.

THE MARKET REPORT

Daily Prices of Metals in New York

Sept.	Copper Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N Y	Lead St L	Zinc St L
16	18.10@18.35	42.25	44.75@45.00	8.30	8.00@8.40	7.65@7.70
17	17.95@18.35	42.25	44.50@44.75	8.15	8.00@8.25	7.65
18	17.95@18.35	42.25	44.75@45.00	8.00	7.75@8.25	7.65
20	17.95@18.35	42.50	44.75@45.00	7.90	7.75@8.25	7.65
21	17.95@18.35	42.00	44.00@44.50	7.85	7.50@8.25	7.65
22	17.95@18.35	41.75	44.00@44.25	7.75	7.50@8.10	7.65

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price, to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Sept.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
16	99½	99½	112	274⅜	279½	35	35	39½	40½
17	99⅛	98⅞	112	277	281½	35¾	35¾	39⅝	40⅜
18	....	....	....	....	....	....	....	....	....
20	98	98	112	275	279½	35½	35½	40	41½
21	97	97	112	272¾	278	35⅜	35½	40⅜	41⅜
22	97	97½	112	269¾	275½	34⅞	34⅞	40⅜	41⅜

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Sept	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
16	348	99½	94¾	60½	20	353	99½	94⅛	59⅞
17	350	99½	94	60	21	351	99½	94⅛	59⅞
18	352½	99½	93⅞	59½	22	347¾	99½	94	60

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. Loeden quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Sept. 22, 1920

No encouraging factors are yet evident in the major metal market. London prices continue depressed and with exchange in the neighborhood of $3.50 any effort to raise prices here is fruitless. It is doubtful that the current year will see any material advances in metal prices, even though the present figures are, in many cases, at or below the cost of production.

Copper

Prices continue to trend farther away from those at which the larger producing interests are willing to sell. At least one large lot of metal has been sold during the last few days under 18c. f.o.b. refinery. Demand is spotty and sporadic and no evidences of any general buying movement can be detected. Inquiries for even small quantities have been few.

The foreign demand shows no appreciable change. France and Germany seem to be waiting for the settling of the indemnity question, before making any definite commercial programs. England is upset by the imminence of labor troubles which holds business in check.

Demand for forward delivery is absent but copper could doubtless be secured at little or no advance over the figures which we quote, which represent September and October delivery.

Lead

Lead is definitely weaker; the foreign importations have had a decided effect. It is not generally understood to what extent English metal has been coming into this country. In the first twenty days of this month, 5,700 tons of pig lead came into this port alone, from London. Adding to this 1,550 tons from Mexico and 350 tons from other countries makes 7,600 tons, a not inconsiderable amount, especially under the present market conditions. Brokers are offering this imported lead at 7¾@8c. New York without finding any great number of takers.

Large lots of lead have been sold at bargain prices, a considerable tonnage being marketed at 7½c., New York, for delivery during the next three months. Demand for prompt metal has been largely satisfied, but a premium over later deliveries is still asked by most sellers; 7⅞@8c., New York, for prompt and 7½c. for forward delivery about represent what lead can be obtained for in the open market at present. Chemical lead is scarcer and a premium of ¼@½c. would be asked in most cases.

Zinc

Conditions are unchanged. Business is very dull indeed and the price seems fairly constant at current levels for all deliveries though the little demand that exists is for September or October. About 1,000 tons of European zinc is reported in the harbor here, the importers expecting to enter it duty free. There is little doubt, however, that they will have considerable difficulty in doing so. Domestic producers do not feel at all kindly about this imported metal, news of which came at a time when market conditions had just begun to improve.

Tin

Tin is very quiet and the market is irregular, with price changes of ⅛@¼c. for the same grade of metal on the same day. Indications are that certain dealers are under considerable pressure to sell. Electrolytic has been in fair demand for small lots at prices equal to, or ⅛@¼c. under, those for spot Straits.

Straits tin for future delivery: Sept 16th, 45.50@45.75c.; 17th, 45.75@46.00c.; 18th, 46.00@46.25c.; 20th, 45.25@45.50c.; 21st, 44.75@45.00c.; 22d, 44.75@45.00c.

Arrivals of tin in long tons: Sept. 13th, Penang, 225; 15th, Liverpool, 50; London, 25; 16th, Rotterdam, 25; London, 25; 18th, China, 20; Straits, 15; 20th, Singapore, 50; China, 175; London, 50; Liverpool, 50.

Silver

The silver market for the last week has been fairly steady, with business on a moderate scale only, owing to continued scarcity of offerings, and a not very keen demand for China account.

In the early part of the year, the Indian government prohibition against dealing with silver coin otherwise than as currency was cancelled, and the Indian traders are therefore again able to melt and use rupees in other form than coin. Exports of silver from San Francisco to the East, for the period Sept. 1 to 10 were 2,695,000 oz. Exports of silver from New York to London, for the period Aug. 21 to Sept. 1 were 243,170 oz.

Mexican Dollars—Sept. 16th, 71⅞; 17th, 71⅞; 18th, 71; 20th, 71⅞; 21st, 71⅞; and Sept. 22d, 71⅞.

Gold

Gold in London on Sept. 16th, 118s. 6d.; 17th to 22d incl., 117s. 6d.

Foreign Exchange

Sterling was firmer toward the end of last week but has reacted so that today's price is not far different from that obtaining a week ago. On Tuesday, Sept. 21st, francs were 6.63c.; lire, 4.32c.; and marks, 1.55c. New York funds in Montreal, 11 per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 35c.; 98@99 per cent, 34.8c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Spot metal, 7¼c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 7@7½c. W. C. C. brand, 9@9½c. Chinese needle antimony, lump, firm at 7½@9c. per lb. Standard powdered needle antimony (200 mesh), 11½c. per lb. Market dull.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4 per lb.; sulphate, $1.60. Market probably firm for some time.

Iridium—Nominal, $350@$400 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum** Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100@$110 per oz.

Platinum—Firm at $115 per oz.; $105 per oz. in 100 oz. lots.

Quicksilver—Market quiet; $75 per 75-lb. flask. San Francisco wires $75. Weak.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 70@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c. California production has fallen off, even since May, owing to the low price, which does not permit operation of mines that were worked in 1918 when prices were $1.50 a unit for 50 per cent. The market is strengthening, and should prices rise some abandoned properties will be reopened. There are considerable tonnages of 40 per cent ore at different points in California, which are being held for prices of 50@60c. a unit, f.o.b. cars, California.

Iron Ores—Lake Superior ores, per ton, delivered at Lower Lake ports: Old Range bessemer, $7.45; Old Range non-bessemer, $6.70; Mesabi bessemer, $7.20; Mesabi non-bessemer, $6.55.

Manganese Ore—65@75c. per unit, seaport; chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 70@75c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $5, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 18—Zinc blende, per ton, high $49.90; basis 60 per cent zinc, premium $46; Prime Western, $45; fines and slimes, $42.50@$40; calamine, basis 40 per cent zinc, $36. Average settling prices: Blende, $45.60; calamine, $38.72; all zinc ores, $45.57.

Lead, high $109.05; basis 80 per cent lead, $100@$90; average settling prices, $105.10 per ton. Considerable lead tonnage shipped this week was purchased on $110 basis.

Shipments for the week: Blende, 12,995; calamine, 71; lead, 2,459 tons. Value, all ores the week, $853,830.

The zinc market was lifeless until today, with offerings of only $42.50 basis Prime Western. Today over 10,000 tons sold on a $45 basis. Offerings of lead dropped today to $90 basis, but the bulk of ore shipped was contracted on $100@$110 basis.

Platteville, Wis., Sept. 18—Blende, basis 60 per cent zinc, $49.75, contract, to $51, open market, base for high-grade. Lead ore, basis 80 per cent lead, $100 per ton. Shipments for the week: Blende, 969; calamine, 39; lead, 93 tons. Shipments for the year: Blende, 50,015; calamine, 2,399; lead, 4,208; sulphur ore, 1,241 tons. Shipped during week to separating plants: 2,569 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground.

$15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30@$35 car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Gypsum—Raw crushed rock, $3.50@$4 per ton; raw ground fine, $4@$4.50; calcined stucco, $9, all f.o.b. works. Containers extra. The last price quoted for plaster of paris in carload lots was $4.25 per 250-lb. bbl., f.o.b. mill, alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $100@$150 per ton, Philadelphia. Domestic, uncut f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 4@5c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 less quantities, including bags.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4.

Sulphur—$18 per ton for domestic; $20 for export, f.o.b. Texas and Louisiana mines.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25@$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c. f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $200, freight allowed; last half, $170; English, $170@$175, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $80@$85, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, 90c.@$1.05 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Metal Products

Copper Sheets — Current New York price, 29¾c. per lb.; wire, 22¼@23c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26⅜c.; sheathing, 25⅜c.; rods, ⅜ to 3 in., 23⅜c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$100@$110 per net ton, carload lots, eastern points; 9-in. straights, f.o.b. Baltimore, $100@$105.

Clay Brick — First-quality fire clay f.o.b. New Jersey, $75 per 1,000; second quality, 9-in. straights, f.o.b. Pennsylvania, Ohio and Kentucky works, $50@$55.

Magnesite Brick — 9-in. straights, f.o.b. Baltimore, $110@$120 per net ton.

Silica Brick—9-in., per 1,000, $65@$70, Chicago district; $65 Mount Union, Pa.

Iron Trade Review

Pittsburgh, Sept. 21, 1920

The pig iron and steel markets continue practically stagnant, but producers are well supplied with orders and production tends to increase rather than decrease. The industry is operating on its momentum and the outlook is that it will be able to continue for several months.

Cancellations of orders and instructions to defer shipment continue to be received, and attract considerable attention, but the volume is so small a percentage of the total business on books that producers are not incommoded. For instance, deliveries of sheets to the automobile industry are reduced by fully one-half from the high point, but the capacity released finds ready employment on orders already on books from other classes of consumers, and indeed the production of sheets is larger than for weeks, about 85 per cent of the mills being in operation, all that can secure steel supplies.

Pig Iron—The local market is stagnant, with practically no inquiry at all. Birmingham iron could be had for Pittsburgh delivery at more than $2 under the cost of Valley iron, but is not bought even at that. We quote: Bessemer and basic, $48.50; foundry and malleable, $50, f.o.b. Valley furnaces, with $1.96 freight to Pittsburgh.

Steel—Several sales of sheet bars have been made at $65, or $2.50 under previous sales, and further concessions could probably be secured. Billets are altogether inactive. We quote: Billets, $60; small billets, $65@$70; sheet bars, $65@$67.50.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16@$16.50; foundry, $17@$18.

Four Months of Dollar Silver

Treasury Department Has Purchased About One-fifteenth of 207,000,000 Oz. Required Under Pittman Act—Government's Purchases Are Serving to Stabilize Silver Prices and Can Prevent a Runaway Market—Oriental Demand for Silver Slackening

FOR FOUR MONTHS the country has been able to watch the effect of the repurchase clause of the Pittman Act upon the silver market. Over 14,000,000 ounces of silver produced in the United States were purchased during that period by the Treasury Department at $1 per ounce, of a total of 207,000,000 ounces to be bought. Difficulties in the way of the silver producer have been gradually eliminated to the satisfaction of both producer and the Government. Those smelters which treated both domestic and foreign silver-bearing ores have been able to take adequate and necessary precautions to guarantee the unquestionable domestic origin of all the silver sold by them at the official government quotation. The system is working smoothly and efficiently, and the difficulties encountered when repurchases first went into effect no longer have much importance.

Foreign and Domestic Markets Close Together

The great stabilizing influence of the Pittman Act in the silver market of the world is emphasized by the small differtial in price existing between the unvarying official domestic dollar quotation and the quotations in the foreign market which singularly enough have fluctuated but little. Except for two days, Aug. 20 and 21, when a quotation of $1.01⅜ was recorded, the price of silver in the foreign market has remained below the dollar level. On those dates the immediate and quantitative offerings of domestic silver acted as a safety valve, relieving the pressure upon the market that had raised the price. Thereafter and to date the price of silver has consistently stayed below the dollar price.

The silver bullion purchases of the Treasury Department are being stored by the Mints preparatory to being coined into silver dollars to replace those melted under authority of the Pittman Act and shipped to India. Although the act specifies that the silver dollars melted be recoined, no time limit has been designated and in view of the pressure upon the Mints of the country to meet the pressing demand for subsidiary silver coinage and gold coins (to replace those exported) there is little disposition to recoin silver dollars at this moment. At best the silver dollars would lie idle in the vaults of the Treasury, silver certificates circulating in their place. The Philadelphia Mint is storing the bulk of all the silver purchased. Until the demand for subsidiary coinage abates there will be no call for the coinage of silver dollars.

There is another angle of the Pittman Act which is worth considering in the event of a runaway silver market — some persons insist this may occur again. The act authorizes the sale of silver bullion for the purpose of providing silver for subsidiary coinage and commercial use as well as facilitating the settlement of adverse trade balances in silver. According to Director Baker of the Mint, in the event that the price of silver should rise over the parity point of subsidiary silver ($1.38) the Treasury Department could conceivably prevent the breaking up of the silver currency and its export or sale for bullion content, by selling part of the large accumulated stocks of silver. Last November, it will be recalled, the price of silver reached a record price of $1.37½ per oz. which was close to the danger mark, but it did not stay there long enough to cause any discomfort to the subsidiary currency system of the country. However, in December standard silver dollars, which were not held against outstanding silver certificates, were made available to certain American banks operating in China on presentation of any form of United States currency (not necessarily silver certificates). By this action, the government showed a method of preventing the exportation of subsidiary silver coins to other countries. The great stock of silver accumulated by the United States between 1878 and 1893, idle though it may have been and idle though it may become, was of great service to the United States during the war. Other countries that did not possess a surplus stock of silver coin or metal were unfortunately placed and could not prevent the widely prevalent melting of their coins except through decrees forbidding exportation of silver, or by debasing the silver currency.

In some quarters the impression has been gained that the chief function of the Pittman Act is to make the Government purchase silver at a higher figure than the metal can be obtained in the general world market. Attacks upon the measure usually ignore the history of the legislation and the behavior of the silver market during the past six years. The seemingly distressing feature of the situation whereby the Government is paying more for its silver than anyone else—although absolutely justified—is emphasized, but the possibility of using this same legislation to prevent a runaway silver market and protecting our currency for one thing is minimized.

The fact that other countries have had such a difficult time trying to keep silver currency in circulation is due not only to the avidity for hoard ng exhibited by the people of European lands, but also to the fact that foreign silver currency because of its bullion value is worth so much more than depreciated paper currency using the same unit of value. A silver mark for its metallic content alone is many times more valuable than a paper mark worth say 2 cents. It is little wonder then that melted silver coins have been exported from Germany.

Less Dependence Upon Silver Coinage

Although the world is placing less dependence on metallic currency than ever before in modern times and the demand for silver for coinage purposes at the present time in European countries is negligible, sooner or later there must come a demand to replace the broken up and exhausted silver stocks of a country such as Germany. Nations are demonstrating ability to transact their business affairs without the aid of subsidiary silver coinage and are transferring former dependence upon this medium to such makeshifts as postage stamps and porcelain coins, to their own detriment, but as soon as financial order is established from the chaotic currency conditions abroad there should be a call for coinage silver once more.

Mexico is reported to be purchasing between one and two million ounces of silver per month at a premium of about 4 cents above the New York official price, which seems to be a rather stiff premium, in an attempt to meet currency requirements not fully met by local production. This action on the part of Mexico will aid the foreign market in maintaining the present level of prices as Oriental support is weaker. With quieter conditions in Mexico and a new regime that is functioning much better than the old, Mexico should once more become a steadily increasing silver producer.

India has become a seller of silver but whether this has been due to an unfavorable outlook for the Monsoon or an action made in anticipation of a possible decline in the market is conjectural. China is still counted upon to support the market but reports of poor harvest conditions in that country are disquieting. Furthermore, exports of Chinese goods are expected to decrease because of an oversupply of Chinese goods abroad, hence Oriental pressure on the market is expected to become lighter rather than heavier.

COMPANY REPORTS

St. Joseph Lead Co. Shows Profit for Six Months

Lead; Missouri

For the six months ending June 30, 1920, the St. Joseph Lead Co. reports net profits, after charges, but before Federal taxes, of $2,488,691, equivalent to $1.76 a share earned on the $14,094,660 capital stock (par value $10). Consolidated income and profit and loss account for the six months ended June 30, 1920, shows as follows:

Operating revenue	$3,266,841
Other income	116,787
Total income	$3,383,628
Charges	79,857
Net income	$3,303,771
Adjustments (credit)	6,392
Deductions	*821,472
Surplus	$2,488,691
Dividends	1,409,466
Balance	$1,079,225
Previous surplus	15,925,780
Total surplus	$17,005,005

*Includes $600,771 for depletion of ore reserves and mineral rights, and $120,265 adjustment of inventory value of matte, January 31, 1920

New York & Honduras Rosario Mining Co. Has a Prosperous Year

Gold, Silver; Honduras

The annual report of the New York & Honduras Rosario Mining Co. for the year 1919 indicates a financially successful year. There was produced from 133,900 tons of ore 1,584,579 oz. of silver, and 10,200 oz. of gold in 1919, compared with 1,587,468 oz. of silver and 9,748 oz. of gold in 1918 from 129,900 tons of ore. The total value of the output increased from $1,782,428 in 1918 to $1,788,579 in 1919.

Dividends paid during the year amounted to $200,000 on a capitalization of 200,000 shares of $10 par value each, or 10 per cent. An amortization distribution of $200,000 was also made to stockholders.

The following statement shows the income and profit and loss for the year:

Production of gold and silver	$2,115,158 25	
Less: Freight and expense on bullion	62,065 30	
Operating income		$2,053,092 95
Operating expense		1,132,805 61
Operating profit		$920,287 34
New York administrative expense		76,368 28
Net income from operating		$843,919 06
Other income		147,996 53
Total income		$991,915 59
Deductions from income		58,828 99
Net profit for period		$933,086 60
Appropriated for reserves		
Depreciation	$64,315 44	
Taxes	106,610 63	
Fire insurance	4,020 70	
		174,946 77
Profit and loss balance—carried to surplus		758,139 83
Add surplus balance—January 1, 1919		2,434,065 59
Total		$3,192,205 42
Deduct—Reserve for depletion of mines in 1919	$334,750 00	
Dividends paid in year 1919	200,000 00	
		534,750 00
Surplus balance—December 31, 1919		$2,657,455 42

The ore reserves reported Dec. 31, 1919, were 283,422 tons valued at $4,279,649 (silver at $1 per oz.), compared with 282,559 tons valued at $3,812,419 in 1918. The development driven was 15,900 feet, compared with 11,266 feet in 1918.

Wolverine Copper Mining Co. Shows a Deficit for the Year

Copper; Michigan

The Wolverine Copper Mining Co. in its report for the year ending June 30, 1920, indicates that 3,932,255 lb. of copper were produced from ore averaging 0.764 per cent copper to the ton. Total operating cost per pound of refined copper was 15.283c.; cost of smelting, freight and marketing product, 2.055c.; taxes, 0.668c.; depletion of orebodies, 2c.; depreciation, 2.043c.; a total cost of 22.049c. per lb. of refined copper.

Sales of 3,457,320 lb. of copper at 19.11c. or $660,727.62 were made, but a loss of $98,297.73 was recorded, as the following table shows:

Sales:		
3,457,320 lbs. copper at 19.11c.		$660,727 62
Cost of Sales:		
Copper on hand June 30, 1919, at cost	$72,015 16	
Operating expenses at mine as per statement hereafter	600,946 75	
Smelting, freight and New York and Boston expenses	80,818 54	
Taxes, exclusive of income and profit taxes	26,282 40	
Depletion of ore bodies	78,644 50	
Depreciation of equipment, etc	80,333 20	
	$939,040 55	
Less: Copper on hand June 30, 1920, at cost	180,015 20	
		759,025 35
Loss on sales of copper		$98,297 73
Deduct:		
Interest on Liberty Bonds	$24,450 00	
Other interest, etc	2,589 01	
	$27,039 01	
Less: Interest paid, etc	14,766 33	$12,272 68
Net loss for the year		$86,025 05

Three dividends were paid during the year of $30,000 each on the $780,000 capital stock of the company consisting of 31,200 shares of a par value of $25 per share.

Surplus on June 30, 1920, stood at $1,479,582.26, compared with $1,565,607.31 on June 30, 1919.

Shattuck Arizona Copper Co. Shows a Loss for the Second Quarter

Lead, Copper; Arizona

The report of the Shattuck Arizona Copper Co. for the quarter ending June 30, 1920, states that the production of metals for the quarter, especially copper, was badly handicapped as a result of shortage of mine labor. The lead mill operations were nearly normal, but lead production costs were high.

A summary of the production for the quarter is as follows:

Dry tons copper ore smelted	5,318
Dry tons lead concentrates smelted	3,719
Dry tons lead ores smelted	50

Metals Recovered From	Copper Ores	Lead Concentrates	Lead Ores
Pounds copper	631,567		
Pounds lead		1,753,244	
Ounces gold	133	933	7
Ounces silver	21,364	60,139	226

The copper production for the quarter is inventoried at 15c. per pound. The returns on lead are actual smelter settements.

The results of operations for the second quarter are as follows:

Copper ore, bullion and sales		$94,735 05
Copper ores, gold and silver, etc		21,213 15
Lead concentrates settlements		243,186 11
Interest		11,378 62
		$370,512 93
Copper operating expense and development	$172,752 37	
Milled lead expense	193,581 82	
Loss on sorted and direct lead ore settlements	34 07	
Administrative expense	12,811 44	
		379,179 70
Depreciation of mine and mill equipment		$8,666 77
		18,886 35
Loss for quarter, exclusive of depletion		$27,553 12

MINING STOCKS

Week Ended September 18, 1920

Stock	Exch.	High	Low	Last	Last Div		
COPPER							
Adventure	Boston	...	...	*50			
Ahmeek	Boston	58½	57½	58	Sept '20, Q	50	
Alaska-B.C.	N. Y. Curb	1	⅞	1			
Allouez	Boston	23	23	23	Mar. '19,	1	00
Anaconda	N. Y.	55⅞	53½	55	Aug '20, Q	1	00
Ariz. Com'l	Boston	10⅞	10½	10½	Oct '18,		50
Big Ledge	N. Y. Curb	1	⅞	1⅛			
Bingham Mines	Boston	9⅛	8¼	9¼	Sept '19, Q		25
Calumet & Ariz.	Boston	57½	56½	56½	Sept '20, Q	1	00
Calumet & Hecla	Boston	285	280	285	June '20, Q	5	00
Canada Copper	N. Y. Curb	1	⅞	1			
Centennial	Boston	...	...	10½	Dec '18, SA	1	00
Cerro de Pasco	N. Y.	44⅛	43	43⅞	Sept '20 Q	1	00
Chief Consol.	Boston Curb	3⅞	3⅞	3⅛	Feb. '20, Q		10
Chile Copper	N. Y.	15⅞	14⅜	15⅛			
Chino	N. Y.	29⅛	28⅜	29⅜	June '20, Q		37½
Columbus Rexall	Salt Lake	*38	*36½	*37½			
Con. Ariz	N. Y. Curb	...	...	⅛	Dec '18, Q		05
Con. Copper M	N. Y. Curb			2¼			
Copper Range	Boston	36⅞	35½	36¼	Sept '20, Q		50
Crystal Copper	Boston Curb	*42	*34	*40			
Davis-Daly	Boston	8¼	8¼	8½	Mar. '20, Q		25
East Butte	Boston	11⅛	10½	11	Dec '19, A		50
First Nat'l	Boston Curb	*85	75	80	Feb '19, SA		15
Franklin	Boston	2⅛	2⅛	2⅛			
Gadsden Copper	N. Y. Curb	*70	*65	*70			
Granby Consol	N. Y.	37	37	37	May '19, Q	1	25
Greene-Cananea	N. Y.	29½	25	29½	Aug '20, Q		50
Hancock	Boston	4¼	4¼	4¼			
Houghton	Boston Curb	...	...	*40			
Howe Sound	N. Y. Curb	...	...	3⅛	July '20, Q		05
Inspiration Con.	N. Y.	49⅜	47⅛	48¾	July '20, Q	1	00
Iron Cap	Boston Curb	9	9	9	Sept '20, K		25
Isle Royale	Boston	28	28	28	Sept '19, SA		50
Kennecott	N. Y.	26⅛	25⅜	26⅛	June '20, Q		50
Keweenaw	Boston	1⅛	1⅛	1⅛			
Lake Copper	Boston	3⅛	3⅛	3⅛			
La Salle	Boston	2⅛	2⅛	2⅛			
Magma Chief	N. Y. Curb	...	...	21			
Magma Copper	N. Y. Curb	18	16	17	Jan. '19, Q		50
Majestic	Boston Curb			*13			
Mason Valley	Boston	1¾	1⅝	1⅝			
Mass. Con.	Boston	3⅛	3⅛	3⅛	Nov. '17, Q	1	00
Mayflower-O.C.	Boston	6⅞	6⅝	6⅝			
Miami	N. Y.	19⅝	19¼	19⅜	Aug '20, Q		50
Michigan	Boston	...	...	3½			
Mohawk	Boston	61	60	61	Aug. '20, Q	1	50
Mother Lode (new)	N. Y. Curb	6	5½	5½			
Nevada Con.	N. Y.	12¾	11⅝	12⅞	June '20, Q		25
New Arcadian	Boston	...	...	2⅜			
New Baltic	Boston Curb	...	...	3			
New Cornelia	Boston	18¼	17⅜	18⅛	Aug '20,		25
Nixon Nev.	N. Y. Curb	...	...	9			
North Butte	Boston	16⅞	16	16⅛	Oct '18, Q		25
North Lake	Boston	⅛	⅛	⅛			
Ohio Copper	N. Y. Curb	...	...	⅝			
Oilway	Boston	...	...	...			
Old Dominion	Boston	1⅛	1⅛	1⅛	Dec. '18, Q	1	00
Osceola	Boston	24⅞	24⅜	24⅞	June '20, Q		50
Phelps Dodge	Open Mar.	39⅞	38⅝	39⅝	June '20, Q	2	50
		†195	†180		July '20, Q	2	50
Quincy	Boston	48	46½	48	Mar '20, Q	1	00
Ray Con.	N. Y.	15⅞	15⅛	15⅛	June '20, Q		25
Ray Hercules	Boston Curb	*75	*60	*62			
St. Mary's M. L.	Boston	42	40	41	June '20, K	2	00
Seneca	Boston	...	...	14⅜			
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q		25
Shattuck Ariz.	N. Y.	...	...	8⅛	Jan. '20,		25
South Lake	Boston	...	...	2			
South Utah	Boston	*15	*15	*15			
Superior	Boston	4½	4½	4½	Apr. '17	1	00
Superior & Boston	Boston	4⅛	4	4			
Tenn. C. & C.	N. Y.	10½	9⅞	10⅞	May '18, I	1	00
Tuolumne	Boston	*60	*55	*55	May '13,		10
United Verde Ex.	Boston Curb	31	30⅛	31	Aug. '20, Q		50
Utah Con.	Boston	8	7½	7½	Sept '18,		25
Utah Copper	N. Y.	65⅛	64	65	June '20, Q	1	50
Utah M. & T.	Boston	1⅛	1⅛	1⅛	Dec. '17,		30
Victoria	Boston	...	...	1½			
Winona	Boston	*40	*40	*40			
Wolverine	Boston	14	13⅛	13⅛	Jan. '20, Q		50
LEAD							
Hecla	N. Y. Curb	4⅜	4⅛	4⅛	June '20, QX		20
St. Joseph Lead	N. Y.	16½	16⅜	16½	June '20, QX		50
Stewart	Boston Curb	*13	*13	*13	Dec. '15,		05
Utah Apex	Boston	1⅞	1⅞	1⅞	Nov. '18,		25
ZINC							
Am. Z. L. & S.	N. Y.	12½	12	12½	May '17,	1	00
Am. Z. L. & S. pf.	N. Y.	46⅞	46⅜	46⅝	Aug. '20, Q	1	50
Butte C. & Z.	N. Y.	7¼	7¼	7¼	June '18, I		50
Butte & Superior	N. Y.	20	20	20	Sept. '17,	1	25
Con. Interst. Cal.	N. Y.	10⅛	9⅞	10	June '20, Q		50
New Jersey Z.	N. Y. Curb	178½	177	177	Aug '20, Q	4	00
Success	N. Y. Curb	*5	*4	*4	July '16,		03
Yellow Pine	Los Angeles	*95	*90	*95	June '20, Q		03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅜	1⅛	1⅜		
Alaska Juneau	N. Y.	1½	1⅜	1½		
Carson Hill	N. Y. Curb.	23⅞	23½	23½		
Cresson Consol. G.	N. Y. Curb.	1	⅞	1	June '20, Q	10
Dome Ex.	Toronto	*38	*36½	*37½		
Dome Mines	N. Y.	11⅞	11⅛	11⅛	July '20, Q	25
Golden Cycle	Colo. Sprgs.	‡	...	*73	Sept '20, Q	02
Goldfield Con.	N. Y. Curb.	*10	*9	*9½	Dec. '19,	05
Hedley	Boston	...	...	4½	June '19,	10
Hollinger Con.	Toronto	5.92	5.80	5.90	Sept '20, X	05
Homestake	N. Y.	...	...	49	Sept. '19,	50
Kirkland Lake	Toronto	*53½	*49½	*50		
Lake Shore	Toronto	1 14	1 12	1.12	Oct. '19,	02
McIntyre-Porcupine	Toronto	2 07	2.00	2.05	Sept '20, K	05
Porcupine Crown	Toronto	*23½	*23	*23	July '17,	03
Portland	Colo. Sprgs.	‡	...	*60	July '20, Q	01
Reorgan. Booth	N. Y. Curb	6	4	5	May '19,	05
Silver Pick	N. Y. Curb.	*7	*5	*5½		
Teck Hughes	Toronto	*8	*7½	*7½		
Tom Reed	Los Angeles	1 05	1 04	1 04	Dec. '19,	02
United Eastern	N. Y. Curb	3¼	2⅛	3¼	Apr. '20, Q	21
Vindicator Consol.	Colo. Sprgs.	‡	...	*18	Jan. '20, Q	01
West Dome Consol.	Toronto	*6¾	*6½	*6¾		
White Caps Min.	N. Y. Curb.	*9	*7½	*8		
Yukon Gold	Boston Curb	...	...	1½	June '18,	02
SILVER						
Arizona Silver	Boston Curb	20	*16	*17	Apr. '20, M	03
Beaver Con.	Toronto	...	...	*41	May '20, K	03
Conagas	Toronto			2 55	Aug '20, Q	12
Crown Reserve	Toronto	*25	25	*25	Jan. '17,	05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept. '19,	1 00
La Rose	Toronto	*35	*33	*33	Apr. '18,	02
McKinley Dar	N. Y. Curb			*55	July '20, Q	03
Mining Corp.	Toronto	1 70	1 65	1 70	Sept '20, Q	12
Nipissing	N. Y. Curb.	10	9⅞	10	July '20, Q	25
Ontario Silver	N. Y.	6¼	5⅞	6¼	Jan. '19, Q	50
Ophir Silver	N. Y. Curb.	1⅛	⅞	1	Jan. '12,	10
Peterson Lake	Toronto	...	...	14¾	Jan. '17,	01
Temiskaming	Toronto	*35⅜	*34	*34	Jan. '20, K	04
Trethewey	Toronto	*26	*25	*25	Jan. '19,	05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1⅞	*2		
Barnes-King	Butte	‡	...	1.11	Aug. '20, Q	05
Bost. & Mont.	Boston	...	...	*63		
Cashboy	N. Y. Curb.	*9½	*8	*9		
El Salvador	N. Y. Curb.	1⅞	1⅛	1⅜		
Jim Butler	N. Y. Curb	16	*15⅞	*16	Aug. '18, SA	07
Jumbo Extension	N. Y. Curb.	*8	*5	*8	June '16,	05
Louisiana Con.	N. Y. Curb	⅛	⅛	⅛		
MacNamara M.	N. Y. Curb.	⅛	⅛	⅛	May '10,	02
N.Y. Hond. Rosar.	Open Mar.	*13	111	...	July '20, QX	50
Tonopah-Belmont	N. Y. Curb.	1⅛	1⅛	1⅛	Jan. '20, Q	05
Tonopah-Divide	N. Y. Curb	2⅛	1⅞	2⅛		
Tonopah Ex.	N. Y. Curb	1⅜	1⅛	1⅜	July '20, Q	05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '19, SA	15
West End Con.	N. Y. Curb.	1⅛	1⅛	1⅛	Dec. '19 SA	05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*21	*19	*20	July, '20, M	01
Consol. M. & S.	Mootreal	25⅛	25	25	July '20, Q	62
Daly Mining	Salt Lake	2.60	2.40	2 40	July '20, Q	10
Daly-West	Salt Lake	...	...	4½	July '20, Q	25
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q	10
Electric Point	Spokane	...	...	*30	May '20, SA	03
Fed. M. & S.	N. Y.	12	11⅞	12	Jan. '09,	1 50
Fed. M. & S. pf.	N. Y.	35	33¼	34⅛	Sept '20, Q	1 75
Florence Silver	Spokane	...	...	35	Apr. '15,	01
Grand Central	Salt Lake	...	...	*37½	June '20, K	03
Iron Blossom	N. Y. Curb.	½	¼	½	Apr. '20, Q	02
Judge M. & S.	Salt Lake	...	...	3.97½	July '20, Q	12
Marsh Mines	N. Y. Curb	*16	*14	*15		
Prince Consol.	N. Y. Curb.	⅜	⅜	⅜	Nov. '17,	02
Rambler-Cariboo	Spokane	*12	*12	*12	Feb. '19,	01
Rex Con.	N. Y. Curb.	*6½	*6	*6¾		
South Heela	Salt Lake	*94	*93	*93	Sept. '19, K	15
Stand. S. L.	N. Y. Curb.	1	¾	1	Dec. '19, K	05
Tamarack-Custer	Spokane	2 35	2 30	2.30	Dec. '19, K	03
Tintic Standard	Salt Lake	3.20	3.00	3 02½	June '20, Q	10
Wilbert	N. Y. Curb.	*4	*3	*4	Nov. '17.	01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	19¼	19	19⅛	Mar. '19,	50
Internat'l Nick.pf.	N. Y.	...	...	80¼	Aug '20, Q	1 50
QUICKSILVER						
New Idrm.	Boston	...	...	5	Jan. '19,	25
TUNGSTEN						
Mojave Tungsten	Boston Curb	*9	*5	*9		
VANADIUM						
Vanadium Corp.	N. Y.	72¼	67⅛	71	July '20, Q	1 50
ASBESTOS						
Asbestos Corp.	Montreal	90	87	90	July '20, Q	1 50
Asbestos Corp. pf.	Montreal	100	99	100	July '20, Q	1 75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	64⅛	59¾	64	Sept '20, Q	1 00
Am. S. & R. pf.	N. Y.	93	92½	93	Sept '20, Q	1 75
Am. Sm. pf. A.	N. Y.	72½	72¼	72½	July '20, Q	1 50
U. S. Sm. R. & M.	N. Y.	60	58	59¾	July '20, Q	1 50
U.S.S.R.& M. pf.	Boston	44	43¼	44	July '20, Q	87½

*Cents per share. †Bid or asked ‡Quotations missing Q. Quarterly.
S.A, Semi-annually. BM, bimonthly K, Irregular. I, Initial N, includes extra

INDUSTRIAL NEWS

John A. Penton, president of Penton Publishing Co., is a director of the Wellman-Seaver-Morgan Co., Cleveland, Ohio.

Chain Belt Co., Milwaukee, Wis., announces that H. S. Rosenthal is now Southern District salesmanager for its Rex mixers and pavers.

Keystone Steel Co., 997 Union Arcade Building, Pittsburgh, Pa., has been organized to do a general brokerage business in iron and steel products.

The United American Metals Corporation, Brooklyn, N. Y., announce the death of their vice president, William H. Mixer, at his home in Berkeley, Cal. Mr. Mixer was one of the pioneers of his company.

The Jeffrey Manufacturing Co., Columbus, Ohio, announces the opening of a new branch office at 1108 Marine Trust Building, Buffalo, N. Y., to be in charge of H. W. Scott, formerly with the home office.

The Merrill Co., 121 Second St., San Francisco, Cal., call attention to the fact that their eastern office is in the Monadnock Building, Chicago, Ill., from which may be secured copies of catalogs and literature they issue.

F. B. Kirkbride, vice-president, has been elected president of SKF Industries, Inc., 165 Broadway, New York, succeeding B. G. Prytz, resigned, who has been elected managing director of the parent company, with headquarters at Gothenburg, Sweden.

The Blaw-Knox Co., Pittsburgh, Pa., steel products, will have an exhibit of clam shell buckets, water-cooled furnace appliances, and Prudential steel buildings at booth 308 of the American Foundrymen's Association exhibition in Columbus, Ohio, Oct. 4 to 8.

The Fawcus Machine Co., gears and mill machinery, has consolidated all departments in its new office building at 2818 Smallman St., Pittsburgh, Pa. A downtown office for meetings by appointment is maintained at suite 1501, Peoples Savings Bank Building.

D. D. Tripp, vice-president of Pioneer Rubber Mills, returned in May from his trip to China, Japan, the Philippines. He anticipates an unprecedented demand for mechanical rubber goods, and his mills are preparing to take care of a material increase in their oriental trade.

Walter H. Taverner, electrical and mechanical engineer, announces that he has severed his connection with the George A. Fuller Co., and is now with the Walter H. Taverner Corporation, 175 Fifth Ave., New York City, electrical and mechanical constructing engineers.

New York Testing Laboratories, 74-80 Washington St., New York City, L. R. Seidell, managing director, have been awarded the contract for the chemical, physical and electrical testing of approximately 400,000 ft. of signalling cable and wire for the city of Troy, N. Y.

The Koppers Co. and the **Aluminum Co. of America**, both of Pittsburgh, Pa., have jointly purchased the American Tar Products Co. and will operate it together. It is planned to manufacture electrodes for the use of the Aluminum company, as well as to continue the general tar-refining work.

Dwight P. Robinson & Co., Inc., engineers and constructors, New York City, has established a branch office in Youngstown, Ohio, in the Home Savings & Loan Building, in charge of Mr. C. I. Crippen. The Cleveland, Ohio, office has been moved from the *Leader-News* Building to the Citizens Building, and Mr. H. P. Clawson is in charge.

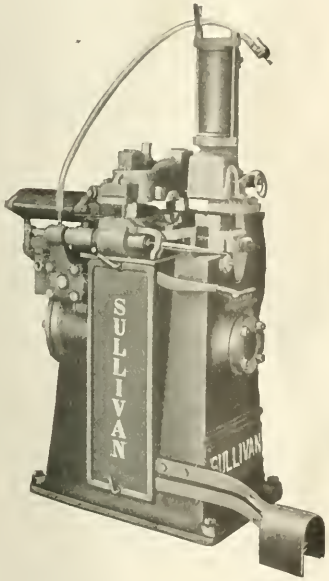
V. C. Kylberg has been appointed sales advisor to the Navy Department. During the period of greatest activity in the disposal of the War Department's surplus property, Mr. Kylberg was Assistant Chief of the Machine Tool Section of the Officer of the Director of Sales. Later he organized the Procurement Division for the Army's vocational training schools. More recently he has been acting head of the Sales Section of the U. S. Shipping Board.

The Oil Engine Manufacturers' Society held its annual meeting Aug. 10, in the club room of the Bessemer Gas Engine Co., at Grove City, Pa. The following were among the officers elected for the ensuing year: President, H. L. Dean, Chicago Pneumatic Tool Co.; Secretary, C. B. Humphrey.

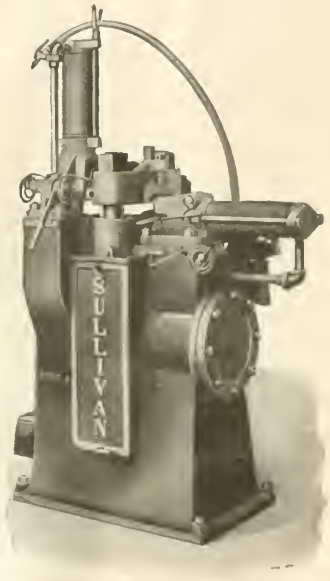
New Small Hammer Sharpener Handles Solid or Hollow Steel

The success attained by the adaptation of the all-hammer process in sharpening and shanking drill steel, as incorporated in the Sullivan drill sharpening machine, has recently induced the manufacturers to design a new model sharpener, embodying the same principles but of smaller and lighter construction, suitable for making and sharpening bits on the steel used in the standard sizes of hammer drills.

This machine, which is shown in the accompanying illustration, is known as the Sullivan Class "B" sharpener, and is designed for handling solid or hollow steel of any section up to 1¼ in. in diameter, and to make bits up to a maximum gage of 2½ in.



SULLIVAN "B" SHARPENER



"B" SHARPENER, REAR VIEW

The Class "B" sharpener weighs 1,500 lb., occupies a floor area of 4 x 2½ ft., and stands 5 ft. high. Its essential features consist of a horizontal hammer cylinder and piston, operating a dolly for upsetting, and a vertical cylinder and piston operating dies for swaging the drill bits or shanks. For upsetting, the steel is clamped in steel dies mounted in the lower, or stationary, and upper, or movable jaws of a yoke or vise operated by a horizontal air cylinder situated in the base of the machine.

The vise, or clamping cylinder and piston are of the differential type, the closing or clamping end being 10 in. in diameter, and the releasing end 4 in. in diameter. The horizontal movement of the piston is communicated to the vertical action of the vise by the air power acting through a toggle, or link. The combined effort of the air power

and toggle leverage is more than 50,000 lb., all of which is applied to hold the steel firmly in the vise.

The action of the vise is controlled by a valve placed in a valve chest on the side of the frame, and operated by a hand lever from the front of the machine. A safety stop is provided, which makes it impossible for the upsetting hammer to start until the steel is securely gripped by the vise.

The two-hammer cylinders are modified Sullivan "DR-6" drills, equipped with floating hammer pistons, and a valve motion which imparts a blow of great strength and liveliness to the dies and dollies.

In order to secure the advantages of the floating hammer piston a novel construction has been employed. Springs are provided to keep the upper swaging dies in a raised position when not in use. The foot lever, which operates the vertical hammer, is kept in a raised position by means of springs. When the lever is depressed, air is admitted to the cylinder and the hammer begins to strike.

In making or resharpening bits, the steel is shifted from one hammer to the other, being alternately upset and swaged until of the proper gage and shape, and the wings, corners, and cutting edge properly drawn out to be uniform, and of the right thickness and angle.

Equipment

The Class "B" sharpener is fitted with a drill steel punch for operating the hole in hollow steel bits and shanks. When the hole has been sufficiently opened, the steel is simply withdrawn and the punch stops operating.

The double taper bits can be accurately formed on the new Sullivan sharpener by means of an adjustable gage plate and dies which are operated by action of the clamping yoke or vise. Sixteen different gages can be provided by means of the gage plate, which is controlled by a key.

For cleaning hollow drill steel an automatic blowgun or jet is provided in the front end of the frame, below and to the left of the vertical hammer. A small nozzle will be noted, against which the hollow steel may be thrust, thus opening the valve, and permitting air to be blown through the steel. Exhaust air is also used for automatic cleaning jets in an ingenious manner from both the horizontal and vertical hammers, so that the working faces of the dies and dollies are kept clean and free from scale and accumulations of dirt and dust at all times.

The Sullivan "B" sharpener, light model, is operated by compressed air at a recommended pressure of 80 to 100 lb. While the machine is much lighter than the Sullivan heavy duty sharpener, it is built very substantially and with ample weight and area of parts where strength is needed, and where stress and strain occur. It will stand much hard work.

Why Foreign Markets Buy Outside the U. S. A.

Walter C. Teagle, head of Standard Oil of New Jersey, recently reported in *System* an important conversation he had on the subject of foreign markets. He gave many illuminating examples of the reasons why the United States fails to develop foreign markets. The most important conclusions he draws are summed up in *Current Opinion* for September, concluding with the admonition to send abroad "the manufacturer himself or at least a high executive who fully knows the business, and can proceed on his own responsibility. . . . A man of resource and imagination. . . .

"One never knows what he is going to run into until he gets on the spot, and one of the reasons that our people so frequently fail in the building of export markets is that they insist on deciding everything ahead of time *and on American experience*, and then not only want matters to move according to schedule but to move immediately. When they fail they blame the market. They should blame themselves."

Outlook for Foreign Trade Better, Says Ingersoll-Rand Official

W. L. Saunders of Ingersoll-Rand Co., who is president of American Manufacturers' Export Association recently reviewed the outlook for foreign trade as follows:

"A few months ago there was cause for alarm in industrial conditions. Prices and bank loans were soaring, and it seemed to conservative business men that the shock of the war was not over; that we were riding for a fall. Being forewarned, the Government, the Federal Reserve Banks and the public determined to exert such reasonable pressure as might forestall drastic results. Restriction of expenditures by the Government, the issue of short-term certificates at market rates, the rise in the discount rate at the Federal Reserve Banks, and the determination on the part of the public that prices must come down or they would not buy, have resulted in a decided readjustment, which is now going on.

Cutting Wire Rope

A section devoted to "hoisting ropes" in the draft of a law to cover mine rules and regulations, proposed by the U. S. Bureau of Mines, is evidence of the extent to which the cutting of wire rope is now required in the maintenance of mine equipment.

The approved method of cutting the rope preparatory to resocketing and reclamping is the well-known oxy-acetylene process. There is no simpler or easier way. A typical outfit that has been found dependable comprises a standard Oxweld cutting blowpipe, a Linde oxygen cylinder, and a tank of Prest-O-Lite dissolved acetylene. With this equipment a competent operator cuts through a two-inch cable in about two minutes.

Dry Power Drills Prohibited in Rand Mines

Regulation Goes into Effect April 1, 1921—Will Affect Many Drills

At a meeting held early in July in the offices of the Government Mining Engineer of the Union of South Africa, representatives of the Transvaal Chamber of Mines, the Mine Managers' Association, Underground Officials' Association, and of the South African Mine Workers' Union agreed that a new regulation should come into effect after March 31, 1921. This regulation, which is an amendment to No. 101 (1) (3) of "Mines, Works and Machinery Regulations," provides that "No person shall in the drilling of holes use or cause or permit to be used any machine drill in which only air is passed into the hole through the hollow jumper of the drill."

As the *South African Mining and Engineering Journal* says, the effect of this order on the mines remains to be seen. There are considerable numbers of dry jackhammers in use today on the Rand and also held in stock, and these will have to be scrapped or converted by the date mentioned. One estimate placed the cost of conversion at £9 per machine.

TRADE CATALOGS

Valves—The Merrill Co., 121 Second St., San Francisco, Cal., have just issued an illustrated 24-page catalog describing the Merco Nordstrom plug valve. The special construction of this valve permits forced lubrication of the sliding surface and the line of special lubricants supplied combine with the construction to make the valve specially interesting to mining and metallurgical companies. The pamphlet may also be secured from the eastern office in Monadnock Building, Chicago, Ill.

Furnaces—The Mine and Smelter Supply Co., 42 Broadway, New York City, and Denver, Col., have issued as their Bulletin No. 63, an elaborately illustrated catalog of 47 pages describing Massco furnaces for melting, hardening, forging, roasting and similar work. These furnaces are designed for low pressure oil fuel, gas or gasoline. Massco burners, blowers, gates, fans and Sil-O-Cel insulation are also described.

Flotation Machines — Southwestern Engineering Co., Hollingsworth Building, Los Angeles, Cal., mining and milling machinery, have issued a very fully illustrated pamphlet describing the K & K flotation machine, giving sample actual flow sheets embracing these machines and useful dots on local and export shipping dimensions. The ore listing laboratory of the company is also fully described. The publication is classed as Catalogue "C."

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

F. E. WORMSER
W. N. P. REED
CLEVELAND ABBE, Jr., Assistant Editors
BENJAMIN L. MILLER
VOLNEY LEWIS
Special Consulting Editors

Volume 110 New York, October 2, 1920 *Number* 14

The Relation of Mining to International Politics

WE of the mining industry at least cannot for a moment ignore our dependence for prosperity on trade relations broader than those of our own comfortable boundaries. The present trying condition of mining, we know, is bound up closely with world politics—more especially with the still grievously tangled European situation. Why are we producing copper at cost when producers of most non-metallic necessities are riding undisturbed on the crest of the still existing inflation and enjoying the fattest of profits? Because the scale of our copper mining and smelting industry is adjusted to the world needs, for supplying Europe as well as America. The researches of our special market editor have shown that the American absorption of copper, so far from being abnormally low, is markedly greater than before the war. But Europe, our old and stable customer, is not buying adequately and cannot do so. She has only enough for her necessities and her luxuries. She is, according to the Spanish writer, Ibañez, now going through the same post-war dementia of extravagance and cheap and easy money from which we are first in trying to emerge. With Europe the war fever was longer and harder, and the compensating devil's-humor of gayety and throwing dull care and dreary common sense to the winds may well be correspondingly deeper and more prolonged. Therefore, they can buy only bread and wine, only firewood and silk stockings, and have only a slight residue for solid improvements such as metals are used for. More than that, their money is no good. With all our bankers' theories as to the solidity of paper or demi-paper currency, they shun paper in practice. We will not sell our copper to Germany for paper marks, nor to Austria for paper krone, nor to France for paper francs. We demand, instead, the good old gold and silver—may Heaven bless them and protect them, and the vital American industries they represent! And the real stuff they do not have. Therefore, with our copper-producing machinery tuned to the world consumption scale, we perforce, to keep the wheels running, produce so much that the supply overtakes the temporary demand, and the price of metal and the cost of metal walk in too close company for our prosperity as miners. And what is true of our mining industry is, of course, true of the world's mining industry.

Therefore, the only remedy is the stabilization of Europe, and that is why our next and chief interest is in European and Americo-European politics, because it is undeniable that just as mad policies have shattered Europe, wise policies can heal her. And Europe least of all is blind to the fact that the policies which dominate her future and well-being are not only those of her own continent and neighboring islands, but those of America. Now, as never before, we need for our happiness and that of the world an intelligent, strong, and wise foreign policy. Now, as never before, we of the mining industry realize that we are simply one of the world's great states, and not to study and act with relation to the other states is in a sense a species of anarchy. From this point of view, the inactivity in international affairs of the United States since the armistice has been criminal negligence—a failure of discharge of duty which in military circles would call for a court-martial of the offenders. As it is, the deadlock apparently will not be thus broken, but only by the Presidential elections. Should these result in a return of democratic rule, of the principle of the submission of the individual and the minority to the need as seen by the majority, of the prudent compromise between different opinions instead of the stubborn deadlock, then we may expect to see such adjustments gradually made that Europe will be assisted to buy and to recuperate. The war is over—let our Government so proclaim it at the earliest moment. Our mining industry needs the markets of all of Europe, on both sides of the line of battle, for its prosperity, provided they have either metal or satisfactory credit to pay with, and provided their governments are fundamentally sound and reliable. This, in general, is true of all western and central Europe. Only, and of course, we shall gain nothing by dealing with freebooters and outlaws, and in this category, by all the evidence, we must place the present government of Russia.

The Attitude of the Banks Toward the Gold Bonus

THE AMERICAN BANKERS' ASSOCIATION recently issued a report of a committee appointed by it to study the proposed bonus on newly mined gold, and in that report the committee was of the unanimous opinion that the contemplated legislation embodied in the McFadden bill would work to the detriment of the public's interest. In view of the fact that the American Bankers' Association is an influential body expressing the financial sentiment of perhaps a goodly majority of banks and bankers in the country, it is surprising to come across a paid advertisement in one of our evening papers by a prominent local bank entitled "The Cost of Gold," which devotes several paragraphs to elucidate the serious decline in United States gold production and the importance of an adequate gold reserve. The concluding paragraph states, "The Harriman National Bank would favor a premium on the use of gold for jewelry, dental needs, window lettering, decoration and a hundred other ways. With this premium upon such uses of gold paid as a subsidy to the mine owner, he could undoubtedly make both ends meet and have legitimate profits wherewith to pay taxes."

This statement is not in keeping with the declaration of the American Bankers' Association and shows out-

spoken dissension from the conclusion reached by that organization. It is pleasing to note such disapproval, and although we have known all along that many bankers, through mature consideration of the McFadden bill, have stamped it as deserving of support, the voices from such quarters have been distressingly silent ever since the A. B. A. issued its report.

It is noticeable that all the adverse criticism directed upon the gold bonus has been destructive in character. It has sought to tear the legislation to pieces, magnifying the untried and supposedly weak points of the measure. If any constructive suggestion has been ventured at all, the statement that deflation would cure existing ills has been stressed the most. Anyone will grant such a statement—when conditions get back to normal the gold miner no doubt will again be able to take up his pick and single-jack—but when will this be? Some economists are of the impression that we shall never again see prices of labor and commodities on the pre-war scale, whereas others estimate a period upward of five years before the situation will be comparable to the pre-war stage. And what of the interval? Is irreparable injury to be done to the highly developed and important gold industry? If not, some arrangement must be made to tide over the gold mines. Perhaps the McFadden bill in its present form is imperfect, perhaps amendments and changes should be incorporated to perfect it—or perhaps other legislation may better meet the circumstances. If so, it is high time to find this out—we need constructive not destructive criticism. The McFadden bill is the best plan so far advanced to assist the gold industry and to strengthen the financial system of the country. Some banks are finding this out and have the courage to air their opinions. More power to their elbows!

Vacationing on the Comstock

IT IS DISAPPOINTING, though not surprising, to hear of the strike that took place at Virginia City, Nev., quite recently when about five hundred workmen employed in the various mines on the Comstock lode quit work after having been refused a dollar increase in pay. Strictly speaking it was not a strike but a "vacation," according to the men themselves, who, feeling sure of their power to make the wheels stop turning, are pleased to jest, doubtless laughing up their sleeves at the neat way in which they get around their contracts and still, to their own way of thinking, preserve their honor.

The strike as a weapon of industrial warfare has become so common that this particular occurrence would ordinarily attract but little comment. The workman in his regal way once more chooses to play the fool. One is reminded of that line in a familiar poem:

> Art thou the king? The king's jester thou.

When will the miner, mucker, or whoever he be come to realize that the strike is a two-edged sword, cutting both ways, injuring not only his employer and the public but himself as well? This is a platitude to all except the striker, who cannot or will not see it.

There is an additional reason, in this recent Comstock strike, for annoyance and disappointment. To those who are interested in the future of the Comstock, the action of the men will seem most inopportune. A new chapter appears to be opening in the history of the famous lode, which of recent years has seemed gradually settling into obscurity. The newly organized United Comstock Mines Co., of which Bulkeley Wells is president, has undertaken the development of low-grade ores at Gold Hill on an extensive scale. Deep diamond drilling is under way at another point on the lode. There has been a shake-up in the management of one important group of mines. A period of change has apparently set in, the chance being that it is for the better and not the worse. And then the workmen strike. If they would have an increased share of the profit they had better wait until it were earned. The companies can scarcely stand an increase in wages with costs already so high. An optimist writes us that the trouble will probably be settled amicably, as is customary on the Comstock. Truly, the striker here is the ass in this bit of asininity. The trouble is said to have a "wobbly" origin. No doubt. Virginia City was once called a place of "Ophirs, gophers and loafers." The last named are evidently still there, as their work is readily apparent.

Concerning Prophecy

WE LIVE in a wonderful age, whose unexpected miracles of science tend to make us broad, receptive and tolerant. Yet, with this there goes hand in hand the scientific caution of waiting for evidence, of not jumping to unwarranted conclusions and beliefs. The bulk of our intelligent citizens do not as of old spring lightly from electricity to "animal magnetism," thence by way of hypnotism and abnormal or unusual psychic conditions to spiritualism, second-sight or prophecy. Our best citizens come from Missouri, and they want to be shown.

We do wrong in these days to speak of the occult and the supernatural. Nothing is supernatural, and if anything is occult, the nature and manifestations of what we call electricity are that; yet electricity has become a familiar demon to us, and gives us none of the terrified thrills its manifestations used to give our forefathers. Psychic phenomena are not occult—they are phenomena illustrative of the set laws of a very well-known system of nerve and brain organs.

Scientifically speaking, the case for prophecy, as we understand it, seems to date to be a poor one. It would be a fine thing—perhaps—were prophecy possible. "Give me a tip on the stock market. I need the money," pleaded a young man to a well-known Wall Street operator. "But I have no knowledge of what the market will do; I can only guess," replied the wizard. "Oh, yes, you do," was the rejoinder. "You know in advance when the market will go up and when it will go down." "Why, you ——— ———," exploded the wizard, "if I knew that 60 per cent of the time, don't you know that I would have had all the money there is in the world before now?" Generally speaking, prophecies make poor reading, both before and after—they are vague and wild, and evidently without moorings.

So far as we can judge, the best forecasts are still scientific, and depend upon the logical reasoning out of results from established facts—of the order of the prophecies of the astronomers who calculate and foretell so accurately the eclipses and the tides. This is supernatural to the savage, but we do not call it "occult."

The forecasts of science in many branches are equally accurate and marvelous. The skilled geological engineer may and often does calculate out, from the geological factors of his problem, the location of a lost or undis-

covered orebody, and shape the course of development in the blind earth so as to uncover it after months or years of burrowing. The same scientific method may be applied with a gratifying amount of success to more variable and elusive problems, even those governing human affairs, and the possession of these ratiocinative and foreseeing qualities distinguishes statesmen from politicians. The man who observes that "one man can see into the ground as far as another" is an ignoramus; and the politician who does not lean on the man capable of drawing future deductions from past and contemporary events, and the application of all the sciences thereto, is in the same foolish category. The forecast of the World War made by H. G. Wells was a famous and accurate one. The sketchy accuracy of Tennyson's vision of a world war fought partly in the air, and a subsequent League of Nations, written nearly eighty years before the war, is astonishing. In his vision of the "world-wide whisper—of the standards of the peoples" rushing to war, he

Heard the heavens filled with shouting, and there rained a ghastly dew
From the nations' airy navies grappling in the central blue.
Till the war-drum throbbed no longer, and the battle flags were furled
In the Parliament of Man, the Federation of the World.

We wonder. Inshallah! as the Arabs say—May God grant it. Yet Tennyson saw something else in the vision.

Slowly comes a hungry people, as a lion creeping nigher
Glares at one that nods and winks behind a slowly-dying fire.

Had the Czar of All the Russias, for example, pinned this under his study lamp as a true prophecy, we should all be happier today.

On the other hand, take imagination unguided by science and logic. Poe is reputed the most imaginative of writers, but he has no reputation for balance or logic In one of his "Tales" he presents an imaginary diary of a balloon voyager, dated a thousand years ahead. It is one of those attempts to construct imaginatively the future, at which Jules Verne did so well. According to Poe, in the year 2800 and something A.D., the principal method of travel would be balloon voyaging, drifting in air currents and with drag-anchors. The imaginary writer gets news of the outside world through newspapers thrown into her balloon from a passing balloon, and when her balloon collapses she can only put her diary into a bottle and throw it into the sea! How flat, after only eighty years, does this "wild" imagination sound, when we are familiar with motor-driven airplanes, the wireless telegraph and telephone, and even know of the wireless-driven motor boats and airplanes!

Sound Industrialism

THERE is something more than typographic and lithographic beauty in the pamphlet issued to commemorate the 175th anniversary of the Taylor-Wharton Iron & Steel Co., at High Bridge, New Jersey. In the present-day seething industrial world of America, beset with giant mushrooms of commerce which in a decade overshadow and perplex the country, with immense bond issues and gigantic bond defaults, with strikes and struggles between leaders and followers—so-called controversies between "capital" and "labor"—a dip into this pamphlet refreshes one as a shady fishing pool after a county fair. The present president is the fifth generation of his family who has directed the mining of iron ore at High Bridge, without, so far as can be discerned, becoming trust magnates or pluto-aristocrats. In his address, the president, Mr. Knox Taylor, observes with proper pride:

"I know of no concern in the line of our great industry which can approach our successful and venerable record. Others may have started sooner, but unless there is some history about which we have been unable to learn, all such beginners have long since dropped out of the race. Since our beginning many have come and gone. Why have we lived on through so many generations? I say in all humility that it is because we have ever been faithful to our trust." . . . "We are, as I have said, so far as we know, the oldest in our line. We are not the biggest; we have never aspired to be. With us it has not been quantity but rather quality." . . . "Such work as ours is not accomplished by great masses of automatic machinery. We need the individual and intelligent and resourceful worker. We need workers who take individual pride in their jobs and the company as a whole. That's the kind of business we do, and that's the kind of employees we are—men and women both."

Among the employees, the president pointed out four groups of three generations each, and twenty men who had served the company close to fifty years, mainly or all of them being representatives of solid old-fashioned American families.

We Always Did Beat the Dutch!

THE Germans who are promoting a company for the extraction of gold from sea water, with a plant to be located on the southeast coast of the United States, had better read up on the history of our country. Like the small boy apropos of scarlet fever, and the high-school girl who was advised to read Shakespeare, we "have had that," and we can't have it again. We have had it, out on our northeast coast, even on the coast of Maine; and does our Berlin friend imagine that what a Yankee clergyman failed to put over he can get away with? Possibly Hans will bite and dig up a few pitchforkfuls of paper marks. He will unless, as we begin to surmise, he is cured of his faith in German efficiency. But this all goes to show that the German genius is to trail along behind the Yankee; though doubtless now they will lay claim to the evolution of the idea. Extry! Great German discovery!

What the "technical and hydrographical reasons" for locating on the southeast coast of the United States are we can only surmise. Probably the United States was selected because it is the only country that still contains a considerable quantity of gold, and the waves that lap the shores of the North Sea contain only a recoverable extract of paper and printer's ink. Doubtless the southeastern coast was selected in order to get as far away as possible from Maine, where the Arctic current proved unfavorable in the Yankee attempt. Moreover, in the vicinity of Palm Beach, what with the higher solvent power of the Gulf Stream, the saline oceanic solutions should be appreciably richer. We suggest to our German friends that if they drive a crosscut under Washington, raise up under the Treasury and flood the vaults with cyanide solution, the waters of Chesapeake Bay and the neighboring high seas will be enriched by the natural convection currents.

WHAT OTHERS THINK

Protect American Citizens

Why not do some propaganda work and agitation for the protection of American citizens and their property in foreign countries rather than so much effort, time, and space in the advertising of the mineral resources of foreign lands? Especially now it seems to be the proper, popular thing of some of our Government departments to advise Americans to go to foreign countries to prospect and develop oil, because our known and prospective resources will be exhausted within the next twenty years.

Judging from the past, what guarantee have we of being able to realize on the investment? Our Government will not protect our lives, to say nothing of our property rights. It is not alone the present administration that refuses to do it, but have we ever done it? Not in Mexico within the last twenty years to my knowledge.

Is there any valid reason why an American in foreign countries is not entitled to protection as much as an Englishman? He is protected and respected in all parts of the world. Over 600 lives of Americans have been lost in Mexico, since 1910, besides many millions of dollars in property, and not a thing has been done. Not only is this true in Mexico but all over the world.

It is more than probable that if, during the past twenty-five years, we as a government had pursued the same policy as Great Britain—a chip on our shoulder, ready to fight to protect our citizens and their property, in all parts of the world—that we as a nation would not have been drawn into the World War.

Germany had no idea that we would fight. Why could not engineers in all classes of each profession and society agitate and work for their own protection in foreign lands as well as for other citizens?

Why not as an organization ask their Congressmen and Senators to define their position on this question? The farmer, as a class, gets what he wants because he has the votes. This is an important subject to the mining profession. Is it not high time that some action was taken?

Organized efforts can accomplish much.

Denver, Col. G. L. SHELDON.

Missouri's Cobalt Industry

I noticed an article in the *Engineering and Mining Journal* of Sept. 4, page 478, referring to Cobalt-Nickel Smelters, in which it is mentioned that a former cobalt-nickel refinery at Fredericktown, Mo., was shut down in 1909, and to the best of your knowledge was not operating at the present time. You will, I am sure, be pleased to hear that the cobalt-nickel industry in Missouri was revived in 1917, and a mill built capable of handling 300 tons of ore per day, with a smelter and refinery for treating the resultant concentrates, and recovering in marketable form the lead, copper, cobalt, and nickel contained. During 1917 and 1918 the plant was under construction, although during the latter part of 1918 some metals were marketed. The main production began in 1919, and the plant is now on a fair operating basis.

The ore milled assays approximately 2.3 per cent copper, 1.5 per cent lead, 0.75 per cent nickel, and 0.55 per cent cobalt. The plant is designed to make a fair recovery on all these metals, so the process is naturally complicated.

The lead is marketed in the form of concentrates from the mill, and as a sludge from the subsequent refining processes; the copper as electrolytic copper; the nickel as metal, or as oxide for the manufacture of nickel salts; and the cobalt as cobalt oxide or as crude hydrate.

The cobalt is the most important product of this plant, as it is an essential raw material of the enameling and ceramic industries, and has lately come into considerable use in the manufacture of driers for the paint industry. It is also the main metal in the alloy stellite, and has a limited market in the manufacture of steel alloys.

The Missouri Cobalt Co. is the only cobalt producer in the United States today, and in view of the increasing demands and the decreasing foreign supply of this metal from the former source, viz., the Cobalt camp of Ontario, Canada, it would appear that the Missouri ores should prove an important asset in the industries of the United States. S. F. KIRKPATRICK,

Managing Director, Missouri Cobalt Co.

Fredericktown, Mo.

[We are glad to publish this letter supplementing the information given in our issue of Sept. 4. It indicates a renewal of an attempt to develop domestic cobalt resources.—EDITOR.]

Smelting Without Fluxes

One does not have to go back to 1851, as is done in the "By the Way" column of Sept. 11, 1920, for an example of smelting without fluxing the ore. In 1905 the citizens of one of our Western towns raised nearly $250,000 to build a local smelting plant. Their ores were highly siliceous—so, to avoid the expense of bringing in basic ores from a distance, their technical advisers, consisting of a lawyer, a dentist and a broker, as I remember it, decided to try a process then being exploited in New Jersey. This consisted of heating the ore in a vertical kiln and then dropping it into cold water (preferably iced.) "The shock of the cold water on the heated ore caused the mineral particles to agglomerate and detach themselves from the gangue. (This is the explanation given to me, and not mine.) "Carbonates and oxides were reduced to metallic form, sulphides were partly roasted and reduced, but might remain unchanged. The entire mass, shattered and disintegrated, was then easily crushed, put over a concentrating table and the rich product sent to Eastern refiners."

Why so plausible a process didn't work seems incomprehensible, but I have never been able to find out that

any bullion or concentrates have ever been shipped from the plant erected to operate under these patents. I believe the original idea of the inventors was to treat the low-grade copper carbonate ores of New Jersey, but New Jersey still figures more as a refiner than as a producer of copper. DONALD M. LIDDELL.

New York, N. Y.

Concerning the Statements of Mining Engineers Abroad

You will not find my name on your list of subscribers for several years past. Constant travel makes it almost impossible to secure your much valued journal when mailed to me direct, so I purchase from the house of Lemare and others and who keep same for me, and I am quite proud of my file extending for more than four years, with only one or two missing numbers.

In the issue of June 26, 1920, appears an article sired by a Mr. Bruhl, stated to be a mining engineer, whose reputation must have been sufficient to allow an excellent half-tone of himself on mule-back "somewhere in Bolivia or S. A." to be published.

It is difficult for us who live our lives in these countries to understand why a journal with the deserved reputation you enjoy can be cajoled into publishing such a sneeringly cynical conglomeration of misstatements as are displayed in this article.

So far as what he says is concerned, dressed in different verbiage it might not hurt. It is possible the celebrated engineer was suffering from liver or "puno" (high altitude) while he was in Bolivia and North Chile, yet he was able to note the "beautiful sunset."

The *Engineering and Mining Journal* is subscribed to and purchased by a large number of Latin-American engineers who are naturally loyal to their own countries. These same acknowledge certain deficiencies in the way of enlightenment, give the hand of fellowship to all foreigners and yearn for information gained by experience and collegiate instruction not obtainable in their own countries. Many of them have studied in the universities of our country, also in Germany and Great Britain, but no one likes to have himself or his people exhibited in print as a group of crooks or damphools as Mr. Bruhl presents them. If Mr. Bruhl presents in his mining reports the same perspicuity as in his Munchausenlike yarn, it is a certainty that he never found anything but country rock and gangue.

Five different Chilean gentlemen brought this article to my attention after I myself had read same, and one of them suggested that had the said Bruhl been less "modest," in place of his own photo he might have shown one taken in our city which he says "is unattractive and in some places smells bad" (*vide* Pell and Mott Streets and some of the N. Y. tenement districts). Not a word about the cleanest, healthiest port on the west coast. No mention of its 64 kilometers of asphaltum paved streets, its wide sidewalks, its 120 kilometers of sewer system, all put down in solid rock, as we have little or no soil here—making it very costly. Nothing is said of its well-lighted streets which would be a credit to any town in the world, of a dozen or more substantial banking and commercial buildings, of the street cleaning department and our own "white wings," compressed-air street-washing machines. Furthermore, there is more than half a mile of a beautiful driveway, to say nothing of an excellent supply of water, brought 327 kilometers by the Antofagasta & Bolivia Ry. Co., and from an elevation of 13,600 ft.

On his trip he also rode in comfortable sleeping cars, not quite as luxurious as the Twentieth Century Limited, but clean and comfortable and with an excellent dining car service provided.

All of this to arrive at just *one* thing. We who live in these countries, and especially in Chile, are kept busy trying to sustain amicable relations with the natives. You never heard of an engineer of English, German, French or Italian extraction breaking into print and offering insults to several countries in one article.

For his one trip as described I have personally made a dozen. In twenty years in Mexico, Peru, Bolivia and Chile I have never locked the door to my room or rooms, have never been robbed of a *cobre*, nor was I ever held up or mulcted by a customs officer in any one of the countries named.

Such an article as this can do more harm than all the beneficent influence of such people as Pope Yeatman, W. S. Morse, W. L. Hamilton, T. S. Hamilton, Frank Aller, H. W. Bellinger, and many others. Why? For the same reason that the good that men do lies buried with their bones and their evil deeds live after them.

If you care to publish this for the "pro amistad" end of the game I will be very glad.

Antofagasta, Chile. ATWOOD BENTON.

Pronunciation

Your Bolshevist editor, as you call him in your issue of Aug. 14, makes a reasonable suggestion in accenting "assay" on the first syllable when used as a noun, and on the last syllable when used as a verb, conforming thus with "essay," which is substantially the same word. This principle also conforms with the double pronunciation of such words as the following list, the accent being shifted as the noun, verb, or adjective form is used: permit, contrast, accent, perfect, project, expert, conduct, frequent, export, import, combat, subject, protest, contest, produce, purport, escort, refuse, abstract present, record, compound, progress, traverse, survey, etc. A few words like "address," which keeps the accent on the last syllable, are exceptions.

However, I stand with your correspondent Roswheel and against the Bolshevist editor in their contention about the word "ain't." This unpleasing word has too bad a reputation, I think, ever to become accepted as good form.

At the end of the note under "By The Way" you say that it is a fool thing to use "rime" for "rhyme," but I believe the shorter form is the older and is a perfectly good word. P. B. MCDONALD.

New York University.

How Do You Assay Bauxite?

The discussion of the proper pronunciation of "assay" makes me think of another word, "bauxite," of which the dictionary pronunciation is miles away from that heard out in the open air. According to the authorities it should be called "bozeite," as if it came from Bozeman, Mont. But whoever heard it called that? Why, even professors of mineralogy call it "lauxite," or at least mine did. AL. U. MINY.

New York, N. Y.

PART OF CREW AT REPLOGLE MINE AT COLLAR OF MAIN SHAFT. RECONSTRUCTION OF HEADFRAME TO PERMIT HOISTING FROM THREE COMPARTMENTS UNDER WAY (NOW COMPLETED)

The Replogle Iron Mine Near Wharton, N. J.

Practically Abandoned for Almost Forty Years, Property Now Has Over 300,000 Tons of Ore Broken in Stopes With Development Progressing Rapidly—Two Concentrators Running and Modern Furnaces and Sintering Plant Under Construction

BY A. H. HUBBELL

ABOUT three miles west of Dover, in the highlands of northern New Jersey, and approximately forty miles from New York, the Wharton Steel Co., or Replogle Steel Co., is opening up one of the numerous deposits of magnetite ore that occur in this region. The work is being done on a large scale with the most up-to-date methods and equipment. The ore is lean and high in silica, running about 36 per cent in iron. It is being concentrated, first in a dry mill by magnetic separators, the tailings then being treated in a wet mill on tables. At Wharton, one and a half miles away, two new blast furnaces are in course of erection, each capable of making 500 tons of pig iron daily. The concentrates from the mills at the mine, which is known as the Replogle mine, are being stored at the furnaces together with Lake ores from the Marquette and Cuyuna ranges, awaiting the completion of the plant. The Wharton company, together with the Wharton & Northern R.R., is entirely owned by the Replogle Steel Co., that was incorporated on Oct. 30, 1919. The last is merely the holding company.

New Jersey was formerly far more important as a producer of iron ore than at present, the peak of production having been reached in 1882, when the output was about 932,000 tons. The decline since then was owing to Lake ore competition at the then low freight tariffs and also to the fact that magnetic separation and other methods of concentration had not been developed to today's high efficiency. At the present time, operations in the state are confined to five companies, including the Wharton (or Replogle) company. The other four are: The Ringwood company, with mines at Ringwood; the Empire Steel & Iron Co., operating at Mount Hope and Oxford; the Thomas Iron Co., working the Richard mine at Wharton, and the Beech Glen mines.

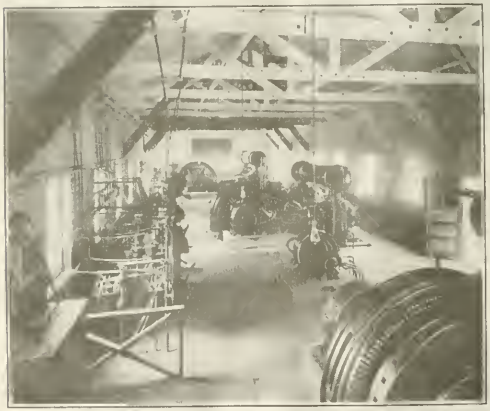
The holdings of the Wharton Steel Co. comprise about 5,000 acres in Randolph and Rockaway townships, of which the fee is owned by the company, and the mineral rights on an additional extensive acreage. In this tract are included about twenty-nine old mines or workings, which with one exception, the Replogle, are closed down. The old Richard mine of the Wharton company, which has been worked for over sixty years and has produced approximately 4,000,000 tons, has been sold to the Thomas Iron Co. Of the properties still included in the holdings the Hibernia has produced over 5,000,000 tons. The Dickerson tract of 385 acres has recently been acquired.

Before the Replogle company took over the Wharton Steel Co. the mine it is now working was known as the Scrub Oaks. The first shallow shafts on this deposit, according to W. S. Bayley, of the New Jersey Geological Survey, were sunk prior to 1868. By 1881 the mine had yielded about 56,000 tons of ore, from which date it remained practically abandoned until July, 1917, when the Wharton company undertook to prospect the ground with the diamond drill. Since then this deposit has been proven to a depth of 1,240 ft. and the probable existence of nearly 27,000,000 tons of iron ore demonstrated. Compared with the present workings and plans the old stope existing prior to July, 1917, is negligible. By the end of 1919, two and a half years later, when the Replogle company took control, the Wharton company had 109,000 tons of ore broken in stopes, no shipments having been made.

Some idea may be gained of the way in which opera-

1. REPLOGLE MINE PLANT, SHOWING ENLARGED HEADER AME AT NO. 1 SHAFT. 2. DWIGHT-LLOYD SINTERING PLANT (SEPT. 15) UNDER CONSTRUCTION AT WHARTON FURNACES. 3. FURNACES AND ORE YARD AT WHARTON, N. J. 4. TAILINGS RECLAMATION PLANT AT REPLOGLE MINE. 5. GENERAL VIEW OF CONCENTRATORS AND CRUSHING PLANT AT MINE, NO. 1 HEADFRAME IN BACKGROUND. 6. NO. 2 SHAFT AND SINKING CREW

tions are now being conducted by the fact that since the first of the year about 200,000 tons has been added to the tonnage broken in stopes, this all on the first level, which has been opened for a distance of about 2,500 ft. from face to face. The second level is in process of being opened up. The main shaft has been enlarged to four compartments, the headframe correspondingly altered, and a hoist capable of working from 1,800 ft. depth has been purchased. The dry concentrator has been supplemented by a wet mill of a capacity of 2,000 tons per 24 hours. About 875 to 1,000 tons of crude ore is being crushed per day at present, which production was doubled commencing Oct. 1. A modern change house to accommodate 500 men is being erected at the mine. Three old furnaces at Wharton have been torn down, one of them scrapped and the two others completely rebuilt on new foundations, at a cost of nearly $3,000,000. The equipment that is being installed is thoroughly up to date. The present operators apparently are optimistic as to the possibilities, all things



COMPRESSOR BUILDING AT REPLOGLE MINE

considered, of these lean ores and are planning on broad lines for the future.

The orebody of the Replogle mine is a lens, or vein, of magnetite in gneiss. It strikes N. 33 deg. 7 min. E., dipping 55 deg. southeast, and pitches 18 deg. northeast. The geology of these deposits of the highlands is discussed at great length by W. S. Bayley in Vol. 7 (1910) of the Reports of the Geological Survey of New Jersey. All the lenses in the mineralized belt have the same general strike. In the Replogle orebody there is no definite contact between the ore and the gneiss, there being instead a gradual change from one to the other. It is claimed that as the magnetite becomes more and more disseminated it is possible to distinguish commercial ore without resorting to systematic sampling.

Considerable diamond drilling has been done by the Wharton company before and since it was taken over by the Replogle interests. The orebody, as stated before, pitches 18 deg. northeast. A hole put down to the southwest has cut ore at a depth of 1,240 ft. measured on the dip. Considering the pitch of the deposit, this represents deeper ore than any yet proved elsewhere. On the Brevoort vein the last hole drilled showed ore at a depth of 600 ft. on the dip and other holes are being put down. All diamond drilling is done under contract by the Sullivan Machinery Co., which has two drills going at the present time.

Non-Magnetic Ore Compelled Erection of Wet Mill

Trouble was experienced in operating the dry mill, where low intensity magnetic separation is employed, the cause of which turned out to be that a considerable part of the iron mineral is martite (Fe_2O_3) instead of magnetite (Fe_3O_4). It was for this reason that the wet mill was erected. The martite and magnetite are so mixed in the ore that it is not possible to mine them separately.

The deposit is opened through two shafts, No. 1 and No. 2, both following the approximate 55-deg. dip of the orebody. No. 1, the main shaft, is now down 311 ft., or 80 ft. below the first level, and is located 100 ft. in the foot wall. It has four compartments, each 6 x 6 ft. in the clear, 10-in. oak timber being used. Sinking is under way on two compartments to the second level, 275 ft. below the first. When the latter is reached and connection made with No. 2 shaft, shaft No. 1 will be completed to this level by raising the remaining two compartments

No. 2 shaft has two compartments, each 6 x 6 ft. in the clear, and was started in ore about 1,400 ft. southwest along the strike from No. 1. It has reached the second level at 506 ft. depth after passing partly through country rock, and a drift has been started toward No. 1. Ore from this development work is hoisted and dumped through an old shaft near by into one of the stopes on the first level. Both shafts are timbered with square sets. In addition, No. 1 shaft is concreted for about 70 ft. below the collar. Aside from the timber used for stope chutes and in the shafts but little of it is used underground.

Shrinkage stoping is employed, stopes being driven the full width of the vein and 400 ft. in length with 50 to 80-ft. pillars in between, in which the manways are carried. There are three such stopes on the first level southwest of No. 1 shaft. In some places the stopes are over 100 ft. wide from foot to hanging wall. Beyond them in the same direction a series of block faults is met which will make stoping difficult where they occur.

Second Orebody Proved Parallel to Replogle Vein

On the other side of the shaft to the northeast the ground is badly broken. After traversing this broken zone for about 800 ft. in a direction approximating N. 65 deg. E. the northeast drift has recently cut a second orebody parallel to the first at a distance of about 400 ft. The existence of this had been shown by diamond drilling. It is known as the Brevoort vein.

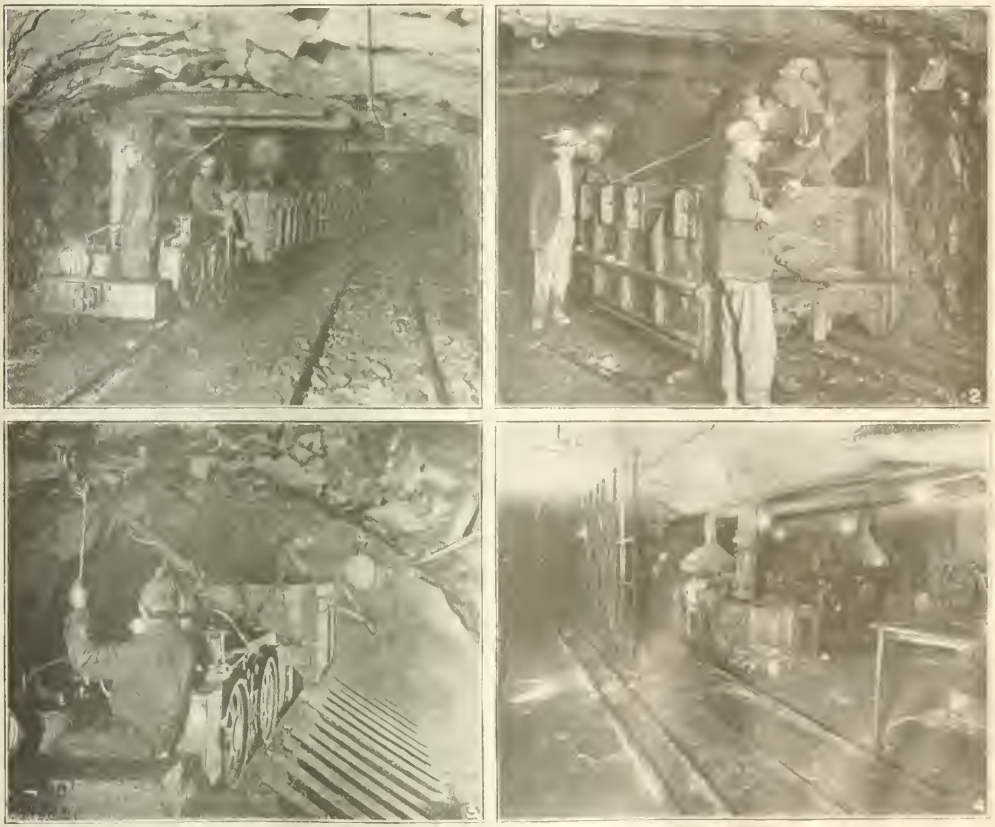
In starting a stope a ten-foot pillar is left over the drift. A sublevel drift is then driven close to the foot wall. Chutes are spaced about 40 ft. apart. Chute grizzlies are made of 105-lb. rails spaced to leave a 10¾-in. opening. Subdrifts were not employed when stoping was first started on this level, so that the muck from the older portions of the stopes must be broken when loading the cars. To obviate the delay in tramming thus caused, the main drift, formerly single track under the stopes, was widened to accommodate two tracks.

At the stope chutes the ore is loaded into 1-ton

70-cu.ft. gable-bottom side-dump mine cars, made by the Easton Car Co., and hauled by electric locomotives to No. 1 shaft, where they are dumped into a 5-ton loading pocket. The grizzly over this consists of 24-in. I-beams cut in half and spaced so as to leave an 11-in. opening.

Three locomotives are in use, one of them being a G. E. 6-ton trolley locomotive. The remaining two are Baldwin-Westinghouse 5½-ton storage battery locomotives which were only recently installed. From six to twelve cars are hauled in a train, the average haul being about 800 ft. Storage batteries are charged once a day under present conditions. The main track is 36-in. gage laid with a grade of 0.5 per cent in favor of the load. Stub switches are used.

All ore is hoisted through No. 1 shaft. The loading pocket is equipped with a measuring box discharging into counterbalanced 2½-ton skips. Hoisting at present is done by a small double-drum geared electric hoist. Equipment is on the way for a new hoisting plant capable of working to 1,800 ft. depth. This will include a Wellman-Seaver-Morgan double-drum hoist, drums being 72 in. in diameter and 60-in. face, with a rope speed of 800 ft. per min. This will be operated by a 350-hp. 2,300-v., a.c. motor and will handle two 5-ton skips in balance. A car for handling men will be installed in the third compartment and will be moved by a single-drum hoist, of 60-in. diameter, and operated by a 140-hp. d.c. motor. Near the shaft, the main drift as it approaches from the southwest branches into two with a pillar between. One track continues straight ahead over the loading pocket. The other passes on the foot-wall side of the pillar and past the underground blacksmith shop and station, connecting again with the first track beyond the pillar. From here the drift runs northeast through the broken ground towards the Brevoort vein previously referred to.

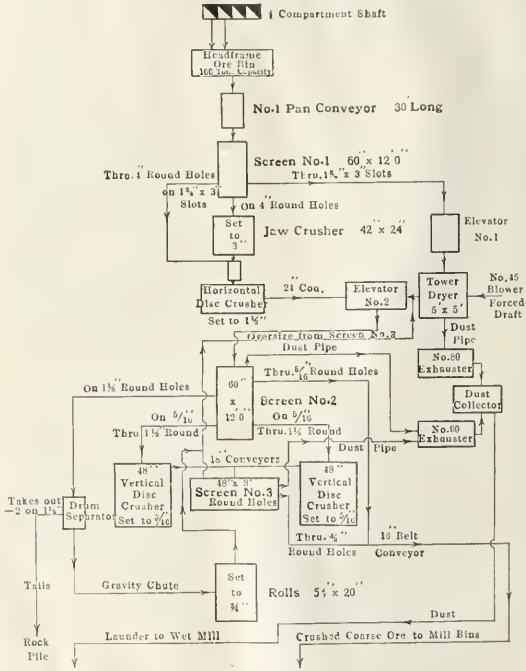


UNDERGROUND VIEWS AT REPLOGLE MINE. 1. MOTOR TRAIN ON FIRST LEVEL (STORAGE BATTERY LOCOMOTIVES ARE ALSO USED). 2. LOADING 4-TON MINE CAR AT STOPE CHUTE. 3. DUMPING INTO LOADING POCKET AT NO. 1 SHAFT. 4. BLACKSMITH SHOP AT FIRST LEVEL STATION

In driving this north (or northeast) drift especially good time was made over a length of 261 ft., which was driven in twenty-six drilling shifts, the formation here being granite. The drift is 9 x 8 ft. in cross section and the work was done with two I-R 24S drills working one shift per day. A wedge cut was used consisting of eight 12-ft. cut holes, the remaining eight holes in the round being 11 ft. long. Sixty per cent gelatine was used in the cut holes and 40 per cent gelatine in the rest. No. 8 caps were used and the round shot with fuse. In drilling, a 24-in. starter was used with a five-eighth-inch

drop in gage and an 18-in. run. A view of the set up in the heading is shown on the front cover of this issue. Powder used averaged 19 lb. per ft. advance. The cut holes were started as close to the rib as possible, the drills being mounted on columns.

All drilling is done by machine. Water Leyners, Denver Turbro and I-R 248 drills are used in drifting, Waugh 73 and I-R—CC 10 drills in stoping, and DDR 13 Jackhamers in sinking. In sinking No. 1 shaft an ordinary pyramid cut is employed, one-inch hex. steel being used with a one-eighth-inch drop and a 1-ft. run. Water for the drills is obtained from a diamond-drill hole from which it is piped to a tank. Compressed air is used to raise the water pressure. The mine makes but little



FLOW SHEET OF CRUSHING PLANT AT REPLOGLE MINE

water, in all about 50 gal. per min., which is pumped out twice daily with a Worthington 4-stage direct-connected electric driven pump, having a capacity of 1,000 gal. per minute. A second pump of the reciprocating type is held in reserve. An Armstrong "Shuveloder" has recently been installed.

Powder is stored underground in a concrete-lined magazine, lighted and heated with electricity. It is kept in separate racks according to grade. Three grades are used, namely 60 per cent gelatine for cut holes in development work, 40 per cent 1¾ in. in stopes, and 40 per cent 1 in. in block holes.

The blacksmith shop is underground. Space has been made for it at the station on No. 1 level. Its equipment includes two I-R 50 sharpeners, two punchers and two Case oil forges (at present using coke). The oil used in tempering the steel is cooled by being pumped through the tank of water used for quenching. The latter is kept cool by being constantly renewed.

The equipment of the power house, which serves the mine and the two mills, includes three motor-driven compressors, namely, one I-R 3,400-ft., 20¼—32 x 24 in.; one I-R 1,900-ft., 15¾—25 x 18 in.; and one Chicago-Pneumatic 1,700-ft., 23—13 x 16 in.; also a 150-kw. 250-v. 60-cycle rotary converter and a synchronous motor generator set consisting of 200-kw., 125-250-v. generator and 290-hp., 2,300-v., 60-cycle motor.

Electric power is supplied by the New Jersey Power & Light Co. Current at 440 v. is used for pumping, at 110 v. for lights and signal system, and at 250 v., d.c., for the electric locomotives and magnetic separators. Mine telephones are in use.

At present about 300 men are employed on operation and construction work at Replogle mine. The mine and crushing plant are running two 8-hour shifts and both mills are working three shifts. About fifteen men are employed on crushing and concentration on two shifts and seven men on the third shift.

The present capacity of the dry mill is 100 tons per hour and of the wet mill 80 tons. Eventually the former will be able to treat 120 tons per hour. The ratio of concentration of both mills combined is 2: 1, though the wet mill, considered by itself, is working under a more favorable ratio. Roughly speaking, out of every 100 tons of crude ore fed to the dry mill 30 tons is removed as dry concentrates, the balance going to the wet plant.

The dry concentrator was built in September, 1918, and has been in commission since then, except for a period of five months in 1919. Poor recovery resulting from the presence of non-magnetic martite, as stated before, led to the building of the wet concentrator, which was placed in operation in March of this year and was run on an experimental basis until June, since when it had been on an operating basis. The flow sheets of both mills and crushing plant are shown in the accompanying illustration. With reference to the crushing plant flow sheet it is planned to install a second Mitchell screen and two more drum separators. It is also intended to do the coarse crushing underground, where a 30 x 42-in. crusher will be installed on the second level.

The wet mill is laid out in eight units, each of which follows the flow sheet given. Every unit is independent of the others. The type of drag employed is the Federal Esperanto. The magnetic separators used in the dry concentrator are of the Ball Norton type and were constructed by the company itself.

Wet and dry concentrates were shipped separately to the furnace until Aug. 1, when they were mixed. For the first eight months of 1920 the concentrates produced ran 0.057 P, 60.18 Fe and 12.07 SiO_2. It is planned to re-treat the tailings that were made by the dry mill before the wet concentrator was installed, the final tailings being expected to run 8 per cent Fe.

In a statement issued with the report of the Replogle Steel Co. for the half year ended June 30, W. H. Brevoort, president, said: "The new freight tariffs will increase the cost of delivery alone on 50 per cent Lake ore to the Eastern District to approximately $5 per ton, which sum is more than sufficient to cover the entire cost of producing Replogle 60 per cent iron concentrate."

Much New Construction Work in Progress

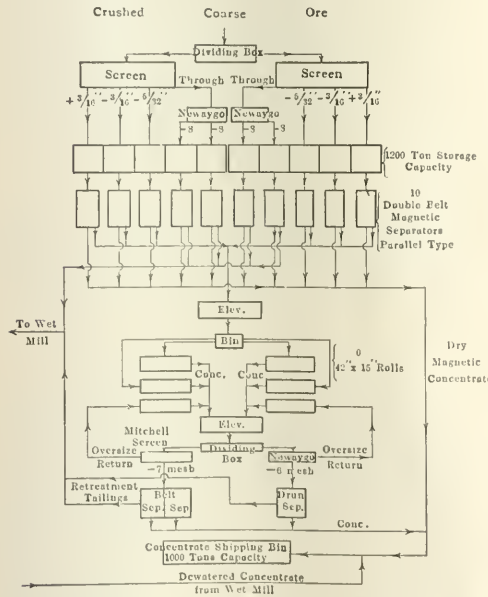
Considerable new construction is under way at the surface plant at Replogle mine. A change house that will

accommodate 500 men and will be as up to date as possible is already partly constructed. A tailings reclamation plant, shown in the photograph, is nearing completion. By means of this it will be possible to draw off the tailings at any point of the dump by means of a belt conveyor that runs the length of the concrete conduit at the base of the trestle. This conveyor will discharge directly into railroad cars. The tailings sands are said to have proved excellent for making concrete, and have been used in the construction work in progress at the Wharton furnaces. It is believed that they can be readily marketed in competition with the output of local sand pits.

Installation of a primary water system is almost complete. By it will be afforded a supply of 300,000 gal. water per 24 hours taken from the mine and a canal in the vicinity. A new system for reclaiming the mill water has also been installed.

Stocking Lake Ores at Furnaces

The concentrates are hauled to the Wharton yards to be weighed and thence to the furnaces, a total distance of 2½ miles. The rail distance to the furnace direct is but 1.3 miles. In the ore yard about 23,000 tons of



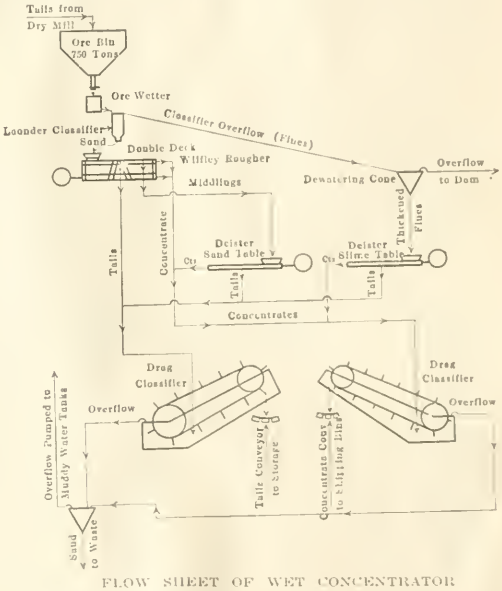
FLOW SHEET OF DRY OR MAGNETIC CONCENTRATOR

concentrates is stocked at present. Lake ores are also being accumulated, about 75,000 tons having been stocked to date. These are of a non-bessemer grade for foundry irons and run about 50 per cent iron.

Remodeling the furnaces at Wharton was started Dec. 12, 1919. The superintendent in charge of construction is S. C. Carter. Prior to the date given the plant comprised two blast furnaces, nominally rated at 500 tons capacity each but actually of smaller output, and one old hand-filled furnace which has been scrapped. The two blast furnaces are being completely rebuilt on new foundations. When completed the plant will have an actual capacity of 1,000 tons of pig iron per 24 hours. A casting machine made by the Pittsburgh Coal Washer Co. will be used. There will be three 100-ton mixer type ladles made by the Treadwell Engineering Co. The ore yard storage capacity is 275,000 tons and an ore bridge is being erected.

A sintering plant of 800-900 tons capacity per 24 hours is under construction. Two Dwight-Lloyd type "B" roasters, each of 400-450 tons capacity, will be installed. These will sinter part of the Replogle concentrates, as well as flue dust from the furnaces. An accumulation of flue dust from several years' operation of the old plant will also be treated.

Twenty 350-hp. gas-fired Sterling boilers are being



FLOW SHEET OF WET CONCENTRATOR

installed in the new boiler plant. The engine room equipment includes six Southwark engines with Iverson air heads, each with a capacity of 384 cu.ft. of air per revolution. These can be speeded up to 50 r.p.m. A new 1,000-kw. Corliss-driven Westinghouse generator is also being installed. The pumping equipment will include one Laidlaw-Dunn-Gordon 1,000,000-gal. pump and three 1,500,000-gal. Worthington pumps.

In all, about 200 men will be employed at the furnaces when the plant is completed. Lime for fluxing will be obtained from the company's quarry at Ogdensburg, N. J., which has a 1,000-ft. face 70 ft. high.

Welfare Work Not Neglected

The Replogle Steel Co. is paying due attention to welfare work. This is supervised by a welfare superintendent, who divides his time between the furnaces and the mine. In the course of his duties he keeps check on living conditions and follows up injured cases. First aid lectures are given once a month at the mine office by the company doctor. A short distance from the mine plant forty houses, constituting the village of Replogle, have been erected. These are four-room structures and are rented to employees at a nominal sum.

The president of the Replogle Steel Co., as well as of

the Wharton Steel Co., is W. H. Brevoort. J. Leonard Replogle is chairman of the board of the Replogle company. L. P. Ross, the vice-president of the Wharton company, is the blast furnace engineer who is to take charge of furnace operations. The members of the mine staff are as follows: A. B. Menefee, superintendent of mines; L. L. Kirtley, assistant superintendent in charge of mills; Warren Davenport, mill foreman; Mr. Van Falkenburg, mine foreman, and William Dressler, master machanic. L. A. Blackner is chief engineer at the mine and W. R. Canton mill clerk. H. J. Briney is furnace superintendent at Wharton. The data given in this article and most of the photographs were readily obtained through the courtesy of the company and the administrative staff at the time of my visits to the property.

South Africa's Mineral Production Increasing

The production of minerals in the Union of South Africa for 1919, according to Vice-Consul Charles J. Pisar, was valued at $247,418,338, or $17,624,484 more than in 1918, when the production was valued at $229,793,854. The production of gold showed a decrease of 86,566 oz. over the previous year, but the output of silver, diamonds, and coal was slightly increased. The

	1918		1919	
Minerals	Tons	Value	Tons	Value
Gold	(a) 8,418,217	$174,017,845	(a) 8,331,651	$172,228,498
Silver	(a) 877,498	772,823	(a) 891,304	991,043
Diamonds	(b) 2,543,735	33,876,008	(b) 2,592,099	54,688,647
Coal	9,878,382	15,801,776	10,261,859	16,693,852
Copper	821	1,745,258	4,904	1,016,622
Tin	2,230	2,179,958	1,629	1,338,829
Antimony	99	12,599	32	2,706
Arsenic, white	18	8,560	8	3,226
Asbestos	3,674	262,971	3,934	323,262
Corundum	3,876	127,794	179	7,232
Graphite	79	11,164	86	12,799
Iron ore	4,879	13,281	3,601	5,261
Mineral paints, iron oxide, ochers	736	6,945	240	2,784
Iron pyrites	4,630	34,075	5,532	43,283
Talc	670	8,336	757	10,560
Lead ore	162	9,178	756	24,201
Magnesite	833	10,628	1,024	13,251
Manganese ore	544	9,563	155	3,776
Mica	3	5,767	3	1,796
Lime	102,372	770,099		
Soda	764	54,013	52	3,664
Tungsten	12	11,606	4	3,046
Flint	220	7,256		
Gypsum	2,638	33,301		
Totals		$229,793,854		$247,418,338

(a) Fine ounces. (b) Carats.

copper output recorded a further decline of nearly 2,000 tons over 1918, and about 15,000 tons over 1917. This was due principally to the closing down in May, 1919, of the mines operated by the Cape Copper Co., in Namaqua Land, on account of the increased operating expenses, the difficulty in obtaining freights, and the fall in the price of copper. The table is a detailed summary of the mineral output for South Africa for 1918 and 1919.

Silver Prices Lower in Canada

The quantity of silver marketed during the first half of 1920 in Ontario, according to the Ontario Department of Mines, was considerably less than the output. An average price of $1.30 per fine ounce was obtained for the first quarter of 1920. For the half year the average New York price was $1.17 for silver in the open market, as distinguished from the fixed price, retroactive to May 13, of $1 per oz. (1,000 fine) under the Pittman Act for metal produced, smelted, and refined exclusively within the United States. For the month of June the average open market price in New York was 90.84c. This disadvantage to the Ontario producer, however, was more than offset by the exchange rate. Since June the export price of silver has risen gradually, until it approaches the quotation for domestic silver.

During the period a total of 4,474,322 oz., worth $5,077,028, was marketed. Of this total 225,513 oz. came from the Miller Lake-O'Brien and Castle properties, at Gowanda, 23,414 oz. from nickel-copper refining operations, and 49,156 oz. from gold ores. Some producers of silver were paid for the cobalt content of ores, concentrates, and residues marketed. In all, $138,317 was received for 296,116 lb.

Extensive Rumanian Salt Deposits

The majority of the Rumanian salt mines adjoin the oil fields, and are situated in the region of the Lower Carpathians, from the Bucovina to the west of Oltenic, a stretch of over 250 square miles. There is sufficient salt to provide for the needs of all the Balkan countries for several centuries. The quality is good.

The Rumanian salt-mining industry, a state monopoly since 1863, is carried on in the following areas, according to *Commerce Reports*: (*a*) Ocna, in the Bakau district, employs about 200 workmen, chiefly prisoners condemned to terms of hard labor. Its pre-war production was about 28,000 tons, at 12 lei per ton. These mines are said to be capable of a total output of at least 400,000,000 tons. (*b*) Ocuele Mari, in the Valcea district, had a pre-war output of 26,000 tons. (*c*) The Slanic mines extend almost unbrokenly for 10 kilometers, and produced before the war 90,000 tons annually. These mines are said to contain about 7,700,000 tons.

It should be realized that in addition to the above mines there are others of lesser importance. A recent calculation places the known salt deposits at more than 10,000,000,000 tons. Owing to lack of organization, the salt export is entirely disproportionate to the production.

Upper Silesia's Metal Production

According to statistics issued by the Upper Silesian Mining & Smelting Syndicate, the number of iron-ore producing undertakings is seven; the production of iron ore, including ore obtained from the lead and zinc mines, amounted in 1919 to 61,469 tonnes, the average price realized being 15.26 marks per tonne. The tonnage produced was less than half the output for the year 1913. The production of calamine was 40,791 tonnes, zinc blende 196,880 tonnes, lead ore 21,950 tonnes, and sulphur pyrites 3,321 tonnes. The output of pig iron amounted to 459,954 tonnes at a cost of 1,581 tonnes of coke per tonne, which compares with 696,146 tonnes pig iron at a cost of 1,395 tonnes of coke per tonne in 1918. The output of the foundries was 20,534 tonnes (29.9 per cent) below that for the preceding year. The production of 50-deg. sulphuric acid in thirteen of the establishments amounted to 121,171 tonnes, as against 260,166 tonnes in 1918. The output of raw zinc was 74,023 tonnes, as compared with 122,961 tonnes in the previous year. The production of lead and litharge was 3,992 tonnes less than the quantity produced in 1918, a fall of 17.7 per cent, and there was also a reduction of 1,098 kilos, equal to 27.1 per cent, in the production of silver.

Hazards Met in Open-Cut Mining

Fewer Dangers at Open-Pit Properties Than Generally Found in Underground Mines—Methods Of Accident Prevention Mainly Those Which Depend on Instruction, Although Safety Appliances Are Used on All Machinery

By D. E. A. Charlton*

SOME years ago, when I was actively engaged in safety work, I made the statement—I do not admit that it was entirely original—that the best beginning that could be made in the development of an accident-prevention program was a careful and systematic study of the accidents which had occurred over a certain period of time at the particular operation or operations where the installation of preventative methods is contemplated. It is to be assumed, of course, that every advantage is to be taken of methods already in practice at similar operations, and for that reason the safety engineer can follow a well-defined plan which will apply to his general problems; but his specific problems, those which are peculiar to his individual operation, will be best determined by the study of the accidents that have occurred about his plant, shop, mine, or whatever the operation engaged in. Having determined the cause, it is then up to the safety engineer to suggest the manner of prevention. Oftentimes it is within his province to put this directly into effect, but at any rate his judgment should be such that possibility a recurrence of a similar accident is reduced to a minimum.

The thoroughness of accident-prevention work in all lines of industry needs no comment here, and it is not the intent of this paper to emphasize what has already been done in the different fields. Those engaged in safety work are all working for a common purpose—the elimination of injury. However, there is the great opporunity for co-operation that we should not lose sight of. If we do so, we become provincial and place ourselves in the class of the man who believes himself sufficient to himself, refuses to accept suggestions, and thereby places limitations upon his accomplishments which are bounded by his own often narrow capabilities. There has been, still is, and will continue to be an immense amount of study given to safety work in every branch of industry, so that it behooves the safety engineer to not only give heed to his own type of accidents and the method of prevention but to those conditions in other fields as well. The idea is simply one which is carried out in any line of work, and its application has been largely responsible for the success that has attended America's industrial progress. By way of illustration: During the recent trip of the American Institute of Mining and Metallurgical Engineers to the Lake Superior region it was most noticeable that the visiting engineers were interested in methods which differed from their own, and the comparison of practices was frequently discussed. This example of course applies to the various branches of mining, but it may well be extended to other industries, any one of which includes features common to all of them.

Open-Pit Accident Percentage Lower Than Other Mining

Open-pit or open-cut mining is free from many of the accidents peculiar to other methods of mining. Although the sources of many open-pit accidents are not present in underground mines, they are, in comparison, in the minority, and it may be said in general that a lower accident rate prevails in open-pit than in underground mines. This is not only true of the average which is based on the number of men employed but also of that obtained on a tonnage basis, for open-pit operations as a rule permit of a greater removal of material than that obtainable through underground methods. The outstanding advantage is, of course, the daylight feature and the relation of this in connection with accident prevention is too well known to the safety engineer to require further comment. It is true that night operations are conducted so that perhaps an additional hazard is introduced. The lighting problem, however, does not present such a serious obstacle as is found in other systems of mining, and present practices have reached a high stage of development, so that there is little difference between the number and seriousness of accidents occurring in the night time and the day time.

In order to obtain an idea of the comparison of the accident rate at open-pit mines and that which holds for all other methods I have reproduced a table which appeared in Technical Paper 252 of the Bureau of Mines, "Metal Mine Accidents in the United States During the Calendar Year 1918," compiled by Albert H. Fay. This shows the number killed and injured in open-pit mines where the ore was mined by steam shovel during the years 1914 to 1918 and includes the returns from typical companies employing about 10,000 men and operating open pits in Minnesota, Alabama,

FATALITIES AND INJURIES AT STEAM SHOVEL OPEN PITS, 1914-1918

	Killed					Injured				
Cause	1914	1915	1916	1917	1918	1914	1915	1916	1917	1918
Falls of rock	5	4	5	9	11	425	449	402	380	346
Run or fall of rock or ore in loading	. .	.....		. . .			8	9	17	5
Explosives	8	1	7	4	9	107	38	41	75	57
Haulage	8	16	11	13	13	271	194	287	304	336
Falls of persons	....	.	.	.	1	238	179	129	223	189
Miscellaneous	3	3	4	3	5	1,256	1,040	1,548	1,288	1,352
Shaft	..	..				....	....			
Total	24	24	27	29	39	2,297	1,908	2,416	2,287	2,285
Per one thousand 300-day workers	2 73	3 16	3 15	2 81	3 66	261 00	250 79	281 58	221 39	214 27
By all methods	4 92	4 25	4 06	3 97	4 58	331 38	358 73	398 52	318 52	322 91

*A paper read at the Ninth Annual Safety Congress of the National Safety Council, Milwaukee, Wis., Sept. 27 to Oct. 1, 1920.

Nevada, New Mexico and Utah. I have also added the number killed and injured in all methods of mining, (including open pits) per 1,000 300-day workers, for the respective years, these figures being obtained from the same source.

The comparison used is entirely an arbitrary one but sufficiently accurate to show that open-pit mining is not so hazardous as other methods.

It should be understood that the term open-pit mining includes not only those operations where steam shovels are used but those in which other methods of excavation are employed. For our purposes, I shall deal with the former, as I believe all of the hazards met with in the latter will be included in such a consideration. It might be well also, in connection with the above explanation, to add that the development of the electrically-operated shovel will preclude the designation "steam shovel open pits" in any treatment that may be made of open-pit accidents, for the success which has attended the installation of these excavators has demonstrated that they will play a considerable part in the future of the open pits and earth removal.

General Causes of Open-Pit Accidents

In order to consider the various hazards met in open pits, the following classification of causes may be used and each subject can be treated with its relation to the operation as a whole. The scheme of classification follows the subdivision of accident causes which is used by the Bureau of Mines, and it is to the best of my knowledge adaptable to most open pits. All of the accidents can be traced directly or indirectly to all of these causes and a further elaboration will only complicate the study which will be made from the operative standpoint:

Falls or slides of rock or ore.
Explosives.
Haulage accidents (locomotives, etc.).
Steam shovels.
Falls of persons.
Falls of derricks, booms, etc.
Machinery (other than locomotives or steam shovels).
Electricity.
Hand Tools.
Other causes.

Accidents resulting from falls or slides of rock or ore in open pits do not constitute as large a percentage of the total open-pit accidents as do those attributed to a similar cause in a study of those accidents relating to underground mining. The reason for this is quite obvious, inasmuch as the nature of the operation permits better accessibility to the dangerous condition. Not infrequently is ample warning given, the men may be removed to a place of safety, and the necessary steps taken to make the bank safe.

Bank Trimming Prevents Accidents from Falls of Ground

I believe the average slope for stripping banks is 1½ : 1 and it is approximately the same for ore, that is where the overburden is composed of glacial till and the ore is soft such as may be found at the open pits on the Mesabi Range. Rock banks or ore which are of denser structure of course permit of steeper slopes unless the pitch of the strata is such that exceptions must be made. In any event the principal preventive measures which must be taken to avoid this type of accident consist of careful inspection of the banks and proper trimming when necessary. Several factors, such as frosts, blasting, removal of rock or ore from other sections of the pit, etc., may influence falls of banks, but all of these must be carefully guarded against. Several companies employ special men on regular bank inspection work and the results have proved that such precautions have entirely justified the expenditures made. Among the rules which are prescribed by many of the companies who are engaged in open-pit operation is to be found a clause relating to workmen at the front and the bank side of a steam shovel. Although perhaps the rule may apply more particularly to steam-shovel operation, it is most applicable in connection with falls of rock or ore. By remaining on the free sides of the shovel during its operation, the men are assured of safety, and should their work require them to occupy positions between the shovel and the bank a rigid watch should be kept and the men advised of any movements of ground. Such precautions are easily obtainable during the daytime. During the night shift, unless sufficient illumination is procurable, the difficulty is necessarily increased.

The Use of Shelter Houses in Open Pits

Accidents attributable to explosives are many and varied. Before taking up the subject of the handling and treatment of powder, it may be well to consider the dangers resulting from blasting and some of the precautions necessary. It is most essential at all times that men working in the pit are given adequate protection from flying pieces of rock and ore, which often travel considerable distances. There should be ample provision made to properly warn the men, and this is usually done by means of warning whistles which are blown—a series of short blasts from either the steam shovel or locomotive whistles—for some time previous to the blasting. Following this it should be the duty of the foreman and the underbosses to see that all of the men seek proper shelter. There are a number of types of shelter houses which are in use in open pits. These consist of steel frames lined with ties or houses built of steel plate and reinforced. The latter are undoubtedly more serviceable and can be transported from one place to another without much difficulty. In addition to affording protection to the men the shelter also serves as a point from which the blaster may, if he is using an electric battery, explode the charge, and so perform that operation in perfect safety.

Primitive Thawing Methods Tabooed

The lists of "dont's" which have been given publicity by the manufacturers of blasting powders and which appear in every safety rule book should have adequate perusal and digestion, for they have all been written with a purpose, and apply in open-pit mining as well as in any operation where blasting powder is used.

It is quite essential that proper storage be provided for explosives. Powder magazines must be kept dry and well ventilated, separate houses being maintained for the storage of black powder and dynamite and also for blasting caps, electric fuses and exploders. It is generally specified that these should be located not less than 300 ft. from the thawing house or any occupied building. Standard types of thawing houses are pro-

vided by powder manufacturers and these are in general use where climatic conditions require that the dynamite be properly prepared before using. Their specifications provide a separate housing for the heating, which is done by hot water, steam, or exhaust steam, and the thawing house proper where the explosives are stored. Certain precautions regarding the proper care of the thawing house, such as the removal of drawers etc., are stipulated. The many accidents which have resulted from attempts to thaw dynamite by primitive and foolhardy methods have caused rigid rules to be made concerning this particular proceeding, and there are, fortunately, few instances today where attempts are made to thaw powder by methods other than those stipulated by powder manufacturers or operators.

The transportation of powder from the magazine or thawer house to the working place must be accomplished safely and in a convenient manner. At several mines a special slide or lowering device is provided and from the lower end of this the men in special charge of that part of the work convey the powder to the various points where it is to be used. Properly marked boxes should be used and separate boxes provided for dynamite and for caps and exploders.

Gopher Hole Practice on the Mesabi Range

The general practice as relating to the charging of dynamite does not differ appreciably in open-pit work and is too well known to warrant discussion in this paper. The use of black powder is perhaps not as familiar. In this connection, I am sure the following description[1] of "gopher holing" as used in the open pits will be of interest:

"Stripping banks 15 ft. or more in height are shaken up ahead of the shovel by blasting 'gopher' holes. These holes are started at the toe of the bank and are pointed downward at angles of 5° to 10° from the horizontal. 'Gopher' holing, when first used, consisted in making the holes large enough to permit a man to enter and work, but frequent accident caused this method to be abandoned, and 'gopher' holes at the present time have an average diameter of about 15 in. Loose ground is removed with a No. 2 round-pointed shovel blade, the edges of which are slightly turned up, fitted with a 25-ft. handle of 2- or 3-in. diameter. When a hard seam is encountered, it is drilled with a long auger or with a moil and one or two sticks of dynamite are pushed in with a pointed loading stick and fired with a blasting machine. The loose ground is then removed with the shovel. If a boulder is struck while the 'gopher' is being driven, repeated blasting with 60 per cent dynamite will often shatter it sufficiently to allow the hole to be continued. Where it is impossible to blast through a boulder, the hole is bottomed against it, or new hole is begun, few feet away, depending on the length attained. The limit of length of a 'gopher' hole is about 25 ft."

After the "gopher" has been prepared dynamite is used to chamber the hole, and when sufficient time has been allowed for the interior to cool so that no premature explosion may take place, the hole is loaded with black powder, from five to ten kegs of 25 lb. being used. In order to avoid danger from sparks and other sources the powder is poured into the hole by means of a launder device which is provided with a covered hopper. Usually the blasting is done by battery. This and the foregoing description represents Mesabi Range practice and has, from a safety standpoint, proved most satisfactory.

[1] "Steam Shovel Mining on the Mesabi Range," by L. D. Davenport, *Engineering and Mining Journal*, March 2, 1918.

Rolling Stock Should Be Carefully Safeguarded

In considering the hazards which may be involved in the use of locomotives and other rolling stock and the prevention of accidents from those causes, open-pit operators have been guided to a great degree by practices which have been standardized by railroads and other industrial enterprises of a similar nature. The Interstate Commerce Commission in 1910 adopted a number of regulations governing safety appliance standards on locomotives and these are in effect at practically all open pits. They relate to sill steps, hand holds, uncoupling levers, hand rails, hand brakes, running boards and other appurtenaces. It is, of course, essential that a well-arranged system of inspection be maintained in order that the proper persons be advised of any breach of regulations in this particular, and constant work is necessary to keep all rolling stock in a safe condition, as the usage to which it is subjected is by no means one that defies wear and tear. There is considerable variety to the equipment used, and the manner of safeguarding locomotives, stripping cars, ore cars, etc., will be governed by the adaptability of safety devices to the certain types. Having specified the mechanical means for the prevention of haulage accidents, it is further necessary to adopt certain regulations and provisions which will make for the avoidance of accident from other than mechanical sources. In Bulletin 75,[2] issued by the Bureau of Mines, the following rules have been suggested as governing safe practices for the operation of locomotives and ore and stripping trains:

"Precautions are necessary against collisions, against runaway trains on the steep grades and sharp curves that usually exist, and against the danger of running down men who may be walking on the track. To avoid this last danger trails and walks should be provided apart from the railroad tracks and their use insisted upon. Dangerous methods of coupling and dangerous methods of boarding cars or engines should be forbidden. Nobody should be allowed to ride the ore trains except the train crews. Proper clearances over cars and on the sides should be provided and material should not be allowed to be piled so close to the track as to be dangerous. The men selected to work on the track should be intelligent and alert and should be taught extraordinary caution in looking out for trains. Frogs should be blocked and signs provided at crossings. There should be a strict adherence to safe practice in regard to the use of headlights and rear lights on locomotives and trains, to the sounding of whistles, and the ringing of bells." . . . "There is a certain amount of danger attached to dumping the stripping cars, and somewhat less to discharging the ore cars when the contents are frozen or sticky. Dangerous practices in performing these operations should be specifically prohibited."

These provisions are generally carried out in open-pit practice and modifications to fit specific conditions have been made by the various companies.

[2] "Rules and Regulations for Metal Mines," by W. R. Ingalls, James Douglas, J. B. Finlay, J. Parke Channing and John Hays Hammond. Govt. Ptg. Office, Washington, D. C., 1915.

It was stated earlier in this paper that the recent advances made in earth excavation practice admitted of a broader term than that of "steam shovel." The steam shovel still holds it own and steam as a motive force remains a dominant feature. With the increasing use of electricity and other forms of power, and the adoption of the drag-line excavator and other mechanical means for earth removal the more general term of "power shovels" or "power excavators" might be more acceptable. However, with a few exceptions, the safeguarding of power excavators is very much the same and follows the lines carried out in any shop scheme wherein all moving parts are covered; that is, where it is possible to do so. It is hardly necessary to state that the construction of guards must be particularly rugged to withstand the hard usage which the machinery must undergo. A regular plan of inspection, such as is carried out in machine-shops and other plants where mechanical devices are safeguarded, should be instituted and rigidly followed.

It is quite necessary that the area which is occupied by the shovel be kept clear of material. This is not always possible and particularly so where the shovel is "moving up," but it will be found an excellent rule and one which will be the means of preventing a number of slight accidents. Orderliness in open-pit operation is as necessary for accident prevention as in any other work and should not be neglected.

Accidents from Falls of Persons

The responsibility of mining companies for injuries which occur on their property not only includes the safeguarding of their employees but also extends to those who may have no connection whatever with the company. For this reason it is not only necessary to maintain a careful watch around the entrances and banks of open pits but also to see that sufficient fencing and guard-railing is done. Stairways should be substantially built and provided with hand rails. Test pits or other openings should be properly covered. The practice of bank-trimming, which was referred to in an earlier paragraph, is often carried out under hazardous conditions, as it is sometimes necessary that the men, in order to properly trim a bank or slope, must place themselves in a position where a movement of the ground might cause them to fall or perhaps be buried in a run of rock or ore. To safeguard against this the men are provided with ropes which are placed around their bodies and substantially fastened to some safe point above. This practice is also extensively used in the milling method of mining, which may be regarded as a modification of open-pit operation. In the winter it is especially necessary to keep stairways and other such places free of accumulations of ice which may cause falls of persons.

Under the subject, "Falls of derricks, booms, etc." will be included hazards that are somewhat limited in number. The construction of stripping dumps requires that considerable trestle work be done, and it will be found that accidents result from carelessness in the handling of the timbers used in the trestles. At coal-loading stations, water tanks, and other such appurtenances to open-pit mines, arrangements must be made to properly safeguard all devices used, and instructions must be issued as to the proper methods of operation.

There is little machinery used in open-pit mines other than that included under the head of steam shovels and rolling stock. There is, of cource, the machine shop, the blacksmith shop, and the other departments at which the necessary repair work must be done, but the hazards to be found at any of these are well known and do not differ from those met with in general shop practice. The same efforts which are applied in the latter should be the rule in the shops of the open pit. Small hoists, compressors, machine drills, or other auxiliary machinery used in open pits should receive the same attention, both as to operation and safeguarding, as in underground or general surface operation.

High-Voltage Electricity Not General in Open Pits

Electricity as a motive power, either in driving a shovel or hauling ore or stripping trains, is not as yet in general use, so that the dangers resulting from the transmission of high voltage have not become to any great extent a problem of the safety engineer. In open pits which have reached the stage where steam-shovel removal of ore has been replaced by scramming operations and the ore is removed through a shaft, motor haulage is frequent and here it is necessary that the same precautions used in underground mining be observed. In some instances electricity is used as the motive power for pumps and considerable lighting is done by means of electricity, but in both of these instances methods of safeguarding are well defined and follow the trend of general practice.

Hand Tools Cause Many Slight Accidents

There are few serious accidents which may be attributed to the improper use or condition of hand tools, but as a source of the slight accident they are prolific. The prevention of this type of accident can be brought about mainly by inspection and instruction in the proper use of the tools. There is always the mushroom-head drill to be found, the loose or broken hammer handle, the stilson wrench that is not working properly and any number of small defects which should not be permitted if the men are to do their work safely and properly.

Under "Other Causes" may be included a miscellaneous lot of accidents which result from improper handling of material, explosions (other than those due to blasting powder) and others which do not properly fall into those causes already mentioned. It may be well at this point to mention one factor which has a considerable bearing on the frequency of open-pit accidents. That has to do with labor and, as each operator and engineer knows, with the dependence that can be placed on each workman to look out for his own safety. Open-pit labor, with the exception of the foremen, shovel operators, locomotive engineers, train crews, and such men as are required for certain classes of skilled work, is not required to be of the standard usually employed underground, and it has been drawn largely from foreign fields. In some cases there is, or has been, an unfamiliarity with the English language, a certain sluggishness that has been due to either indifference or timidity, and a rather detrimental effect in so far as the best conditions for obtaining prevention of accidents were concerned. In many instances, this condition has been counteracted by the further employment of such men who would serve as instructors, as bosses, and a lower percentage of accidents to the class of unskilled labor has resulted.

The safety engineer will find much to interest him

in the study of accident prevention and the hazards as met with in open-pit mines. The mechanical safeguarding which can be done is limited, but the opportunity for "safety psychology" presents ever an absorbing problem. Such details as "breaking in" a man on the day shift before he is permitted to work at night, transferring one workman to another place for which he is better fitted and following out other plans which can be determined co-operatively with the foremen, are some of the interesting studies that are open to the safety engineer.

Present System of Lighting in Open Pits Is Improvement Over Earlier Methods

The matter of illumination in open pits is receiving considerable attention. Formerly the practice consisted of obtaining only such light as was possible from the locomotives, lanterns, and gasoline burners on the steam shovels. Later the gasoline burners were discarded as being unsafe and the steam shovels were wired and provided with a small dynamo. This practice exists today and is supplemented by the use of carbide flare lights which provide excellent light. The practice of extending wiring into pits for illumination purposes has not met general acceptance, due to the fact that frequent blasting causes breakage of the globes and arc lights.

All open-pit mines make use of signals which are given from the shovels or locomotives. A specified code is used and by means of this the men in charge may be notified of any happening at the particular point where the shovel or locomotive is situated. The value of such a system to accident prevention methods as used at open pits is undeniable.

A treatise on the subject of safety in open-pit mining would be incomplete without pointing out the use for warning signs, safety bulletins and safety rules. These will necessarily be a large part of any safety campaign, but are too well known to warrant further discussion.

In conclusion, the hazards met in open-pit mines are less than those that may be expected from other types of mines. In general it may be said that the three big causes of accidents in open pits are from falls of ground, explosives, and those due to haulage. Similarly these same causes make up the bulk of underground mine accidents, but the manner of prevention in each case is, by reason of the difference in the mode of operation, different.

I realize that much of the information will doubtless be an old story, particularly to those who have had the opportunity to be in touch with open-pit work. The last few years have brought about notable changes. We have today bigger shovels, bigger stripping cars, methods for handling materials on the stripping dumps, compressed-air tie tampers, and other devices which are producing more effective results. All of these are given close scrutiny from the safety standpoint, and so far as their mechanical make-up is concerned, the operator may rest assured that the manufacturers have considered the necessary points to make them safe for the workman. With improved machinery and devices must come the higher type of workman, so that as a higher intelligence is demanded the possibility of accident from causes due to ignorance, indifference, and lack of understanding is decreased. And this in short should mean a marked decrease in the number of open-pit accidents.

Encouraging Outlook for South African Iron Industry

Considerable importance was attached to the establishment of a blast furnace at Pretoria, South Africa, in 1918, according to a report of the Bureau of Foreign and Domestic Commerce, for the purpose of producing pig iron from domestic ore. This furnace has a daily capacity of ten to fifteen tons; and though it was in the nature of an experiment, the results obtained were so successful that the promoters now intend to place the industry on a firm and permanent basis. Several other furnaces began operations in the Transvaal, and a company for the same purpose was organized in Natal during 1919.

In pre-war days nearly all of the pig iron used in South Africa was imported from Great Britain, the price there being so low that it was not profitable to exploit the local resources. The war conditions induced local capitalists to exploit the iron deposits in South Africa, but for a time considerable doubt was expressed as to whether it was economically feasible to produce pig iron in the country.

The industry is said to have passed now beyond the experimental stage, and it is claimed that pig iron can be turned out in South Africa at a lower cost than in the United States or Great Britain under post-war conditions. The promoters express great confidence in being able to supply the domestic demand, besides competing in foreign markets.

Fuller's Earth Production Increased in 1919

About 106,000 short tons of fuller's earth, valued at $2,000,000, or $18.87 a ton, was produced in the United States in 1919, as shown by preliminary returns made by the producers to the U. S. Geological Survey. These figures are the highest yet recorded by the Geological Survey, and show an increase of 217 per cent in quantity and of 563 per cent in value in ten years. The increase in quantity in 1919 compared with 1918 was 25 per cent and the increase in value was 74 per cent. The average price per ton increased from $13.57 in 1918 to $18.87 in 1919. Florida, which has long been the leading producer, made nearly nine-tenths of the output in 1919.

The imports of fuller's earth in 1919 were 13,873 short tons, valued at the port of shipment at $189,711, or $13.67 a ton, an increase of 10 per cent in quantity and of 15 per cent in value compared with those in 1918. The increase in the average price per ton was 54c. The imports in 1919 compared with those of the year of greatest imports, 1914, when the entries amounted to 24,977 tons, valued at $195,083, or $7.81 a ton, show a decrease of 44 per cent in quantity and of 3 per cent in value.

South Australian Barytes Deposits

Important deposits of barytes (99 per cent barium sulphate) are reported by Consul Starrett, Adelaide, as now being developed at Noarlunga, about 25 miles from Adelaide. Certified analysis of samples of this product has proved it to be of unsurpassed purity. Barium sulphate is an established ingredient for many kinds of paints, and the exploitation of these extensive deposits should greatly relieve the prevailing shortage of paint supplies.

A Trip to Porto Rico

Island a Motorist's Paradise, but No Place for Mining Engineers Except on Vacations

By Allen Murray Yonge
Written for *Engineering and Mining Journal*

THE policy of the Spaniards who first came to the rich little island of Porto Rico was heartless from the start. According to historical accounts, they enslaved the natives for field and mine work and drove them so cruelly that, at the end of fifty years, the entire race had either died from overwork or fled from its fate. From this, one would naturally suppose that the island abounded in mineral wealth and especially in the precious metal, gold, but such, however, is not the case, although some mineral does exist and along several rivers of the island placers were once worked. One is led to surmise that the first Spaniards practically made "a clean-up" of all the gold early in the sixteenth century, although the peons living along the rivers named Corozal, Negro Mavilla and Morovis wash the sands of these streams when they have no agriculture

ROAD FROM CARFAÑO TO BAYAMON, PORTO RICO

work. Their recovery of the metal, however, is very small.

There are some small deposits of iron on the island, though none of magnitude, and good copper specimens may also be found. But there is nothing to indicate anything of promise. The occurrences referred to are in the states of Naguabo, on the east, and in San German, on the west. Lignite has also been discovered in the central range of mountains reaching from the town of Moco to Corozal.

My trip to Porto Rico was for the purpose of examining the supposedly large manganese deposits of Juana Diaz, which lie on the southern slope of the mountains, 950 ft. above the sea and about fourteen miles north of Ponce, the southern seaport. Two miles away is the Camino Real, or military road connecting San Juan, the capital of the island, and Ponce.

The ore at Juana Diaz lies on or near the surface in the form of manganese oxides, running from 48 to 56 per cent Mn and occurring in pockets containing from 10 to 1,000 tons. These pockets, or kidneys, are entirely imbedded in the weathered marble, the latter making up the very mountains themselves.

HARBOR OF SAN JUAN, PORTO RICO

The extent of the pockets can only be approximated, and little development can be done in advance of actual mining of the ores. It is my belief that but a small tonnage yet remains to be won, as extensive prospecting has been done and nothing of promise found. About 5,000 tons of manganese ore has been mined, and perhaps an equal amount may yet be taken out. The actual mining is cheap, and workmen are plentiful at from $1.50 to $2 per day. The cost of a ton of the ore delivered in the United States is as follows: Stripping and mining, $2; sacking ore, 75c; sacks, 75c; transportation, pack animals to foot of mountain, $7.50; truck to Ponce, $1.25; lighterage to ship, $2; and ocean freight, $8.50; a total of $22.75. About thirty tons per working day is being mined and shipped to port, but indications are that the ore will be exhausted soon.

Porto Rico is a motorists' paradise, with its network of perfect roads from one end of the island to the other. One can go anywhere beneath an arch of beautiful laurel that also borders a perfectly made macadam road, passing between fields of tobacco and sugar cane, or along cliffs where superb views of the little valleys and picturesque villages below are to be had. The roads are alive with motors and trucks of many kinds and days can be devoted to delightful trips.

Americans should experience great satisfaction in visiting Porto Rico, for they may take a just pride in the evidence of prosperity and contentment to be seen on every hand. Cleanliness prevails everywhere. Through the efficiency and good administration of the resident United States and native officials a new and efficient sanitary system, water supply, electric lights, street cars, schools and wharves have been created.

ONE OF PORTO RICO'S HOTELS, THE VANDERBILT

The Manufacture of White Arsenic

Details of Experimental Work Carried On in an Effort To Obtain a Dense White Product Free From Antimony and Lead — Proper Draft Regulation And Deep Cooling Chambers Found Essential

By E. C. Williams
Written for *Engineering and Mining Journal*

THE objective, in the work to be described, was a dense white arsenic, but in experiments made to secure this, a method for producing refined As_2O_3 (over 99 per cent) in one operation was developed.

The name arsenic furnace will be made to do double duty. Properly, it consists of a small reverberatory furnace connected to cooling chambers. The furnaces were fired with coke and charged with blast-furnace flue dust and Cottrell plant product, assaying as shown in Table I.

TABLE I. ANALYSES OF FLUE DUST AND COTTRELL PRODUCT

Per Cent	Pb	Cu	SiO_2	Fe	CaO	S	Sb	As
B.F. flue dust.....	7 0		5.0	9 0	3 9	3 0	1 2	24.0
	to	0 02	to	to	to	to	to	to
	29 0		10 0	10 0	4 0	3 4	2 0	40 0
Cottrell Product.....	1.5		0 40	0 8	1.0	1 6	1 0	54 0
	to	0 06	to	to	to	to	to	to
	19 0	. .	11 3	1 0	1.2	2 3	2 0	74 0

Three different types of cooling chambers were experimented with. One which will be referred to as No. 1 type consisted of a straight flue 115 ft. long from which five wings, each 33 ft. long, extended at right angles, the first wing having two furnaces connected, the last two double decked. The straight flue had no baffle walls but a butterfly door deflected the fumes through the wings. Each wing was divided by a wall, the fumes entering one side and passing out the other to the straight flue again, giving a travel of 66 ft. in the single- and 132 ft. in the double-decked wings. The wings had baffle walls 5 ft. 6 in. apart, making rooms 54 in. high x 34 in. x 66 in. Whenever height is mentioned, that over 3 ft. 6 in. is meant, this being the height of an archway which the cars passed under to receive the As_2O_3. These "rooms" will from time to time be referred to by the door numbers, each room having a door and each door numbered in rotation, starting at the furnace.

The type of furnace described gave very unsatisfactory results. The fumes had to pass through a tortuous passage, 600 ft. long, before reaching the main smelter flue chamber. As a result, the draft, which was created by motor-driven fans at the outlet, had to be very strong to have the proper effect back at the furnace. The As_2O_3 derived from this furnace carried high impurities, Sb averaging from 1 to 7.50, and Pb 2.0 per cent.

Another furnace, No. 2, had a straight chamber 155 ft. long, 8 ft. 10 in. high x 8 ft. wide; the baffle walls were 4 ft. 6 in. apart, the passageway for the fumes being 30 in. wide and the height of the chambers.

No. 3 furnace was a composite of the other two. The first 65 ft. of the chambers measured 9 ft. high x 7 ft., then sloped down to 6 ft. x 7 ft. for a length of 200 ft. The first part had no baffle walls, whereas the latter part did.

The products of all three furnaces were mixed in one bin and conveyed by a screw-and-belt elevator to the ball mills of the barreling machine. The barrels were of 30-gal. capacity, the average net shipping weight being about 190 kg. The individual barrel weights showed a wide discrepancy, varying from 120 to 250 kg. net. As a first step in an effort to increase the density of the product, a sample barrel was taken from each furnace for several days. No. 2 type showed a consistently high figure, varying from 211 to 242 kg.; No. 1 from 140 to 206, and No. 3 from 170 to 208 kg.

Product Varied Considerably in Density

It was soon evident that the density of As_2O_3 varied in different parts of the chambers, so for several succeeding days the sample barrel was taken from the same door, and far less variation resulted, but each furnace gave different results. Further investigation showed—as was to be expected—that the As_2O_3 which was deposited the quickest, i.e., nearest the furnace and in the greatest heat, was the denser, and the farther it was carried, the lighter it became. This statement, of course, is confined to chamber limits.

Next, the total product from each furnace was weighed separately. No. 1 gave a general average of 167 kg. net per barrel, No. 2, 236, and No. 3, 190 kg.

Faulty Feeding Found Responsible

A great variation was found in the daily average weight per barrel from each furnace; also in the daily production. Most of the trouble was finally found to be in the feeding. The labor employed was thoroughly unreliable, with no sense of responsibility whatsoever. A wheelbarrow held 100 kg. of flue dust comfortably, yet, with the class of labor attracted to this kind of work, a hatful was preferable to a full barrow. From three to six wheelbarrows constituted a charge, and the furnaces were charged some two and some three times each eight-hour shift, but the laborers considered it their duty not to charge a furnace except under compulsion. Under these conditions furnace action was quite irregular.

The No. 1 type was charged for a time from the top by means of cars. A plate was removed and the charge dropped by pulling out a slide in the car bottom. This feed was very unsatisfactory, partly on account of enormous clouds of escaping fumes and partly from the fact that the dropped charge packed in the furnace.

When tests proved that the farther As_2O_3 was carried before depositing, the lighter it became, the fact that draft affected density was indicated. Tests were therefore begun on the draft. Greater reliance could be placed on the actions of the No. 2 type, as it had but one furnace connected and consequently responded more accurately to changes.

Draft Found To Influence Impurities

It had long been the custom to take samples of As_2O_3 from certain doors of each furnace every morning and run them for Sb. This was to help distinguish between off- and high-grade As_2O_3. But every change of draft changed the Sb contents at the different doors,

so this indicated that the draft influenced the impurities as well as the density. The doors at which samples were taken were changed from time to time as indications prompted, until Nos. 7, 10, 14, and 20 were finally selected, corresponding to 39, 52, 70, and 95 ft. from where the fumes left the furnace and entered the cooling chambers. The reason for this was that the draft-changing experiments brought about the condensation of fumes at No. 7 door in greater quantity at No. 10; at No. 14 the height of condensation took place; from there on it decreased until beyond No. 20 there was so little it was unnecessary to clean out the chambers oftener than once a week. From No. 20 on, the As_2O_3 always had to be returned, as it was of reddish color. This was long attributed to Se which was present, but it eventually developed that this reddish substance was only the fume carried in the hottest fire. Insufficient charging with a hot fire always produced reddish As_2O_3 in the No. 1 type (shallow) cooling chambers.

When the fumes were condensed as already described, the As_2O_3 showed a very low Sb content with the peculiarity of slightly higher Sb at No. 20 than at No. 14 door. For example:

Door Numbers	Sb	Sb	Sb
7	0.44	0.39	0.40
10	0.40	0.35	0.34
14	0.34	0.34	0.28
20	0.44	0.38	0.30

Working backward and with an easier and more definite guide, when the draft was set to produce the above-described deposit of Sb, the As_2O_3 was condensed within well-defined limits and the net average weight per barrel was increased from 236 to 300 kg. In other words, the specific gravity was raised from 2 to 2.6. Shipments (carload lots) ran less than 0.35 per cent Sb, where formerly the high-grade had averaged 1.00 per cent Sb.

The interesting feature of draft experiments was that the Sb could be brought to so low a quantity in the chambers, whereas with the same material charged, an extreme like this had before presented itself:

Door Numbers	Sb
7	7.05
10	2.14
14	1.08
20	0.90

Draft Controlled by Antimony Percentage

Such excellent results being obtained on the No. 2 type, the draft was adjusted on No. 3 to produce the same deposit of Sb. This reduced the quantity of Sb to the same as that of No. 2 and raised the specific gravity from 1.7 to 2.5. But No. 3 was not as tractable nor efficient as No. 2, which was attributed to the fact that it had several right-angle turns.

Working on the latter theory, experiments were recommenced on No. 1 type. The two double-decked wings were blocked off, which resulted in much improvement in furnace action. Then the other two wings were cut out; the butterfly doors formerly used to deflect fumes through the wings were set at an angle to aid in detaining fume passage; the draft was changed until the required low Sb was produced, so that this type then gave the same percentage of impurities as the others, and raised the specific gravity from 1.6 to 2.2. However, the hot gases passed so closely over the deposited As_2O_3 that a slight failure in proper charging often blackened the product. Shallow chambers required the closest attention to produce even a fair product.

The presence of 0.40 to 2.20 per cent Pb caused much complaint from consumers. Various efforts were made to overcome this—regulating the fire, reducing the amount of air admitted to the grates and leaving an opening of an inch or two in the second door of the furnace (the furnace was charged through the first door), for the admission of cold air to the fumes. The Pb decreased, but the exact reason is unknown.

Lead in Product Reduced by Resmelting

Complaints over high Pb growing more persistent, refining was ordered. By this is meant putting the product through the furnace again. By this means Sb was brought down to 0.30 per cent and Pb to a trace. A pure white product resulted, heavily crystallized in the first half of the chambers. Brilliantly beautiful crystals were formed and would build up like the roofs of a Chinese pagoda, several inches high and often four inches in diameter. One roof would form on top of another with infinite precision and regularity.

In the efforts to secure high density in the product the Sb control for draft regulation was developed, which, along with better organization, automatically lowered the Pb impurities. At one time the morning samples were run for Pb with the following result:

Doors	Pb
7	0.075
10	0.076
14	0.140
20	1.020

It is plausible to think that if no Sb were present, Pb or some other impurity could be used with which to regulate the draft.

The Cottrell plant product was vicious stuff, catching fire seemingly spontaneously. From the time the plant was started, As took fire in the hoppers. At first it was attributed to chemical reactions induced by water sprays in the smelter flue chamber, but these had been used before with no bad results. One day a shovelful of the product was accidentally dropped in a passageway in a strong draft and soon caught fire. Noting this, the hoppers of the Cottrell plant were made airtight, which removed the fire trouble.

Arsenic Might Be Distilled on a Heated Hearth

The combustibility of this material led to an attempt to distill it with its own heat. Fire was drawn from a furnace, and the furnace was then charged. It performed nicely—while the hearth was hot. This might lead to experiments to introduce heat from below instead of passing it over the charge.

Once, evidently through a demand for greater production, another furnace was built and connected to No. 1 type by a flue 2 ft. 6 in. x 3 ft. x 35 ft. On account of this irregularity experiments were made on it which gave excellent results in regard to density, this averaging as high as 2.5. This was before the draft regulation control was developed. Certain physical conditions caused the abandonment of this end of the plant, which prevented further experiments. Earnest efforts were made to test out this flue connection on the deeper type of chambers, but the management was not experimentally inclined.

Difficulty was once experienced with poor draft on No. 2 type of furnace. The furnace was shut down and many tons of crystallized As_2O_3 barred off the baffle walls and ceiling. This did not give relief, so the fur-

nace was again shut down and a systematic search made. Trouble was located in an unlooked-for spot. A small shelf, a support for a fan bearing, had filled up with As_2O_3, thereby cutting off the draft. This cloud, however, had the proverbial silver lining. The back end of this furnace had two tiers of doors, and in the search for the draft obstruction it was noticed that the furnace had a fair draft when the last (top) door was open. Upon starting up again the smelter stack was depended on for draft, and it proved to be entirely sufficient. With slight changes the other types were placed on the same draft. Discontinuance of motor-driven fans seemed to take most of the "grief" from the plant, besides making considerable saving.

BASIC PRINCIPLES OF FURNACE DESIGN AND OPERATION

In summing up, the results obtained developed certain principles, namely, that draft controls impurities and, to a great extent, density; that deeper cooling chambers produced a denser, cleaner and whiter product; that cooling chambers and furnace should be in a straight line—the furnace possibly connected to the chambers by a flue 2 ft. 6 in. x 2 ft. 6 in. x 20 ft. (the length optional, but 20 ft. probably a mean). By a straight line is meant the elimination of all right-angle turns, thereby procuring as great a draft as is possible on the furnace with a minimum in the chambers, the velocity to decrease the farther the fumes travel from the furnace. To accomplish this, the cooling chamber should gradually be enlarged as it leads from the furnace. Taking No. 2 type as an excellent foundation, superior results could be obtained by applying these principles.

Before concluding, it would not be amiss to mention that the best remedy for arsenic fume burns was found to be boracic acid, either powder or saturated solution, though the powder was found the more effective.

Ontario's Gold Production Increasing

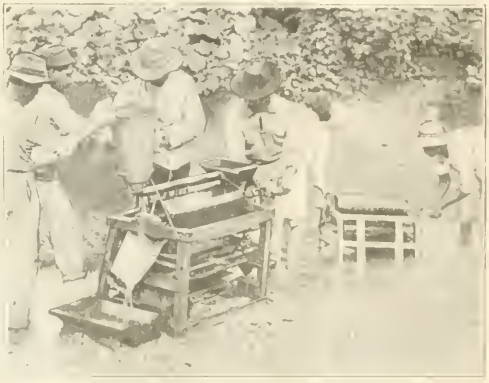
Ontario's position as a producer of gold is becoming increasingly important, according to the Ontario Department of Mines. For the first half of 1920 the output was nearly 22 per cent greater than the 1919 production. Production of gold by individual mines is presented herewith:

Porcupine	
Hollinger	$2,928,079
McIntyre	1,085,298
Dome	989,566
Porcupine Crown	70,017
Dome Lake	46,809
North Crown	31,019
Davidson	13,489
Total	$5,164,277
Kirkland Lake	
Lake Shore	243,977
Kirkland Lake	137,676
Teck-Hughes	125,137
Total	$506,790

From miscellaneous mines the output was $17,138, of which the Argonaut, in Gauthier Township, contributed $16,938. There was also a recovery of gold worth $2,498 from nickel-copper refining operations. In addition, gold mines produced 49,156 oz. of silver, worth $56,364. During the period 673,694 tons of ore was milled. The milling capacity at Porcupine at the end of June was 5,296 tons and at Kirkland Lake 330 tons daily. The 150-ton mill of the Wright-Hargreaves mine at Kirkland Lake is nearing completion.

A Miniature Gold-Washing Plant

The accompanying photograph shows a gold-washing machine used in Cuyabá, which is the capital of the State of Matto Grosso, Brazil. It will be noted that the gold-bearing sands are washed through a contrivance similar to a sand-screen, which carries out the coarse



A 6-MANPOWER GOLD-WASHING PLANT

material, and then they pass downward through a series of sieves or screens, a crude form of various well-known types of mining equipment. The apparatus has the advantage of portability and is somewhat more pretentious than that sometimes found in use by the natives in the backwoods.

Magnesite in New Mexico

A deposit of magnesite that crops out on a steep hillside west of Ash Creek two miles above its junction with Gila River, about thirty miles north of Lordsburg, N. M., was recently examined by R. W. Stone, of the U. S. Geological Survey. The general alignment of the outcrops might indicate that it is a continuous body, 1,000 to 1,500 ft. long and 30 ft. thick, in limestone, but close examination shows that the limestone occurs as a number of detached blocks, none of them more than a few rods long, inclosed in granite and cut by dikes and sills of diabase older than the granite.

The magnesite has replaced certain beds of limestone, but at no place has it yet proved to be 30 ft. thick, as at first indicated. At one place where the deposit has been prospected and has since caved there appears to be a total thickness of 20 to 30 ft. of magnesite and limestone. The best exposure shows only 7 ft. of magnesite in a limestone block 5 or 6 rods long, in which the beds stand vertical. Not all the limestone blocks contain magnesite. The small quantity of magnesite available and the distance of the deposits from a railroad render them of little present commercial interest.

The magnesite is hard, amorphous, and pure white, resembling the variety common in California. It is believed to have been derived from the diabase.

Manganese in Brazil

Deposits of high grade manganese ore totaling 120,000,000 tons are available for development in the State of Matto Grosso, Brazil. The ore is reported to average 45 per cent.

Mining Engineers of Note

John Uno Sebenius

IN NORTHERN MINNESOTA, before the present-day status of open-pit mining was reached, the neophyte referred to the system of mining then in practice as "iron-ore farming." The visitor of today, whether he is familiar with the methods used on the Mesabi or totally ignorant of them, cannot fail to be impressed with the great strides that have been made and the wonderful improvements now in evidence. This is true not only of open-pit practice but in underground mining as well. It is not mentioned in all of the histories of the Mesabi that John Uno Sebenius was in a true sense a farmer—in addition to his other activities—but those who knew him in the early 90's, when the importance of the range was scarcely realized, still speak of the potato patch and the garden that formed a prominent part of his exploration camp at that time. He was one of the first to realize the tremendous possibilities of the district as an iron-ore field, and it is due in no small measure to his efforts and accomplishments that the Mesabi Range has far outlived the "farming" stage and stands today as the greatest iron-ore producing region in the world.

JOHN UNO SEBENIUS

Mr. Sebenius came to the United States in 1888 from Sweden, where he had been graduated from the Royal Institute of Technology and the School of Mines at Stockholm two years previous. The following year he was engaged as geologist and mining engineer for the Ayer estate, of Boston, Mass., and did considerable work in northern Michigan. In 1890, Mr. Sebenius was appointed assistant superintendent of the Witherbee, Sherman & Co. mines at Lake Champlain, N. Y., and for the two years following he had charge of the erection, installation, and operation of their magnetic concentration plant, which at that time was the largest and most successful installation of that type in existence. In the fall of 1892, he went to Minnesota and began a series of extensive trips through the Lake Superior ranges, and it was at this time that his first general examination of the Mesabi Range was made. After serving in a consulting capacity for the Rouchleu-Ray Iron Co., and later for the Lake Superior Consolidated Iron Mines, he became, in 1901, identified with the Oliver Iron Mining Co., the iron mining subsidiary of the newly formed United States Steel Corporation, as mining engineer and superintendent of explorations. In 1905, he received the title of general mining engineer of the Oliver Iron Mining Co. and has occupied the position since that time. During his work on the Mesabi Range, Mr. Sebenius has always been fully informed as to the geology, structure, and developments in that district. His travel and investigation in connection with mining operations have given him ample opportunity to observe practices in other sections, and he is recognized as one of the foremost authorities on iron-ore geology and mining. An evidence of this was his appointment, during last year, as a consulting engineer of the Bureau of Mines. Mr. Sebenius has always taken an active part in public affairs. During the administration of John A. Johnson as Governor of Minnesota he served as a major on his staff, and also held the rank of colonel on the staff of Governors Eberhardt, Hammond and Burnquist. He is a member of the American Institute of Mining and Metallurgical Engineers, the American Society of Swedish Engineers, the Lake Superior Mining Institute, and the Duluth Engineers Club. He also holds memberships in the following clubs: Kitchi Gammi, Commercial, Northland Country, Duluth Curling, Duluth Boat, and the Norroena (of which he is president) of Duluth, and the Minneapolis Athletic and Odin clubs of Minneapolis.

The strenuous out-door life which Mr. Sebenius followed in the early days fostered in him the love of the open, and even today the pleasure of his work is divided, when time permits, with hunting and fishing trips and other outdoor recreation that the North Country so well affords. Mr. Sebenius' keen interest not only in professional but in civic and industrial matters is an example which engineers may well emulate. He is a consistent booster for professional ethics, the bigger fields for the engineer, and the outdoor existence that keeps one physically fit and makes life worth while.

BY THE WAY

A New Use for Explosives

The *Official Gazette* of the Patent Office rivals the old oaken bucket as a source of innocent pleasure. There is always something novel in it. It is the shop window where the latest product of man's genius is laid before the public. Had it been published in Solomon's time he would never have written that there is nothing new under the sun. Everything has come its way or will come sooner or later. It has something in each issue that will appeal to every mood or fancy, whatever be the pursuit of the reader. Were it sold by subscription, what selling arguments were possible! Occasionally a critic may pause to exclaim "Can such things be!" but he immediately resumes, knowing well that they can or they would never have gotten into the *Gazette*. For example, patent No. 1,347,005 covers a device for the prevention of pocket picking. The inventor is Francesco Bini, of Milan, Italy. At once it comes to mind that pickpockets must be numerous in Italy. At any rate, Mr. Bini thinks so well of his invention that he is seeking a patent in the United States. Translating the description in the *Gazette* into English, as nearly as we are able, we find that the device carries an alarm consisting of a charge of detonating material that will go off when the pickpocket inserts his hand into his prospective victim's pocket. This is really clever. How one invention is but the stepping stone to another! Mankind progresses by degrees. This device was truly born of a depth bomb mated with a mouse trap. Let the libraries and archives perish so long as the *Gazette* be preserved and the history of human achievement can be rewritten from its pages.

Dignity Wounded

Speaking of the recent bomb explosion, the *Evening Sun* says: "To destroy Wall Street would require a train of mining engineers." We protest. The phrase used is doubtless correct in a military sort of a way, but now that the great war is over let us have peace. A mining engineer creates and does not destroy. He makes the desert a habitable place and produces earth's riches. Is it not enough that he should be classed with engine drivers after having put in four arduous years at college and winning a beautiful sheepskin—is this not enough, we repeat, or should he now be publicly classified as a sapper or house wrecker simply because of his familiarity with explosives and blasting. The *Evening Sun's* intentions are good, but it should watch its step. It has many mining engineers among its readers and now that they are conscious of their own exceeding worth they are apt to start reading some other three-cent paper. Furthermore, they will have the sympathy and support of the F. A. E. S.—they are organized. Let the offender beware!

Rings Like a Fake

Herr Simons, the German Foreign Minister, is reported to have stated to a correspondent of the *Evening Standard* (London) that a new metal had been discovered at Frankfort. It was of high value, and likely to take the place of copper. In color it was white, like aluminum, and when struck had a "ring like steel."

North Bloomfield Née Humbug

"One of the most noted hydraulic mines was that known as North Bloomfield, some eight or ten miles northeast of Nevada City," says Hittel's History of California." "It was situated near a little creek flowing into the South Fork of the Yuba and between it and the Middle Fork, where, about the year 1851, a prospecting party consisting of two Irishmen and a German discovered a rich deposit of gravel. After working it for some time and finding their provisions running low, they sent one of the Irishmen to Nevada with several hundred dollars' worth of dust for supplies but with strict injunctions to keep silent as to their fortunate strike. The Irishman sold his dust, purchased his supplies and a mule to pack them, and got ready to return. But having some money left, he could not resist the temptation of a little conviviality; and, as one glass led to another, he grew more and more loquacious and at length began to boast of the money he and his partners were making. When asked where his claim was situated, however, he seemed to remember his promises to be discreet and refused to disclose the locality. But the next morning, when he started off, he was followed at a distance by a hundred or more excited adventurers, who succeeded in tracking him to his camp. They prospected for several days along the creek and found a little gold but for some unexplained reason failed to find rich deposits and, returning disappointed to Nevada, unanimously pronounced the creek a humbug; and from that time forward, whenever the place was mentioned, it was called Humbug Creek. Subsequently, in 1853, when hydraulic mining commenced there and a town started, it was also called Humbug from the name of the creek. In 1856, after the place, on account of the great richness disclosed by the deep hydraulic diggings that had been opened, became one of the liveliest and most prosperous towns in the county, the citizens, on the occasion of procuring a post-office, had the name changed to that of North Bloomfield."

The Tommy-Knockers*

When I die (said the mining engineer) do not bury me at all;
Cache me on the bottom level, with a pick beside my pall;
Leave a candlestick and matches, then cave the stopes and drifts,
And I'll be a tommy-knocker for a hundred thousand shifts.
Yes, a jolly tommy-knock, always starting for a walk;
Always pounding on the rock, scaring honest Hunkies with my little tap, tap, tap—
Always listening for the blast 'till the pumps are pulled at last,
And the bloody surface tenderfoots are routed from their nap;
Then the depths of earth will be lighted and we can see right through,
And all the lost bonanzas will be nuts for me and you.
Then we'll dig, dig, dig (If we've been good engineers)
Ore shot with chunks of metal, through all the happy years.
We'll have angels for muckers, who'll never ask for pay,
And the ore will stope itself, over—under—anyway—
Anyway you say!
Oh, boy! Don't wake me up
And say the men are striking and the tax-collector's here,
And the bottom of the metal market's gone,
And how you've lost the ore-shoot, and all the other grief;
Jest let me snooze 'till Gabriel blows his hawn!

—SAMUEL B. ELLIS.

*The tommy-knocker is the gnome of the underground. He is often heard tapping the rock in mines, and superstitious miners do not like to work alone for fear of meeting him.

CONSULTATION

Active Placer Operations

"If you have the information available will you please advise me if there is any placer mining for gold being done on this continent at the present time, and if so, where?"

There is still considerable placer mining being done on the North American continent at the present time in spite of the existing relatively high cost of placer mining compared with pre-war costs. However, the production of the various placer fields is gradually decreasing, due not only to the high cost of labor and supplies but also to the diminished reserves in the placer goldfields and their gradual exhaustion. Many placer mines in California are potential producing localities, but are prevented from operating by the anti-debris laws in effect in that state.

Although we have not a list of all the active placer mines in the country, the following list will give you an idea of the chief producing localities; the figures given represent 1918 production in troy ounces as given by the U. S. Geological Survey, and illustrate how much placer gold the various states produce:

Oz.	
12	Alabama and Georgia—small production.
38,334	Alaska—about 700 placer localities.
33	Arizona—small production, Yuma, Pima, Maricopa and Yavapai Counties.
29,909	California—Yuba, Sacramento, Butte, Calaveras, Amador, Merced, Stanislaus, Placer, Shasta, Siskiyou, San Joaquin, Nevada and Trinity Counties.
6,650	Colorado—Summit and Lake Counties.
3,283	Idaho—Boise and Shoshone Counties.
3,166	Montana—Silver Bow and Lewis and Clark Counties.
3,907	Nevada—Esmeralda and Nye Counties.
21	New Mexico—small production.
17	North Carolina—small production.
4,102	Oregon—Baker, Grant, Jackson, Curry, Douglas, Crook, Josephine and Malheur Counties.
	South Dakota—Lawrence and Pennington Counties produced negligible amounts.
15	Utah—small production.
45	Washington—small production.

In Canada placer gold is being recovered from operations chiefly in British Columbia and Yukon Territory. Mexico and Central America (chiefly Honduras) also produce placer gold.

Silver Standard Countries

"I have heard it stated that China and India are the two chief silver standard countries of the world. What other nations have their currency systems based on a silver standard?"

China is a silver standard country. India is not, but uses what is known as the gold exchange standard which contemplates little or no circulation of the standard metal, gold, but a linking of the circulating medium, silver, to a gold basis. India is a great silver-consuming country, and uses large amounts in coinage, but it is incorrect to say the country is on a silver standard.

A comprehensive list of silver standard countries would include Abyssinia, Afghanistan, China, Eritrea, French Indo-China, Honduras, Morocco, Persia and San Salvador. Other nations that are chiefly using silver in their circulating currency systems but which have a gold exchange standard are British East Africa, Ceylon, former German East Africa, India, Italian Somaliland, Federated Malay States, Nicaragua, Philippines, Siam, Straits Settlements, and Zanzibar. In addition to these countries, Mexico's chief money in circulation ordinarily is silver. It is to be noted that several of the nations listed, East Africa, Ceylon, Italian Somaliland and Zanzibar use the silver rupee, the common coin of India.

Feldspar Potash in Connecticut

"We are interested in a large tract of land in Connecticut containing extensive deposits of feldspar and are informed that this deposit is valuable for its potash content. Will you kindly tell me what the possibilities are of developing such an industry in Connecticut and what attempts have been made to produce the material. What are your quotations on feldspar potash?"

The State of Connecticut does not produce any appreciable amount of potash. No doubt there are extensive geological formations which contain feldspar there, as this mineral is a common constituent of rocks in the East and is found abundantly in the North Atlantic States. However, the use of ground feldspar rich in potash as a fertilizer is only commercially feasible in exceptional circumstances. This has been emphatically demonstrated by tests of the Department of Agriculture. Attempts to extract potash from feldspar are still in the experimental stage, and many patents have been issued covering various processes. If you are endeavoring to develop a prospective potash producing area from feldspar deposits you are doing pioneer work in this line that is subject to the risks attendant upon most untried mining ventures.

Feldspar often contains as much as 14 per cent of potash (K_2O), but a series of unpublished analyses of the U. S. Geological Survey indicates that the average quarry product rarely runs above 7 to 7.5 per cent. The potash feldspar resources of the country are known to be large, but due to the cheaper sources of potash from both domestic and foreign quarters, it appears to be many years before attention will be turned to them and they can be commercially used.

Owing to the fact that potash feldspar is not produced in commercial quantities, we do not quote prices on this material.

Lubricating Grades of Graphite

"In your market report of Sept. 11 you quote lubricating grades of graphite with prices ranging from 11 cents to 30 and 40 cents for higher grades. Will you kindly inform us of the specifications and requirements of graphite that might be termed lubricating grades?"

Lubricating grades of graphite refer to a high grade of graphite of exceptional purity which does not contain any gritty matter such as quartz. As the grain size is immaterial, both amorphus and crystalline graphite can fall in this class. This is essentially the sense in which the term is used by the trade and in the *Engineering and Mining Journal* quotations.

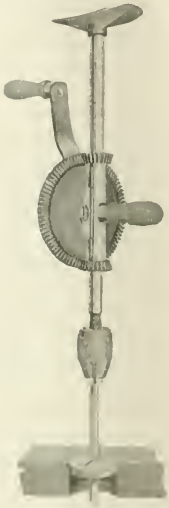
HANDY KNOWLEDGE

Grinding Valves With a Breast Drill

BY C. NYE

Written for *Engineering and Mining Journal*

The common method of grinding valves by means of a screwdriver, oscillated by hand, is slow work and tires the wrist. A practical and mechanically superior manner of performing this operation is to insert the screwdriver blade in a breast drill and then turn the drill handle back and forth. A better result is easily obtained



USING BREAST DRILL TO GRIND VALVES

and in a fraction of the time required by the old method. The drill being geared up, the screwdriver blade turns several times to a single half-turn of the drill handle. Valves that average a half hour by the wrist method are ground with ease in an average of ten minutes by the drill method.

Kerosene To Prevent Slacking of Carbide

That kerosene poured upon carbide will prevent the waste and loss of carbide through premature slacking is maintained by the *Queensland Government Mining Journal*. It is stated that this remedy for slacking is successful and that it takes only a little kerosene to "do the trick," as it spreads rapidly over the whole of the carbide in a tin. Subsequent generation of acetylene is not affected.

Moisture is the great enemy to the preservation of carbide, and it can be seen easily that kerosene or some similar light oil would prevent the moisture taking effect quickly; but kerosene is highly inflammable and what effect the combination of carbide, kerosene, acetylene and the metal of the container exerts on the safety of the combination would seem to us a matter warranting investigation.

Motor-Haulage Block-Signal Protection

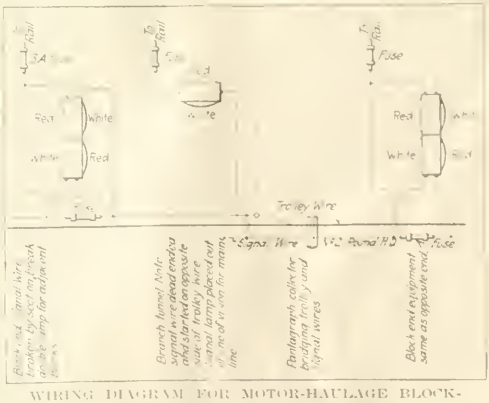
BY T. H. ARNOLD

Written for *Engineering and Mining Journal*

For motor haulages underground where there is a considerable amount of moisture and wet track, a track-circuit signal system is impracticable, as the maintenance cost is excessive and the reliability considerably impaired.

In a simple system devised for the Arizona Copper Co. with pantagraph collectors, a wire of No. 2 hard-drawn round copper is strung parallel with the trolley wire and insulated from it, and spaced two or three inches away. The signal wire is connected at each end of the block to block lamps, which are also connected to the track. The pantagraph collector bridges the trolley wire, and the signal wire thus furnishes current for the block lamps. At frogs and crossings, the wire must be raised over the branch wire, or dead ended and another wire started on the opposite side. The two wires must be carefully aligned for vertical height, which is readily accomplished by means of a double hanger.

The block lamps are usually constructed of galvanized iron and use a 4-in. diameter semaphore lens. At the junction of two blocks a double lamp is used giving a red indication opposing and a white indication back into each block. For branch tunnels not protected with block signals a standard railroad switch lamp is used, giving a red and a white indication. For special uses, three and four signal lamps will be required.



WIRING DIAGRAM FOR MOTOR-HAULAGE BLOCK-SIGNAL PROTECTION

This system, though not giving absolute protection, has many desirable features. The installation cost is low; a moving train is indicated by a flicker of the block lamp; the indication of a train in the block is positive, and the maintenance is negligible. The main defect in the system is that a car standing on the track does not give a signal unless a locomotive is in the block; also, it does not give the direction in which a train is moving, but, on the whole, the operation has been satisfactory.

THE PETROLEUM INDUSTRY

Relation of the Bureau of Mines To the Oil Industry*

THE BUREAU OF MINES is one of three organizations provided by the Federal Government to bring about a greater efficiency in the production and utilization of precious petroleum resources. The Geological Survey provides information for a better understanding of the occurrence and the finding of petroleum; the Bureau of Standards provides means for standardizing instruments for use in the petroleum industry and means for testing and standardizing products manufactured by it.

The Bureau of Mines was established by act of Congress, in 1910, for the purpose of conducting scientific and technologic investigations concerning mining, its various branches and the production and utilization and conservation of petroleum and its products. In short, it has been commissioned by our Government to look after the public interests in the production, manufacture, and utilization of our natural mineral resources.

Its relations to the petroleum industry are advisory rather than supervisory, the only important exception at present being the supervision of drilling and producing operations on Government leased lands. It endeavors to do what is best for the public welfare and looks to ultimate good rather than to the immediate gain. It believes that the ultimate good for the public will prove to be also the ultimate good for the industry and that fundamentally the interests of the public and of the industry are one and the same.

It stands also as an intermediary between the industry and the various departments of the Government—as a sort of consulting board to which matters concerning petroleum and its products are referred by them. In order to faithfully fulfill this function the Bureau of Mines must cover the whole field of the industry and as far as possible those industries allied with the production and utilization of petroleum and its products.

The Bureau of Mines organization for carrying on this particular work is at present divided into four main subjects as follows: Production Technology, Engineering Technology, Chemical Technology, and Oil Shale Technology.

The section of Production Technology handles such problems as (1) methods for drilling wells whereby the various types of equipment may be most efficiently used, to the end that a maximum production may be secured from the sands. This involves the problem of protecting the sands against wastes of oil or gas and against infiltrating water by the use of mud-laden fluid, cements, and like substances; (2) the collection of various data covering the development work as it is carried on which will guide operators in future work, enabling them to avoid serious and costly mistakes and supplying them with information of the repair of producing wells; (3) the collection of such data as the logs of wells, casing records, production records and complementary facts, in order to gain information which may increase the production of the present and future wells and prolong the life of the fields; (4) the valuation of oil lands along a basis which will assist the operator in determining a fair price for the purchase of oil and oil properties.

There are at present engineers of the Bureau who devote their entire time to production problems in Wyoming, California, Oklahoma, and Texas. Great savings already have been effected to the industry through their constructive advice and through the corrective measures that they have recommended.

Co-operative work which was carried on with the Indian Office, under an annual appropriation of only $17,500, resulted, through the proper control of underground waters, in increasing the daily production of one group of oil wells in the Cushing field as much as 3,000 bbl. per day by cementing. At this rate, the increased production for the first year succeeding the repair of the wells amounted to approximately $2,500,000. Operators in the Wyoming fields have recognized the value of the work that the Bureau is doing, and have recently renewed a co-operative agreement whereby $30,000 a year is voluntarily contributed by them and is being spent under the direction of the Bureau for conserving oil and gas on their property.

The Legislature of the State of Oklahoma has recently renewed an agreement appropriating $12,500 of state funds for co-operative work with the Bureau along similar lines. Just recently, an unsolicited fund of $1,000 was proffered the Bureau by the operators of the Hewitt Field, Oklahoma, as a nucleus of a co-operative fund to be expended in conservation work in that field.

Oil Property Taxation

The Bureau of Internal Revenue of the Treasury Department, in endeavoring to arrive at a fair method for taxing oil properties in the United States, called upon engineers of the Bureau of Mines to work out a plan, and, as a result, the Bureau has devised and developed a new and equitable method for estimating the future and ultimate production of oil properties in the United States. This method has been used as a basis for assessing taxes imposed by acts of Congress.

Through its section of Engineering Technology, the Petroleum Division of the Bureau has made valuable recommendations for the transportation and storage of oil. Recently, investigations conducted by it have disclosed that, in many cases, 20 per cent of the volume of the gasoline content of crude oil is being lost by evaporation before it reaches the refinery. The investi-

*Abstract of address delivered at the convention of the Independent Oil Men's Association at Denver, Col., on Thursday, Sept. 30, by F. G. Cottrell, director of the Bureau of Mines.

gation likewise disclosed that probably at least one-half of this loss may be economically saved, and various companies have been induced to make the effort. One tank company recently reported that it had received more inquiries on protection against evaporation losses within the last six months than in the ten years previous. During the ten-year period from January, 1908, to January, 1918, approximately 12,750,000 bbl. of oil and 5,024,506,000 cu.ft. of natural gas were destroyed by fire in the United States, entailing a total estimated property loss of more than $25,000,000. Oil and gas fires had become so common, especially in parts of Oklahoma and Texas, that many people regarded them as an unavoidable evil. In one week, during the summer of 1914, in the Healdton and Cushing fields of Oklahoma, fire destroyed eighty-six tanks, ranging in size from 250 to 55,000 bbl. capacity, numerous oil rigs with equipment, several field pumping stations, besides reservoirs, entailing a total property loss of approximately $1,000,000. As a result of detailed investigations carried on by the Bureau to ascertain, if possible, the causes of these fires, it was found that most of the more disastrous fires resulted from carelessness or from improper storage and transportation facilities. The Bureau has been able to suggest means for successfully combating the most disastrous fires and to entirely eliminate hundreds of lesser fires. Through the adoption of its recommendations, many thousands of dollars have been saved to the industry and enormous quantities of oil and gas have been conserved for use.

A study was also made of methods for increasing the efficiency of the utilization of natural gas. Engineers of the Bureau examined many plants for producing natural-gas gasoline, and through information gathered have been able to make recommendations that have greatly increased the proportion of gasoline recovered from the gas, thereby materially increasing the supply of gasoline. At present a study of the utilization of heavy oils ranging in gravity from 7 to 14 deg. Bé. is being made, and in the near future the Bureau may be able to make recommendation whereby the enormous quantity of tars, heavy oils, and oil-saturated sands known to exist in the United States may be made to yield useful petroleum products.

In the period of under-supply—a condition which is likely to become worse rather than better—when prices of petroleum products have gone up and there have developed serious shortages of gasoline, fuel oils, and other products, the industry is under critical examination and the public demands that justification be shown for these conditions. Without the crude-oil statistics of the Survey and the refined-oil statistics of the Bureau of Mines, there would be most serious misunderstandings between the public and the industry.

A monthly bibliography of petroleum and allied substances is being placed in the hands of trade journals and most of the larger libraries in the United States. In this way, the Bureau hopes to aid in assisting those interested in obtaining accurate and reliable information concerning petroleum and allied substances and to assist in keeping the public in close touch with literature dealing with this subject.

Through the section of Chemical Technology, chemists and chemical engineers of the Bureau are making, every six months, a complete survey of the motor gasoline sold throughout the United States. Samples of gasoline are collected from service stations in various parts of the country, and these samples are analyzed and the results compiled and published. Through these reports, the public as well as the producing companies are kept informed of the quality of the gasoline sold to consumers. A study of the analysis of the most recent survey, July, shows that the volatility of the gasoline put on the market has decreased. This is because the increased demand for the product necessitated the refiner to "cut deeper" into the crude. As commercial gasoline no longer comes up to the Government specifications, the Bureau, believing that these specifications are too rigid, has recommended that they be changed.

At present, a survey is being made of all the crude oils produced in the United States. Results of the analyses will be compiled and published when the survey is completed.

An important activity of the chemical division has been the standardization of testing methods for petroleum products. The gasoline distillation tests adopted as standard by the American Society for Testing Materials were developed by the Bureau and much work has been done on standardizing other tests.

In the work on Oil-Shale Technology, the Bureau has been much handicapped by lack of funds. However, two of its engineers have been able to give most of their time to investigations and experiments connected with this work. The oil-shale industry is at present passing through a critical period. A relatively large amount of money has already been spent by private individuals in endeavors to determine the practical and commercial feasibility of retorting oil from oil shales. However, the industry is faced with a lack of essential fundamental information which it is the province of a government bureau to obtain. There are a multitude of technical problems which are yet to be solved.

The development of the oil-shale industry must necessarily be a matter of years, not only because there must be built up a fund of technical knowledge and practical experience, but because great amounts of capital and labor will be necessary before any considerable proportion of our present and future oil needs can be supplied from our shales. There is no doubt that the industry will be developed into one of the largest in the United States, and it is high time the Government hasten this development by starting immediately the necessary preliminary investigations.

The Bureau is requesting from Congress an appropriation of $170,000 with which it contemplates the establishment of an oil-shale station in some suitable locality, including the necessary grounds, laboratory, and equipment. It contemplates the erection of a one-unit Scotch retort, the design and operation of which are already well understood, to provide a standard. By means of this standard retort it will be possible to compare various processes one with the other, also various methods of retorting, one with another, and various shales, one with another. This standardization will be invaluable to the industry and it is believed can best be done by a Federal agency.

The Bureau has from the first maintained that the production of oil from shale is not for the individual of small means. It is a manufacturing venture involving the handling of large amounts of low-grade raw material and should be undertaken only when substantial backing from capital is to be had and where the best technical skill can be obtained.

NEWS FROM THE OIL FIELDS

State Receipts Increased by the Development of Texas Oil Resources

From Our Special Correspondent

The report of the Texas State Land Commissioner, J. T. Robinson, for the two-year period ended Aug. 31 1920, will show receipts by the state of over $7,750,000 from sales of school land and lease rentals and royalties. This is an increase of more than $2,000,000 over the preceeding period of two years, and was due to the great increase in the development of the oil resources of the state.

The States Oil Corporation, of Eastland, brought in a tremendous gas well on Sept. 18 on the J. M. Radford farm, seven miles north of Eastland. It is claimed that the well came in producing over 50,000,000 cu.ft. daily. Steps were taken at once to prevent undue waste.

The new tank farm, oil-ship unloading, and railway distributing station of the National Oil Corporation, near Galveston, will it is stated be completed and in operation by the middle of October. Three 55,000-bbl. tanks, a 24-tank car-loading rack and trackage have been completed. The 14-in. pipe line from the unloading pier to the tank farm is being pushed to completion.

The most important oil-well completion in the coastal fields recently was the No. 2 Gallagher of the Humble Oil & Refining Co. at Damon Mound, Brazoria County. This well came in flowing 1,000 bbl. by heads from 3,211 ft., and is not only the deepest well in the field but extends the field one quarter mile to the south. At Hull, small producing wells were completed by the Phoenix Development Co., Theis, Wilherson & Parker, and the Humble Oil & Refining Co. The daily production of the field is now over 14,000 bbl. At West Columbia the "big well," No. 1 Abrams of the Texas Co., is still flowing at the rate of approximately 8,000 bbl. daily through the drill stem. It is expected several new wells will be completed in this field soon. One well was completed in the Spindle Top field, the original salt-dome field, by Wilson & Broach, pumping 15 bbl. from about 750 ft.

Homer Field Still Largest Producer in Louisiana

From Our Special Correspondent

Nearly one-half of the Louisiana oil production of about 100,000 bbl. weekly comes from the Homer field. The shallow sand in this field is holding up well, making a steady production and showing little salt water. Some deep wells in the lower sand have made large productions for a short time, but nearly all rapidly sanded up. A well of this nature completed recently was the No. B-1 Shaw of the Oklahoma Gas & Oil Co., which came in making 2,000 bbl. and which rapidly increased to double that amount when bottom sediment began to show.

The Union Petroleum Co., a subsidiary of the Sinclair Consolidated Oil Corporation, is building a compounding plant of 500,000-bbl. capacity and steel storage tanks of large capacity at its Westwego station.

Vinton, Calcasieu Parish, continues to be the largest producer in the Louisiana coastal fields. The Gulf Production Co. recently completed a 100-bbl. pumping well in its No. 34 Vincent well in this section.

Lee County Ranks First as Kentucky Oil Producer

From Our Special Correspondent

Complete reports for August show that Lee County continues to hold first rank in the production of oil in Kentucky. Of the 775,004 bbl. for the entire state its oil runs showed 465,532 bbl. Estill County was next, with 92,693, Allen third, with 86,843, Warren fourth, with 31,393, and Powell fifth, with 26,326 bbl. The price of oil in the state increased recently from $4 to $4.25 a barrel.

Warren County continues to lead in new production, and drilling operations are still centralized there. A flowing well was drilled in on the Phelps lease, six miles south of Bowling Green, on B-1 Shaw of the Oklahoma Gas & Oil air. It was capped after numerous attempts, and is producing 500 bbl. a day.

A second big well was brought in on the Kister lease, in the White Stone Quarry district, Warren County, estimated at 100 to 150 bbl. a day. Johnson, Kerstetter & Stein have drilled in No. 1 on the Briggs lease at 1,155 ft. Oil stood 240 ft. in the hole. A well on the Jefferson lease was shot on Sept. 24 at 1,101 ft. No. 1 on the Porter lease was shot the same day at 1,025 ft. and has an estimated production of 50 bbl.

Well No. 20 on the George Sledge lease, in Allen County, was brought in on Sept. 21 at 292 ft., good for 100 bbl. daily or better. This well proves up the entire acreage of 399 acres.

Lively development is reported in Johnson County. The Seminole Oil Co. brought in its first well in the Weir sand this week. It will be drilled to the Berea sand.

The Heilbron Oil Co. of Tulsa, Okla., has contracted to drill a well before Dec. 1 on the holdings of S. S. Langley and the Eagle Lumber Co. near Ramsey, Dallas County, Ark.

Refinery at Laramie, Wyo., Making Good Progress

From Our Special Correspondent

Construction of the refinery of the Standard Oil Co. at Laramie is progressing rapidly. Eight of the ten stills have been set in place, and the construction work is nearly completed.

The Producers & Refiners' Corporation struck oil at the Wertz camp, Carbon County, on Sec. 7-26-79. Considerable gas pressure was obtained between 3,200 and 3,400 ft. The quantity of oil has not been determined.

No. 2 well of the Iowa-Wyoming Oil Co., in the Bolton Creek field, was completed at a depth of 2,050 ft. and came in flowing considerable oil with the well water. Sufficient gas came with the oil and water to necessitate the moving back of the field boiler to prevent danger from fire. This field is about thirty miles southwest of Casper. Other companies having holdings close to this producing well are the Chappell, Mike Henry, San Juan, and Victor-Wyoming.

In the Piney field, the Petrograd Oil Co. has spudded in and the Associated Oil Co. is preparing to drill a deep test well. The latter company will drill its first well on the C. Freer ranch, and work will be carried on throughout the winter.

The Sand Hills Oil Co. is setting casing in its test well in the Ferris district preparatory to drilling in below 3,100 ft. It is stated that oil is standing in the hole.

Crude-Oil Production Costs in California Show Large Increase

The cost of field operations in the production of crude oil in California has increased 200 per cent, or possibly 300 per cent, during the last five years, according to statistics recently published by the State Mining Bureau. In 1915 the operating cost was generally less than 20c. per bbl., whereas in 1919 the figure was 40c. or more. Decrease in productiveness of wells, coupled with advanced cost of labor and material, are the underlying reasons. The total capital invested in the oil industry is about $320,000,000, upon which dividends of $35,418,851 were paid, or at a rate of about 11 per cent. About two-thirds of the total output of crude oil is refinable, or about a gravity of 18 deg. Bé. The total area of proven oil land is 91,792 acres, or about 143 square miles. Upon this land there are 8,928 producing wells, slightly more than ten acres per well. Future drilling will probably increase the number of wells, until the average amount of land drained by a single well will be seven or eight acres.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

"Implied" Contract Legal and Enforceable

Oklahoma Supreme Court Sustains Gilchrist Drilling Co. in Action Against Tulsa Fuel & Manufacturing Co.

The status of an implied contract is decided in the judgment of the Supreme Court of Oklahoma in favor of the Gilchrist Drilling Co. against the Tulsa Fuel & Manufacturing Co. The Lynna Oil Co. was the owner of an oil lease, and the Tulsa company was the owner of a gas lease on the same land near Tulsa. The Tulsa gas lease was prior to the oil lease, and there seems to have been some agreement between the Tulsa company and the former original owners of the oil lease that either party had the right to drill wells upon the leasehold estate, the oil-lease holder taking over all oil wells, and the gas-lease holder taking over any gas wells, the party so taking a well to pay the expense of drilling.

After the Lynna Oil Co. purchased the oil lease, the Gilchrist Drilling Co. drilled a test well for gas and oil to the depth of 1,275 ft. The well proved to be dry, and the Lynna company paid one-half of the bill and refused to pay the balance, claiming the Tulsa company was liable therefor. The latter refused to pay, and this action was brought to recover.

It was admitted there was no written or oral agreement between the oil and lease holders as to the drilling of the well. However, the testimony showed that the manager for the gas company knew of the drilling and was at the well during the operations; that frequent reports were made him, and that he was consulted as to the best place to drill the well. It appears that the oil company furnished the casing for the well and also the gas to run the machinery.

As there was no express contract between the parties, the plaintiff must rely upon what is known as an "implied contract." The intention of the parties to an "implied contract" is to be gathered from their acts in connection with the surrounding circumstances, and what was said between the parties at the time, the nature of the work done, and as to how the interest of the parties sought to be charged is effected thereby.

It was said the only distinction in this species of contract and express contracts rests in the mode of proof. Both are founded on the mutual agreement of the parties. One must be proved by an actual agreement, whereas in the case of the other it will be implied that the party did make such an agreement as, under the circumstances disclosed, he ought to have made.

Contracts implied in fact must be a reasonable deduction from all the circumstances and relations of the parties, although they need not be evidenced by any precise words, and may result from random statements and uncertain language.

Judgment against the gas company was affirmed.

Texas Court Sustains Legality Of Unilateral Lease

Holds Agreement Not Invalid Through Allowing Lessees To Pay Rent Instead of Drilling Well.

The Supreme Court of Texas has reversed the Court of Civil Appeals in the suit brought against the Corsicana Petroleum Co. for the cancellation of a mineral or oil lease. The lessors contended that the lease was unilateral and therefore void, and that the lessee company had forfeited it by failing to complete an oil well on the premises within one year.

The lease covered "all the oil, gas, coal, and other minerals," with the "exclusive right to drill, mine, and operate on the lands for producing gas, oil, coal, and other minerals." The lessee agreed in the instrument to complete a well on the premises within one year or pay to the lessors a specified lease rental quarterly to the end of the term of ten years, or until the well was completed, or the lease surrendered as provided. A further clause gave the lessee an option either to surrender the lease upon certain payment or to continue it in full force and effect for quarter to quarter by making the quarterly payments.

The court found there was nothing unlawful about such a contract. Acceptance of payments instead of the completion of a well was a matter of agreement and the lease covered the point. But it was contended that such a lease was unilateral and therefore unenforceable. The court said a contract for the grant of an option is necessarily unilateral. An option is granted for the purpose of enabling the lessee to exercise the particular right or not, as he may elect. The value of it consists in that privilege. Owners of property have the unquestioned power to grant such rights with respect to it. They are free to validly make such contracts, and when so made the courts will uphold and enforce them.

In many valid contracts the promise is only on one side. They are unilateral. The inquiry as to such is whether such promise is supported by a consideration. In return for the payment made the lessors herein agreed that the lessee should have the right to surrender the lease on the terms stated. The presence of this provision in the lease did not invalidate it as contended.

Judgment for the Corsicana Petroleum Co. was ordered.

Casinghead Gas Does Not Make A Gas Well

Federal District Court of Oklahoma Rules That It Is a Component Part of Oil

In the action by the Twin Hills Gasoline Co. against the Bradford Oil Corporation, removed from the Oklahoma courts to the Federal District Court, Judge Williams has entered judgment for the Twin Hills company.

The action was based on an oil and gas lease, the controversy arising over the construction of certain paragraphs of such lease relating to "gas wells" and "casinghead gas." The lease provided that the lessor should receive one-eighth part of all the oil produced, that the lessee should pay $200 per annum on each gas-producing well, and that the lessee should have the right to use casinghead gas for the purpose of operating the wells. And the court held that "casinghead gas," which is a component part of oil being produced from wet gas existing only with oil, would not make a well a "gas well" so as to entitle the lessor to $200 per annum, but the lessor would be entitled to his one-eighth part of the casinghead gas separated from the oil and saved.

In construing an oil and gas lease which is ambiguous the court will look to the intent of the parties and the surrounding circumstances.

The court found in favor of the Bradford Oil Corporation as to the plaintiff's claim for $200 for each well produced on the property because the wells were found to be oil wells and not gas-producing wells. But it found plaintiff was entitled to recover one-eighth part of all oil produced on the property, including the casinghead gas.

Reservations of Coal and Mineral Include Oil, Petroleum and Gas

The Court of Civil Appeals of Texas, at El Paso, has denied a rehearing on its judgment in the suit brought by W. L. Parmer against J. E. Luse and another to quiet title to certain mineral claims in Eastland County, Tex. Reservations in the deeds of J. E. Luse to realty "excepting and reserving all coal and mineral and the right to prospect, mine, and remove the same," and "the coal and mineral in said described land and the right to work and remove the same is especially retained" to the grantor, were construed by the court to be reservations of oil, petroleum, and gas. And under such a conveyance reserving oil and gas rights in the grantor, Luse, the grantee, Parmer, is entitled to the ordinary possession of the surface, and such possession alone will not defeat by the statute of limitations the title to the minerals which were reserved.

ECHOES FROM THE FRATERNITY

Future of the United States Zinc Industry*

Unit Cost, Not Furnace Recovery, Plant Manager's Proper Objective—How To Establish Foreign Market

None of us can afford to be deceived about our own affairs. Every zinc man in the United States knows that the stabilization of his industry depends upon increased home consumption and increased foreign demand. Every member of the American Zinc Institute knows if he reads the Institute *Bulletin*, what has been done toward increasing home consumption. Likewise, he knows what remains to be done; in fact, what must be done if that consumption is to be maintained and ultimately increased.

Simply telling other people, orally or through a bulletin, to "Make It of Zinc" is akin to mining for zinc with a sledge-hammer hand-drill crowbar outfit. Neither will the publication and the distribution of architectural service sheets alone create a demand for zinc roofing material. That demand can only be created through backing those service sheets with a substantial amount of advertising, with the publication of a zinc worker's handbook, and with the adoption of all the other methods which are making an ever widening and more unassailable market for other forms of roofing.

So far as increasing the foreign demand is concerned, let us not delude ourselves regarding our European business. Plainly stated, supply war-shackled nations and then competing with war-crippled nations have merely given the zinc men of the United States an incidental European zinc market. Those nations, however, are rapidly returning to a condition of comparative normality.

Trying to measure England's recovery from the war by the daily rates in a disorganized exchange market is about as satisfactory as looking through the wrong end of a telescope. That country, through a series of corporate mergers, is fast transforming and remoulding the fundamentals of world trade. By the end of 1920 Belgium will probably be producing zinc at one-half of her 1913 rate. Even Germany, suffice to say at this time, has begun her renascence in zinc. These nations must eventually discharge their large financial obligations to this country. As far as possible their payments will be made not in money, but in goods of their own manufacture. Such goods will include zinc unless the zinc industry of the United States does not forthwith reform itself.

An export market as tender as our present one has shown itself to be is not an export market in the world's understanding of that term. When world-market conditions recently favored a return of a considerable quantity of United States-made slab zinc no small concern was exhibited by some of the zinc men in this country, and the menace of such dumping was strongly reflected in home-market quotations. This concern and this reflection were by no means unwarranted, for in the world's commodity markets the law of supply and demand inexorably governs.

Frankly, how can an industry expect to prosper even at home when it is guilty of the wasteful practices exposed in Mr. Stone's admirable paper, entitled "Differences in European and American Smelting Practices," read at the 1920 Annual Meeting of the Institute.[1]

Quoting from the summing up of the studies of that authority: "To make the same amount of zinc (432,000 tons) from the same ores with European recoveries and fuel consumption would take 1,084,800 tons of ore and 1,084,800 tons of fuel, a saving of 37,000 tons of ore and 1,000,000 tons of fuel. If we wish to hold our own, and even to avoid going backward, we must do more economical work and reduce our costs below those of other nations." Mr. Stone has clearly pointed out the only way in which the zinc men of the United States can permanently compete in the world's zinc markets, namely, by reducing their costs.

Mr. Schwab said at the 1920 annual dinner of the Institute that he believed "the real returns in business are derived from the economies practiced in that business." It is certain that he had the zinc business as well as the steel and other business in mind when he uttered that modern business truth.

Slab zinc manufacturers are prone to dwell upon the "furnace recovery" element in their work. That factor, though, is only an integral part of their big problem, namely, reduction of their costs. There are some zinc men who must learn that economy is not only the saving, but also the spending of time, money or anything else to the best possible advantage. There are also some zinc men who must stop thinking that a thing is not right because they do not do it, that a method is not good because they do not use it, and that equipment is not the best because they do not own it; in other words, these zinc men must awaken to the fact that the wisest of us has much to learn.

The modern formula for reducing costs is: (1) Gathering and classifying all that is to be learned about each operation; (2) carefully selecting and progressively developing men for the work to be done; (3) bringing the men and the work together.

Is that the formula generally followed in the zinc industry in the United States? It is not! Unit cost, not merely furnace recovery, must henceforth be the objective of the zinc plant manager. The study of materials used, including their handling and conversion, is one of the most important problems confronting the zinc industry of the United States today, as is lucidly set forth in Mr. Stone's paper.

One of the leading zinc companies of the United States quoted in a recent advertisement: "Research is a financial asset. If industry is to continue to guarantee prosperity, it must keep in direct touch with the vanguard of technical knowledge and skill. Modern industry no longer has to take whatever is available. It decides what characteristics are needed in the metals or chemicals, and then delegates the research laboratory to provide the necessary element." That zinc company practices what it commends by reproduction, and prospers accordingly.

The foregoing briefly outlines the fundamental principles underlying the work which must be done to establish and maintain a foreign market for United States-made zinc. This is a work which peculiarly belongs to the American zinc Institute. As the representative of the zinc industry of the United States, therefore, the Institute stands ready to co-operate through its Development of Industry Committee with the zinc manufacturers of the United States in studying, analyzing, charting, diagramming and putting each and every operation in their plants to a test in the light of world practice with a view of reducing their zinc costs below those of other nations.

The zinc men of the United States can reduce their unit cost through such a co-operative movement. If they will do so they will be able profitably to compete in the world's zinc markets when the economic conditions in the other nations return to normal. If they will not do so they will simply continue to supply for a time what will eventually prove to have been an incidental European market. *The future of the zinc industry in the United States of America is in the hands of the members of the American Zinc Institute.*

The Engineers' Club of Northern Minnesota met at the Mohami Club, Virginia, Minn., on Sept. 25. Graham Bright, of the Westinghouse Electric & Manufacturing Co., gave an illustrated talk on the modern electric hoist.

*This article is the leading article in the October issue of the American Zinc Institute *Bulletin*.

[1] American Zinc Institute, 1920 Annual Meeting *Bulletin*, p. 29 *et seq.*

Technical Papers

Mining Law—A series of volumes on mining law, embracing the mining law of the British Empire and foreign countries, will shortly be published for the Imperial Mineral Resources Bureau. Address H. M. Stationery Office, Westminster, London, S. W. 1. The purpose of the series is to provide an up-to-date and authoritative exposition of the mining laws in force in different parts of the world, available both for the legal profession and for all those who are in any way interested in mining and minerals. In the first place the mining laws of the British Empire will be discussed and a commencement has already been made with those of Nigeria and of the Gold Coast, which form the first two volumes of the series and will shortly be issued. The price of the former will be 15s. 6d. postpaid. The third volume, which will deal with the Transvaal, is in course of preparation. Each volume will contain a critical analysis of the statute and case law, and will include the full text of the laws, ordinances, proclamations, regulations, rules and notices, which are directly or indirectly material to the subject matter of the work. The volumes will be revised and brought up to date periodically by the issue of supplements.

Molybdenum—Molybdenum has become much more important than formerly. Accurate methods of assaying are necessary, as the old methods left much to be desired. The Bureau of Mines has investigated the subject and has just issued Technical Paper 230 (obtainable from the Superintendent of Documents, Washington, D. C., for 5c.) entitled "Determination of Molybdenum." Improved volumetric and gravimetric methods, more accurate than any previously devised, are described.

Gold in Black Sand—Some tests were carried out by the Alaska station of the Bureau of Mines on the separation of gold from a black sand containing over 90 per cent of magnetite and garnet. The most satisfactory method of treatment was found to be barrel amalgamation in the presence of caustic soda. U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,158 (five pages), obtainable on request from the Bureau at Washington, tells about the work.

Mineral Statistics—The following separate sections of "Mineral Resources of the United States" have recently been issued by the U. S. Geological Survey, Washington, D. C., and may be obtained without charge: "Clay-working Industries, Silica Brick, etc., in 1918" (pp. 90); "Platinum and Allied Metals in 1919" (pp. 12); "Lithium Minerals in 1919" (pp. 6); "Abrasive Materials in 1918" (pp. 17); and "Cobalt, Molybdenum, Nickel, Titanium, Tungsten, Radium, Uranium and Vanadium in 1917" (pp. 60).

Drill Bits—Walter E. Carr in the September issue of *The Compressed Air Magazine* (11 Broadway, N. Y., 25c.), has a one and one-half page article entitled "Getting Best Results from Rock Drill Bits." Drilling speed can be vastly increased, and the number of bits to be resharpened considerably reduced, by the use of modern drill bits and sharpening equipment.

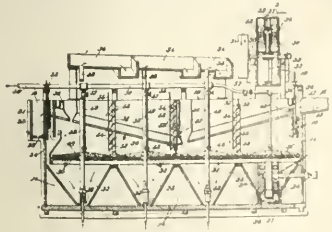
North Dakota Oil—A nine-page pamphlet, Bulletin No. 1, has been issued by the North Dakota Geol. Survey, Grand Forks, N. D. (free) describing the petroleum possibilities of that state. Small amounts of gas have been developed, but few wells have been drilled and no oil in commercial quantity has been found.

Gas in Kansas—The State Geological Survey of Kansas (Lawrence, Kans.) has issued Bulletin No. 5 (32 pages) on the Elk City gas field (free). The first well was drilled July 12, 1918. So far, 52 producing wells have been drilled averaging 27,000,000 cu.ft. daily.

Recent Patents

1,351,096. Apparatus for Separating or Concentrating Ores. David Cole, El Paso, Tex., assignor to Minerals Separation North American Corporation, New York, N. Y. Filed Dec. 4, 1915.

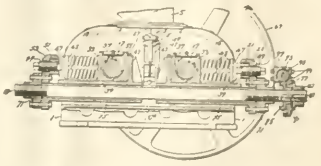
A hydraulic sizer comprising a tank having an inlet at one end, an outlet at the opposite end, and a plurality of sizing compartments at the bottom, said tank being constructed and arranged to permit a free flow of material therethrough in a substantially horizontal direction from said inlet to



said outlet and above said compartments, and a series of vertically disposed spaced sets of shutters within said tank, said shutters having slats downwardly inclined in the direction of flow.

1,350,748. Crushing-Roll Machine. Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass. Filed Feb. 13, 1917.

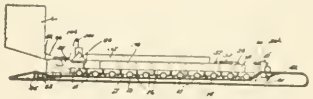
A machine comprising, in combination, a bed, carriages slidably mounted on said bed, a pair of opposed crushing rolls carried by said carriages, a pair of adjusting shafts threaded to both of said carriages, worm wheels on said shafts adjacent one end of said base, a cross shaft having worms meshing with said worm wheels simultaneously to rotate said adjusting shafts to vary the space between said crushing rolls, heads connected to said shafts adjacent one



end of said bed, and means detachably to secure said heads to said bed to confine said adjusting shafts against axial movement.

1,350,440. Apparatus for Agglomerating Ores. Edward W. Davis, Duluth, Minn. Filed Nov. 19, 1918.

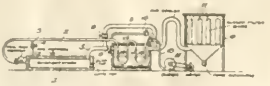
The combination in sintering apparatus of a track, a series of trucks mounted on said track to receive charges of material to be sintered, a vacuum chamber adjacent said track, means for forming an air-tight communication between each of said trucks and said vacuum chamber during the travel of said trucks adjacent thereto, and reciprocating feeding means mounted adjacent



said track and adapted to move said series of trucks by engagement with one of them, said feeding means having a part adapted to engage one of said trucks automatically upon its forward stroke and to pass by said truck upon its return stroke.

1,350,286. Process of Treating Ores. Lewis Bailey Skinner, Denver, Col. Filed Feb. 10, 1919.

The process of treating complex zinckiferous ores carrying precious metal values which comprises preparing a mixture of an oxidized ore of the character specified with an excess of carbonaceous reducing material, the mixture containing matte-forming constituents, charging said mixture on the hearth of a reverberatory furnace, firing the furnace with suitable fuel



and smelting the charge at a furnace temperature of at least about 1,200 deg. C. to produce molten matte and supernatant slag shielded by a non-oxidizing atmosphere, conducting from the furnace fume resulting from reduction and volatilization of zinc from the charge, and continuing the heat treatment of said molten mass until slag tapped from the furnace contains not substantially more than about 6 per cent zinc.

MEN YOU SHOULD KNOW ABOUT

Alfred H. Brooks expected to arrive in Seattle Sept. 27.

R. L. Agassiz, president of Calumet & Hecla Mining Co., has gone to Houghton, Mich., on an inspection trip.

L. M. Prindle is doing geologic field work in the Hoosic-Bennington quadrangle in Vermont and Massachusetts.

R. E. Davis has resigned as director of the Wisconsin Mining School, Plattville, Wis., to engage in private practice.

Ravenel Macbeth, secretary of the Idaho Mining Association, is at the Arlington Hotel, Washington, D. C., for an indefinite stay.

John R. Hall, of Knauth, Nachod & Kuhne, has returned from an inspection of Alvarado Mining & Milling Co., Parral, Chihuahua, Mexico.

J. S. Bradford, mining engineer, formerly general manager at Chiksan Mines, Chosen (Korea) is now at Gensan, Korea, P. O. box No. 14.

F. E. Downs, mill superintendent with the Mexican Corporation, Ltd., Taziutlan unit, has resigned that position and is now in Mexico City.

V. Durand, mining engineer and graduate of Saint Etienne in 1906, has been appointed chief engineer of the Mines de la Chazotte, France.

Warren R. Roberts, chairman of the coal section of the standardization committee of American Mining Congress, is making a visit to western Canada.

U. H. Berthier, mining engineer, who was at Monterrey, is now assistant superintendent at the Mapimi smelter, Durango, Mex., of Cia. Minera de Penoles.

H. N. Lawrie, economist of the American Mining Congress, has completed his trip through the gold camps of the country, and is again at the Washington headquarters.

Donald B. Gillies, vice-president of the McKinney Steel Co., has returned to Cleveland, Ohio., following a visit to the company's mines in the Lake Superior district.

W. S. Bayley, of Urbana, Ill., is at Murphy, N. C., continuing the investigation of the iron ores of North Carolina, begun last summer by the North Carolina Geological Survey.

W. K. McNeill and **W. R. Rogers**, of the Ontario Department of Mines, were in charge of the Ontario exhibit at the National Exposition of Chemical Industries in New York last week.

W. G. Mather, of Cleveland, Ohio, president of the Cleveland-Cliffs Iron Co., and the directors of the company have been on a tour of inspection of the company's holdings in Michigan and Minnesota.

John L. Agnew, general superintendent of the mining and smelting division of the International Nickel Co., is traveling by automobile from the works at Copper Cliff, Ont., to Kentucky.

W. T. Lee, of the U. S. Geological Survey, is completing field work on the coastal plain of Maryland and Virginia. He has made airplane observations of submerged topography.

M. Pigeot, director of mines of Montrambert, who was nominated Chevalier de la Légion d'Honneur recently, has been presented with a rich jewel of the order by the personnel of the Montrambert company.

I. G. Wheaton, during the past four years in charge of operations at Gowganda, for the Crews McFarlan Mining Co., Ltd., has been appointed superintendent of the Wachman Mining & Milling Co., Ltd., Dryden, Ont.

Harris & Ewing, Photo.

EDSON S. BASTIN

E. S. Bastin, now a member of the geologic staff of the University of Chicago, has severed his connection with the U. S. Geological Survey, effective Oct. 31. Mr. Bastin has been teaching economic geology at the University of Chicago since the first of the year, but has maintained a part-time relationship with the Geological Survey.

W. B. Plank, mining engineer, who has been in charge of the Birmingham district for the U. S. Bureau of Mines, has resigned to accept a position as instructor of mining engineering at Lafayette College, Easton, Pa.

L. A. Butler, mining engineer, expected to sail Oct. 2 for West Africa, where he will be engaged in engineering work. His address will be Dun Du, via Pema, care of Caixa 347, Loanda, Angola, West Africa.

William Guggenheim, **J. Leonard Replogle**, of Vanadium Corporation of America, and **Eugene Meyer, Jr.**, of New York City, were among those receiving the decoration of Commander of the Italian Order of the Crown on Sept. 23, at a luncheon by F. Quattrone in honor of Mr. Guggenheim.

John A. Burgess, recently resigned as general manager for United Eastern Mining Co., Oatman, Ariz. He has opened private offices at 648 Mills Building, San Francisco, Cal.

Among the members and guests registering at the Petroleum Section meeting of A. I. M. E., at St. Louis, we noted R. Van A. Mills, Washington, D. C.; F. W. DeWolf, Urbana, Ill.; Arthur Knapp, Shreveport, La.; John L. Henning, Lake Charles, La.; E. W. Ames, Ft. Worth, Tex.; S. O. Andros, Galesburg, Ill.; Winslow H. Herschel, Washington, D. C.; Walt M. Small, Tampico, Fla.; Wallace E. Pratt, Houston, Tex.; Ralph Arnold, Los Angeles, Cal.; Arthur Thacher, St. Louis, Mo.; John R. Roberts, Eastland, Tex.; David White, Washington, D. C.; L. A. Mylius, Urbana, Ill.; J. E. Wallis, Los Angeles, Cal.; Mowry Bates, St. Louis, Mo.; D. F. Sullivan, Chicago; W. J. Howard, St. Paul, Minn.; L. S. Wetzel, Clayton, Mo.; Ralph R. Matthews, Wood River, Ill.; Joseph L. Tweedy, Dallas, Tex.; Edgar Kraus, Houston, Tex.; R. D. Meyer, Denver, Col.; F. J. Fohs, New York City; Wilbur A. Nelson, Nashville, Tenn. and J. W. Gerhard, St. Louis, Mo.

SOCIETY MEETINGS ANNOUNCED

Canadian Institute of Mining & Metallurgy will hold its **Western Meeting** in Winnipeg, Man., Oct. 25, 26 and 27. Headquarters will be the Fort Garry Hotel, in that city. The program includes worth-while papers on the oil, coal, copper, gold and other mining industries of western Canada. Exhibits of all minerals known to occur in Manitoba and the west will be shown.

The Institute extends an invitation to all members and to all others interested in mining to come to Winnipeg for this convention. Those intending to be present should send their names and addresses promptly to the secretary, W. W. Berridge, P. O. box 3076, Winnipeg, Man., Canada.

The New York Section of American Institute of Mining & Metallurgical Engineers holds its regular monthly meeting on Oct. 6, at the Machinery Club, 50 Church St. After the informal dinner at 6:30 the members will hear an unusually interesting address. Courtenay De Kalb will give a talk on "A Visit to Some of King Solomon's Mines." He will refer in particular to the Rio Tinto and the Almaden mines, illustrating his comments with unusual stereopticon views. A general discussion will follow the talk, and many of those present will be expected to take part.

This is the first Fall monthly meeting and a large attendance is expected. Those coming to the dinner ($2, payable at the dinner) are requested to advise at once the treasurer, E. L. Gruver, 25 Broad St. (phone Broad 6768).

Petroleum Section of A. I. M. E. Meets in St. Louis

Two-Day Convention Draws Many Specialists — Paper on Russian Oil Fields Proves of Great Interest — Members Entertained by St. Louis Section of Institute — Anheuser-Busch's Bevo Well Gushes for Occasion

By H. A. Wheeler
Special Correspondent *Engineering and Mining Journal*

The Petroleum Section of the A. I. M. E. held its first independent meeting at St. Louis, Mo., on Sept. 21 and 22, the St. Louis Section of the Institute acting as host to the visitors. By thus convening at a location midway between the financial centers of the East and the field workers of the West, it was anticipated that it would draw a larger and more representative attendance of geologists and oil specialists than do the usual general meetings of the Institute, where the oil section is a minor feature. It was also an effort to attract to the Institute some of the numerous workers in the Western fields, who thus far have not affiliated with the A. I. M. E., many of whom are members of the American Petroleum Association, an essentially Western organization. With this latter object in view Ralph Arnold, chairman of the Petroleum Section, issued invitations to all the members of the latter organization, some of whom took advantage of the opportunity to attend this special oil convention.

The meetings were held in the assembly room of the American Annex Hotel, which was the headquarters of the convention and where ample room was found in spite of a shortage of accommodations in the city caused by a very large convention of retail druggists that was held during the same week.

The petroleum convention was attended by over one hundred members and guests. The first day was devoted to a morning and an afternoon session for reading and discussing papers, with a smoker in the evening that afforded an opportunity for social "section" meetings. The morning of the second day was devoted to papers and discussions, but proved far too short to permit justice to be done to all the papers, and some of the discussions had to be omitted for lack of time. On Wednesday afternoon most of the members relaxed by making a sight-seeing trip about St. Louis, in the course of which they stopped at the very interesting Bevo plant of the Anheuser-Busch brewery and sampled some of the latest product. A hasty visit was also made to the Shaw Botanical Gardens, one of the largest and most noteworthy in this country. Some of the members visited the large new refinery of the Roxanna Oil Co. at Wood River, Ill., and a few inspected the experimental shale oil plant of the Industrial Process Co. of St. Louis.

Twenty papers were presented, some of which evoked very active discussions. The origin of the coastal salt domes came up several times and produced such prolonged discussions as to suggest a special meeting and section on salt domes. The advocates of the volcanic origin of the salt plugs decidedly predominated, their views being in harmony with those accepted regarding similar Mexican coastal pools, in which the dome structure is unquestionably due to vulcanism.

An innovation of the meeting was the presentation of papers by foreign members, these including a paper on Brazilian oil shales and a very interesting review of the rich Russian oil fields, a brief extract of which is hereafter given. The meetings were presided over by Ralph Arnold, chairman, and by E. L. DeGolyer, vice chairman, of the Petroleum Committee of the Institute.

Russian Oil Fields Discussed

The most interesting paper of the meeting was an excellent, comprehensive review of the "Oil Fields of Russia" by A. Beeby Thompson, of London, the eminent oil geologist. These fields are but little known in this country, although according to Mr. Thompson's figures they are the richest that have ever been opened. They have been of very great importance to Europe in the past and are destined to regain this leading position in the future when Russian conditions become sufficiently settled to permit of their being reopened and extended. According to geologic evidence, the future output is likely to exceed the past brilliant record, especially since the recent introduction of American methods that have greatly decreased the cost of drilling and operating.

Two districts have thus far produced most of the oil, of which Baku, on the shores of the Caspian Sea, preeminently leads as a producing, refining and shipping center, while the Grozny field exceeds the combined output of the minor oil fields thus far developed. The oil is of a heavy, asphaltic grade that yields small amounts of gasoline, considerable kerosene and a large amount of fuel oil or residuum. It is this large fuel oil yield that is destined to become very important in the future as a dangerous competitor to the American and Mexican exporters in supplying the European markets when normal conditions again prevail in Russia.

The oil occurs on well defined structures and is produced from eight or more sands of Tertiary age that occur in unconsolidated sediments. The surface seepage of oil, asphalt, gas springs, and mud volcanoes are very noteworthy, and abundant, and some oil has been produced from shallow pits. Submarine gas issues are an interesting feature of the Caspian Sea and have caused such violent ebullitions as to capsize boats.

The wells are mainly shallow and the deepest do not exceed 2,000 ft. They are drilled with rods operated by a walking beam and are cased with "stove-pipe" or riveted casing, the initial sizes being 36 to 42 in. The system is very crude, slow (taking one to three years) and very expensive, the costs per foot ranging from $12 to $25 before the war, in spite of very cheap labor, of which about 50 per cent is for casing. The Russian engineers were unable to use the American cable or rotary systems successfully and have been highly antagonistic to recent attempts to introduce American practice. The system of operating after the wells cease flowing is by bailing with large, high speed bailers, as the excessive amounts of sand produced with the oil, 50 per cent in some cases, renders pumps prohibitory. The cost of bailing a 120-bbl. well was 20c. per barrel in pre-war times. The air lift system has also been successfully used.

Rotary System of Drilling Proved Better

Recent results under American control, after months of obstacles and delays through the excessive jealousy of the Russians, have proved that the rotary system is not only very successful but in offset wells has shown a very great saving in time, costs and freedom from accidents, while the 10-in. screw-joint casing proved vastly more efficient than the huge, costly riveted Russian casing. In the discussion that followed Arthur Knapp stated that where 50 to 75 per cent of the wells put down by Russian methods failed to bottom successfully, the use of American methods resulted in only half as many failures, besides affording a very large saving in time and cost; that he had successfully employed American pumping methods for extracting the oil after the well ceased flowing with a marked saving and much less risk than with the Russian bailing, with its heavy wear and tear of ropes and casing, excessive power and greater risk from accidents. By employing screens below the pump, an innovation in Russian practice, he had greatly reduced sanding troubles.

Output Per Acre Large in Russian Field

The most interesting feature of the Russian wells is the phenomenally large output per acre, as the yields vastly exceed anything known in American practice. The Grozny field has produced 300,000 bbl. per acre and the Baku-

field 500,000 to 2,500,000 bbl per acre. A tract of 250 acres produced over 1,500,000 bbl. per acre where twelve sands were struck that aggregated several hundred feet in thickness. The Balakhany-Saboontchy field of Baku, comprising about 2,600 acres, has outputted 500,000 bbl. per acre and is still capable of enormous collective production, although the output of the individual wells is now small.

Individual gushers or "fountains" have come in at 25,000 to 100,000 bbl. per diem, but the flow lasts only a few days and the gusher period is a thing of the past in the developed fields. The ultimate yield per well declined from 675,000 bbl. in 1892-1896 to 225,000 bbl. in 1912.

A typical well in the Grozny field yielding an ultimate output of 80,000 bbl. is cited as producing 50 per cent of its total production in the first year, 22 per cent in the second, 15 per cent in the third and 7½ per cent in the fourth year.

Russian production started in 1863 with 37,400 bbl. and increased to 203,000 bbl. by 1869 and became very active in 1877. From 1898 to 1901 the Baku fields produced about half of the world's oil output. The approximate output to 1918 is as follows:

	Barrels
Baku district, from 3,600 acres	1,652,610,000
Grozny district, from 8,000 acres	139,858,000
From 7 minor districts	61,526,000
Total	1,853,994 000

The Russian statistics are usually given in the local term *poods* and a barrel is equivalent to 8.3 *poods*.

Deep Drilling of Salt Domes on Gulf Coast Urged

In a paper on the "Urgency for Deeper Drilling on the Gulf Coast," A. F. Lucas urges the testing with very deep wells, under careful geologic guidance, of the salt domes of the coastal region to depths of at least 7,000 ft. He argued that the present high price and assured greater demand for oil warrant such deep exploration, especially as there is considerable promise of it being successful and that improved rotary drilling methods now render such great depths feasible. Capt. Lucas is inclined to regard the salt, sulphur and oil as contemporaneous, and referred to crystals of salt that contain oil, gas and sulphur, in which view Arthur Knapp concurred. Whereas Capt. Lucas formerly regarded the origin of the salt cores as due to crystallization from solution, he is now favorably disposed to the more prevalently accepted theory that they are due to volcanic plugs.

H. E. Williams' paper on "Oil Shales and Petroleum in Brazil" stated that Brazil has encouraging prospects for developing into an oil producer and has extensive amounts of oil shale of good grade that is now being studied and tested by government experts.

Water Problems Considered

The paper on "Oil-field Water Problems" by A. W. Ambrose brought out the great importance of careful observation by production engineers of the source and volume of oil field waters through chemical analyses. Casing records should be kept, he said. Subsequent variations are apt to occur in the analyses of the waters from a given well through changes that occur during the different phases as the gas volume decreases, with a consequent decline in vapor carrying capacity. The paper caused much discussion that brought out the very great importance of not drilling too deep into or too close to the underlying water table that occurs in most Mid-Continent oil fields.

It was shown by Mr. DeGolyer that in Mexico the life of some of the large gushers had been greatly prolonged by throttling down or reducing the output of the flowing wells when water or sediment began to show and to continue throttling or pinching the output as the wells increase in age. It was also thought that a sharp distinction must be made in studying water encroachment in the character of the oil, as the greater the viscosity the greater the danger of condemning and abandoning a well before the available oil was completely recovered through the tendency of the water to advance faster as the oil was recovered by pumping. That with thin, light oils, like the Pennsylvania, with a very low viscosity, the oil and water advanced at about an equal rate to the well, whereas Mid-Continent oils would drag and lag behind the advancing water, which would be still more marked in the very viscous California oils. Mr. DeGolyer cited Mexican wells where a close watch of the temperature has enabled them to forestall water trouble by prematurely throttling before the water appeared, when the oil temperature rose above normal. The underlying water is 14 deg. to 18 deg. warmer than the pure oil and hence warned of its threatened appearance in advance by the increase in temperature. R. A. Conkling, of the Roxanna Company, referred to a well-drilled lease in Oklahoma that had been kept free from water trouble through stopping drilling some distance above the water table, whereas the adjoining leases were making heavy water from the same sand by having drilled too deep and into the water table.

Inefficient Use of Oil as Fuel Pointed Out

The paper by W. N. Best on "Efficiency in Use of Oil as Fuel" brought out an interesting discussion that showed that although many burners now on the market are more or less unsatisfactory and wasteful, this is usually owing to lack of knowledge in using burners under the great range of conditions existing; that if thorough atomization of the oil is attained, whether by steam or air pressure, and if the oil is reliably fed by eliminating sediment and foreign clogging matter, successful results are readily attainable. This requires the oil to be heated to secure a thin, easily fed liquid, if residuum is used, supplied by tanks or pumps.

The short paper by J. E. Hackford, of London, on the "Nature of Coal" was a suggestive and thoughtful study from a purely chemical viewpoint of the marked similarity in the constituents of some coals with some of the oxidized products of petroleum, like albertite, grahamite, gilsonite and others, and he cited the prolonged litigation that has occurred in attempting to distinguish legally between such similarly appearing products as a connecting link.

The paper on "Oil-field Brines," by C. W. Washburne, elicited a keen discussion by R. A. Mills and E. DeGolyer on the coastal salt domes. A corrollary of Mr. Washburne's paper shows that the salt cores could not have been formed by precipitation from salt solutions, as they cut across many open sands that outcrop at a higher elevation farther inland, in which artesian circulation would result from an upward movement at the site of the salt core and consequently the salt cores must be intrusive plugs. This was disputed by Mr. Mills, who maintained that the strong salt solutions would seal up and close the pores of the porous horizons adjacent to the salt core by precipitation.

F. J. Fohs presented an incomplete but comprehensive paper on the "Gulf Cretaceous Oil Fields" that was liberally illustrated by maps of the main structural features of the northern Louisiana oil fields and several local maps of individual structures. This paper will be subsequently enlarged before it is submitted for publication. Lack of time prevented a discussion.

Conditions in Illinois Fields Considered

L. A. Mylius, of the Illinois Survey, presented a brief review of "Present Conditions in the Illinois Oil Fields," which are now producing about 12,000,000 bbl. annually and have shown an annual shrinkage of about 15 per cent since 1908, the zenith year, when 33,686,238 bbl. was produced. He cited the recent deep developments in the old shallow Casey field, where good wells are now being obtained from the Trenton limestone at about 2,400 ft., as compared with the 300 to 600 ft. horizons in the Coal Measure that opened up the eastern Illinois fields.

H. A. Wheeler gave a brief review on "Faulting in the Illinois Oil Fields" that showed that faults had thus far proved destructive on otherwise promising structures through leakage in favorable districts and that faults were much more numerous in the western part of the state, where it was within the zone of the influence of the Ozark uplift of Missouri. He cited an example where oil is migrating today through a heavy fault in the Centralia district, as shown by its marked accumulation in the old, worked-out rooms of a coal mine through which the fault passes.

The local committee on arrangements consisted of H. A. Wheeler, chairman; Prof. W. E. McCourt, secretary; J. E. Caselton, F. V. Desloge, J. D. Robertson and Arthur Thacher.

THE MINING NEWS

LEADING EVENTS

Special London Letter

The Threatened Strike of Coal Miners—New Minerals in Derbyshire—Mineral Resources Bureau Busy—Katanga To Issue New Capital

BY W. A. DOMAN

London, Sept. 14—The threatened strike of coal miners and the attitude of labor generally are dominating not only the mining world but industrial and political spheres as well. Through the Coal Association the colliery owners are setting out very important facts concerning the earnings, output and slacking of the miners, which certainly do not confirm the altruistic claims of the latter. By their leaders they have refused every avenue of inquiry which would have ensured to them an impartial hearing, and consequently other branches of labor and the public generally are being antagonized. It is the more unfortunate because there is big business in contemplation which capitalists are deferring for the present. For instance, in a mining direction the Chemical & Metallurgical Co. has a plant to erect for one of its processes, and the François Cementation Process is debarred from proceeding with its contracts. Colliery owners are scarcely likely to sink additional shafts and open up new pits with the general position so uncertain.

It is announced that half a dozen new minerals have been discovered in the Peak district of Derbyshire by Mr. Garnett, the most important being cobalt. The others are diabantite, nephrite, cimolite, utahite, sulphur and allophane. The Peak district is one of those wild places that would fit in anywhere; one could even find gulches to satisfy the American promoter. Its geological appearance is such that no one would ever be surprised at the discovery of any mineral there. Lead is being principally worked by small syndicates. The veins, however, are narrow, and their extraction would not support a big company. This is one reason why English capital seeks an outlet at the other end of the world.

The Imperial Mineral Resources Bureau is getting to work. It is issuing pamphlets treating of certain base metals, and is also dealing with the mining laws of the British Empire and of foreign countries. It has a big program, but if carried out it will prove invaluable to the government and traders alike. The war showed us our backwardness in respect of mineral knowledge.

Tin interests are still at work endeavoring to fix a minimum price for the metal. It is argued that as there are only about 150 producing mines and some of them of only secondary importance the thing is quite feasible. There is certainly a "live wire" in it—Oliver Wethered. He is a born optimist.

The Union Minière, which controls the great Katanga copper belt, in which Tanganyika Concessions is interested, is reported to be about to issue new capital at 800 francs in the proportion of one new share for six old. There is ample scope for the employment of additional funds, though the production of copper is about 2,000 tons per month.

For last month the Rand gold output is rather disappointing, for while the value is satisfactory—£3,940,216 against £3,864,520 in July—owing to the high price at which the metal is taken, namely, £5 12s. 6d. per oz., labor is again short as usual at this season of the year. The Far Eastern portion of the Rand continues to contribute the greatest amount of gold, and this time the Brakpan and Spring Mines, which for some months have done rather badly, are well to the fore with increased profits. The Anglo-American Corporation of South Africa is largely interested in these mines, and as their quotations have fallen so has that of the Anglo-American Corporation in sympathy.

WEEKLY RÉSUMÉ

The strike of miners on the Comstock Lode, in Nevada, remains unsettled, except at the Northend mines, in spite of concessions offered by the operators. Likewise in the Slocan, in British Columbia, the men who struck last May are still out and the shortage of labor is hampering operations. Canada Copper's concentrator at Allenby, B. C., is expected to be running soon when shipments will be made to Trail. The recent advance in freight rates in the United States has been discussed at conferences of operators held in Salt Lake City and Phoenix, Ariz. In the iron country a project to explore the western end of the Marquette Range is under way. The Northwestern is planning to increase the capacity of its Ashland ore docks and improvement of the Great Northern's docks at Allouez Bay has been started. Nov. 15 has been set by the Federal Trade Commission for a re-hearing of the Pittsburgh steel basing point case. In South Dakota at Deadwood the Iron Hill tunnel has reached its objective. In Illinois, various companies in the fluorspar district are affected by a strike of their employees. Explosives experts of the U. S. Bureau of Mines at Washington have undertaken to study the recent Wall Street explosion.

From abroad comes word that Katanga is to increase its capital and that the Knight's Deep stamp mill on the Rand has been destroyed by fire.

Knight's Deep Mill Burned

Fire destroyed the engine room and a 400-stamp mill at Knight's Deep, Ltd., East Rand, Transvaal, on Sept. 20. The damage is estimated at £100,000.

Comstock Mines, Except Northend Group, Remain Shut Down

Men Refuse To Accept Operators' Terms Upon Instruction From Union To Stay Out

The following notice was recently issued by the mine operators of the Comstock district of Nevada to the striking employees:

"In order to arrive at a solution of the labor troubles of the Comstock district, the superintendents have considered the following facts:

"First: That there is no operation on the Comstock lode that is at present in a paying condition and that an increase in wages would be disastrous to all.

"Second: That the prevailing high cost of living is working a hardship on many of the families of the district. The operators have already issued a statement setting forth the fact that they are unable to meet the wage increase, and also their belief that the cost of living is now on the decline. It appears that there is some doubt in the minds of the miners as to the merits of this statement.

"The principal grievance or complaint of the miners seems to be that they cannot live on the present wage in face of the cost of living. With the above facts in mind the operators propose a plan which, it is believed, will in every way answer the demands of the miners for lower living costs and at the same time will provide an absolute guarantee on the part of the operators that the cost of living will materially decrease.

"The proposal is as follows: (1) The scale of wages will be the same as that which has prevailed during the past year. (2) Beginning with the day of the acceptance of this proposal miners or their families may go to the operators' general merchandise store and procure any of the commodities carried in stock at a price 20 per cent below present wholesale prices. This will bring commodities a shade below wholesale prices of 1917 and in reality will result in a saving that will average 25 per cent as compared with present retail prices. The operators, in establishing these reduced prices, desire the co-operation of the advisory committee of miners so there may be no dissatisfaction in this arrangement. Under this plan the operators assume the financial responsibility for any losses that aforesaid store may suffer, either through price changes, upkeep or overhead. (3) Room and board, including rooms with bedding and sheets, will be supplied to single men for $39 per month, which is a reduction of over 20 per cent under present living costs.

The operators make this proposal as a guarantee of their belief that the cost of living will decrease and in a spirit of fair play.

"(Signed)

"H. L. SLOSSON, JR.
"GEORGE H. DRYSDALE
"ALEXANDER WISE
"R. A. HARDY
"H. B. BULMER"

After the appearance of this notice on the part of the operators the United Comstock Mines Co. offered to give the miners in its employ contracts instead of day's pay. Under this arrangement a number of the miners returned to work but the following notice from the Gold Hill Miners' Union stopped all further work:

"NOTICE FROM GOLD HILL MINERS' UNION

"That the minimum be a flat scale of $6 for eight hours' work, and that there be no bonus and that men taking contracts receive a minimum of $7 a day and recognition of the union.

"THOMAS ODGERS, president
"W. J. STACK, secretary"

The situation at present is that work has ceased except in the Northend group of mines under Superintendent Alex Wise. At these properties the $6 per day wage has been granted by the superintendent.

Canada Copper's Mill Ready To Start

The Canada Copper Corporation expects that the new power line to its mill at Allenby, B. C., will be delivered to it complete by Oct. 4. It is stated that there will then be no reason why operation of the mill should not begin within a few days thereafter. The full capacity of the concentrator, namely 2,000 tons, will be worked up to as rapidly as possible. Shipments of concentrates to Trail will begin promptly. The plant has been standing idle since its completion about nine months ago. The railroad is completed and in operation and the heavy machinery has now been moved from Princeton up to the mine and is being rapidly installed on its foundations.

Northwestern Ry. To Increase Capacity of Ashland Docks

The Chicago & Northwestern Ry. is to make an addition and improvements to its No. 3 ore dock at Ashland, Wis., on Lake Superior, during the coming winter. The dock will be lengthened 1,000 ft., extending it clear to the harbor improvement line. This will give 340 pockets instead of 200, and the total storage capacity of the company's three docks at that point will be increased to 213,000 tons. All pockets will be operated electrically. The Soo line has one dock at Ashland which has a capacity of 53,000 tons. All of the ore from the Gogebic Range passes through Ashland during the period of navigation and it is expected that this year's shipments from the range will total about 8,000,000 tons. A large increase is looked for next year.

Slocan's Season Output Crippled by Strike Situation

Operators, Except Silversmith Mines, Standing Pat in Refusing to Employ O. B. U. Members

Since the One Big Union called a general strike in the Slocan, in British Columbia, on May 1 last, the operators, excepting the Silversmith Mines, have refused to employ any man who is an O.B.U. They will, however, employ all men who may belong to other unions or are non-union. Under these conditions they have been and still are working very short-handed. In fact, it is said, this strike has crippled the Slocan output for the season, which promised well in the spring. The general feeling, according to the manager of one company, is that now is the time to take a determined stand and once and for all time to break up the O.B.U. by a concerted effort. The strikers had demanded a $1 per day increase, also that the British Columbia Health Regulation Act be strictly adhered to and that all employees be provided with blankets, sheets, pillows and pillow slips.

Winter is approaching and many men will be released from various outside employments and naturally will look to the mines. Many of the mine workers who went out on May 1 went into the woods and harvest fields. These will probably return to the mines when bad weather sets in and the harvest is over. The prospects are not good, however, for securing a fair-sized crew soon, owing to the demand for building materials and lumber, which is likely to continue.

The 100-ton mill of the Noble Five mine at Sandon, erection of which was begun in May, 1919, was started Aug. 23 last and is operating but one 8-hour shift at present.

Effort To Close Cascade Mill at Neihart, Mont., Fails

The effort of Attorney General Ford, of Montana, to close down the Cascade Mines & Milling Co.'s mill at Neihart, Mont., has failed. Some time ago, acting for local interests, the attorney general brought suit for an injunction requiring the company to desist from dumping its tailings into Belt Creek on the ground that the water was becoming polluted. Testimony was brought forward in favor of granting the order, but the company showed that if such an order was granted it would be absolutely necessary to close the mill down and consequently the mining properties of the company, thus throwing out of work a large number of men and injuring the only industry in the district. The judge, after having had the whole question under consideration for some time, has decided to refuse the injunction. The mill, which has only been running at half force since the proceedings were started, is now operating full capacity and more men are being put to work underground.

Mine Managers Testify at Rate Hearing at Phoenix

Gila Copper Sulphide Paying 7½c. Per Ton More for Nine-Mile Haul

"Sick babies" was the designation applied to small producing Arizona mines by Grant H. Dowell, of the Phelps Dodge Corporation, at a State Corporation Commission hearing at Phoenix, Ariz., to pass upon a petition of the railroads to add 25 per cent to their freight tariffs. It was generally agreed that the increase suggested would stop production in a majority of the smaller properties of the state. Mr. Dowell said that smelting costs at Douglas had about doubled already through added transportation charges. Because of this his company in 1919 paid for customs ores $225,000 less than in the previous year.

G. M. Colvocoresses, the general manager of the Consolidated Arizona smelter at Humboldt, told that increase in freight rates would put about 60 of his customs ores shippers out of business. Especially would there be harm to production at the Swansea mine, now under lease to his company.

Percy Williams, manager of the El Tiro lease at Silver Bell, gave figures showing that his company now is making a profit of 80c. a ton on ores that average 130 lb. of copper to the ton. The proposed freight increase would leave the company 45c. "in the hole" for every ton shipped. George Morris, manager of the Gila Copper Sulphide Co. at Christmas, Ariz., included his mine as one of the "sick babies" and aroused interest by showing that the Arizona Eastern had interpreted the 25 per cent raise as increasing his rate for the haul to Hayden from 22½c. to 30c. a ton. The distance is nine miles for about 250 tons a day. He insisted also that the proposed raise would affect the living costs of his workmen, now furnished supplies at cost, and thus wages would have to be raised in the same old unending round. The railroads claim the increase under the Interstate Commerce Commission's recent interstate order.

Inspiration Sues State and County for Tax Refund

About $1,430,000 is demanded from Gila County, Ariz., and the State of Arizona in a suit filed in the Superior Court by the Inspiration Consolidated Copper Co. and the International Smelter Co., of Miami, Ariz., on account of taxes alleged to have been erroneously collected of the plaintiff corporations during the years 1917, 1918 and 1919. The gross sum due the Inspiration is alleged to be $1,264,000, while the smelter corporation demands repayment of $41,824 for 1917, $76,152 for 1918 and $47,511 for 1919. It is alleged that the State Tax Commission, sitting as a board of equalization, raised the valuations unconstitutionally after the tax rate for Gila County had been fixed by the county assessor and county board of equalization.

Utah Operators and Freight Officials Discuss Rates

Smelters Hit by Increase Effective on Outside Ores—Tonnage Decrease Caused

Mine operators of Utah, Nevada and California have been meeting in informal conference in Salt Lake City with freight officials of railroads carrying ores to the Utah smelters in regard to the matter of the increased rates on low-grade ores as ruled by the Interstate Commerce Commission. As has already been stated in these columns, the state public utilities commission of Utah has refused to allow the increase within the state, so that operators here are not materially affected. But the smelters are affected in the matter of ores coming from outside. It is felt that the 25 per cent increase granted will cause many properties to close down and others to curtail their output of low-grade ores. In Nevada there has been a revival of old producers, which are now adding to the tonnage of low-grade ores. Operators in Plumas County, Cal., according to representatives from that district, would have to close down almost entirely.

It was conceded that both smelters and railroads require tonnage to be able to maintain profitable operation. As none of the officials present were empowered to act, nothing was decided at the meeting, which was held in a friendly spirit. It is hoped, however, that the executives of the various railroads will consider the whole question in the near future.

Arizona Commercial Employees Take Short "Vacation"

A few days' "vacation" was recently taken by about 150 employees of the Arizona Commercial Mining Co. at Globe, Ariz., to enforce against Superintendent Plummer a demand that he cease to exercise authority in the employment of shift bosses, backing up the contention of a foreman that such authority was his own prerogative. When the foreman resigned, he was followed by the shift bosses and then by the miners, only the pump men remaining. The men went back to work after listening to a Federal mediator.

Pittsburgh Steel Basing Point Case To Be Re-heard

By a majority vote the Federal Trade Commission has granted motions filed with it for rehearing and re-argument in the matter of the application of the Western Association of Rolled Steel Consumers for the issuance of a complaint against U. S. Steel Corporation, et al., known as the "Pittsburgh Basing Point for Steel Prices" case. The commission has fixed Nov. 15, 1920, at 11 a.m. as the time for such rehearing and re-argument at the offices of the commission in Washington.

Inspiration Wins Long-Drawn-Out Damage Suit

Through a judgment of the U. S. Court of Appeals at San Francisco, reversing a verdict from the Federal court in Tucson, the New Cornelia Copper Co. finally is victor in one of the oddest cases ever known to mining litigation. On Nov. 27, 1918, a number of Mexican employees of the corporation built a fire to warm themselves while waiting for the time they should go to work. The fire was lighted against an old boiler, property of the company, but for some time unused. In the boiler was a quantity of dynamite stolen from the company hidden by thieves. There was resultant explosion of the powder, with consequent injury to the members of the group of men. The widow of Jesus Maria Ochoa, killed, sued for damages, after refusing an offer of settlement by the company, which, however, at no time assumed any degree of responsibility. In the lower court she was given $10,000. The appellate court fails to find where responsibility attached to the defendant for the explosion.

Quebec Asked To Found Radium Institute

The Faculty of Medicine of McGill University, Montreal, Que., has requested the provincial government of Quebec to found an Institute of Radium. The estimated cost is between four and five hundred thousand dollars, including the price of two grains of radium and the installation of a laboratory.

Recent Production Reports

Calumet & Hecla produced 7,520,107 lb. copper in August against 8,312,025 in July. Production by subsidiaries was as follows: Ahmeek, 1,608,200; Allouez, 49,200; C. & H., 4,259,566; Centennial, 0; Isle Royale, 791,351; La Salle, 0; Osceola, 647,629; Superior, 48,600, and White Pine, 115,361.

Burma Corporation produced 4,424,000 lb. refined lead and 243,340 oz. refined silver in August compared with 3,416,000 lb. refined lead and 190,070 oz. silver in July.

Chile Copper produced 10,640,000 lb. copper in August against 9,904,000 in July.

Kennecott Copper produced 11,268,000 lb. copper (including Braden's output) in August, compared with 10,656,000 in July.

Granby Con. M. S. & P. Co. produced 2,471,200 lb. copper in August compared with 2,400,000 in July.

Cie. du Boleo, Santa Rosalia, Baja California, produced 618,390 lb. of copper in August against 781,613 in July.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Wall Street Explosion To Be Studied by Bureau of Mines

Rice Confident TNT Was Not Used—Research Experiments Under Way

The Bureau of Mines has decided to make an exhaustive investigation of the explosion in front of the New York office of J. P. Morgan & Co. A preliminary investigation was made by George S. Rice, chief mining engineer of the Bureau, who happened to be in New York at the time of the explosion. C. E. Munroe, chief explosives chemist of the Bureau, and Spencer P. Howell, an explosives engineer, have been sent to New York to study the explosion. In this connection the Bureau is conducting experiments to determine the exact effect when explosives are detonated on a platform such as was formed by the wagon carrying the charge which wrought such devastation in Wall Street.

Mr. Rice, who made the preliminary examination for the Bureau of Mines, is of the opinion that the damage done by the explosion was equivalent to the destruction which would be caused by 50 lb. of dynamite, but he does not mean that dynamite was necessarily the explosive used in Wall Street. He feels practically certain that TNT was not used. Mr. Rice made observations of the effects of explosives in the battle area in France and was able to use that information in estimating the amount of explosive which had been used in Wall Street.

Iron Ores of North Carolina To Be Studied

Plans have been perfected for a co-operative agreement between the U. S. Bureau of Mines and the North Carolina Geological and Economic Survey to study problems pertaining to the marketing and treating of iron ores in North Carolina. The work will be confined to the magnetic iron ore fields, where it is believed improved methods will make possible a more extensive commercial exploitation of these ores.

Salary Question Still Unsettled in Bureau of Mines

Difficult To Hold Technical Employees at Present Pay—Resignations Continue

The rapid turnover among the technical employees of the U. S. Bureau of Mines is continuing. Officials of the Bureau are convinced that the salary scale must be advanced to practically that which was recommended by the Reclassification Commission. It is a matter of fact that with the recent increases which it has been necessary to pay laborers at the Bureau of Mines some of the laborers were being paid at a higher rate than the technical men engaged in the work.

Alaska has been without a mining inspector for a number of months because no properly qualified engineer will accept the position for $3,000, which is the statutory salary. After an investigation of the matter officials of the Bureau of Mines are of the opinion that the proper man cannot be secured for less than $4,800.

Vocational Board Training Men in Mining Engineering

The Federal Board for Vocational Education is training more than a hundred disabled ex-service men in mining engineering. These men have been enrolled at the following institutions: Harvard University, Huntington School (Boston), Columbia University, Carnegie Institute of Technology, Lafayette College, Lehigh University, Pennsylvania State College, University of Pittsburgh, University of West Virginia, Georgia School of Technology, Michigan School of Mines, Rolla School of Mines, Montana School of Mines, South Dakota School of Mines, Colorado School of Mines, New Mexico School of Mines, University of Utah, Stanford University, University of Arizona, University of California, University of Nevada, University of Washington, and El Paso School of Mines.

Geologic Work in Tropics Attended by Hardships

Government Engineers in Some Cases Loath To Undertake Such Trips for Private Interests

Formerly it was not difficult for private interests to make arrangements with Government geologists and engineers to make trips into Central and South America. Government agencies interested in mining and oil development rather encouraged the practice and extended leave freely for such trips because their technical employee would return with much information of value to his bureau. There has been no change of bureau policy in that connection, but so many of the men have met with physical misfortunes of one kind or another on these trips that it is becoming difficult to persuade the more experienced engineers to undertake such expeditions.

Geologic work in many tropical areas carries with it the greatest of hardships. Not only are the many animal and insect pests to be contended with but there is often the greatest difficulty in securing food which is at all palatable to those accustomed to an American diet. The worst feature of this type of work, however, is the probability of contracting disease. Among the engineers who have gone out from Washington, several on their return have had to fight stubborn cases of malaria and dysentery. There has been one serious case of blood poisoning, while another engineer has had his hearing affected by his stay in the very high altitudes of the Andes. Others have acquired hookworm to say nothing of those who have ringworm on their feet and legs and have had experience with the tropical type of chigger.

Industry Seeking Government Aid More Than Before

Government agencies in general are being called upon by the industries to a much greater extent than was the case before the war. The result of having maintained clearing houses for many industries in Washington during the war period has acquainted these industries with the advantages coming from such an exchange of information and has familiarized them, as never before, with the service the Government bureaus are prepared to render.

War Mineral Awards

Two claims carrying awards aggregating $5,909.53 were made by the War Minerals Relief Commission during the week ended Sept. 18. In the tungsten claim of Frank W. Griffin $5,837.03, which was 41 per cent of the amount claimed, was recommended. In the chrome claim of William S. Moulton $72.50 was recommended. The claim asks for reimbursement to the extent of $311.50.

Awards during the week ended Sept. 11 have been announced by the War Minerals Relief Commission as follows (The claimant, the mineral, the amount recommended, and its percentage relationship to the amount claimed are shown): Edward De Kruso, chrome, $838.60, 49 per cent; D. R. Ridge, chrome, $163.32, 69 per cent; J. J. Skeahan, chrome, $199, 39 per cent. In the claim of Hymer & Rufener an award of $752.19 had been allowed previously but on the presentation of additional evidence a further award of $2,987.61 has been allowed. In the claim of A. J. Schmidt an award of $2,085.19 had been made previously. An additional award of $90.23 has been allowed.

The case of David Taylor vs. Nevada Humboldt Tungsten Mines Co. was on trial before Judge Farrington of the Federal Court at Carson City, Nev., recently. The case involved two points, that of equity to the property and of money judgment. The property involved is the tungsten mines near Mill City which were sold some time ago to W. J. Loring and associates by L. A. Friedman and associates.

NEWS BY MINING DISTRICTS

MEXICO

Coahuila

The Mexican Coal & Coke Co., having its principal mines at Esperanzas, Coahuila, has asked a concession for the free importation of electrical material for the purpose of establishing a transmission line from Esperanzas to the fields at Palau, Coah., where extensive operations are to be started soon. The permission will be granted undoubtedly, with the usual restrictions. The northern coal fields have been pretty well freed recently of professional labor agitators and an increased output of both coal and coke is anticipated.

CANADA

British Columbia

Acute Labor Shortage Hampering Operations in West Kootenays—Claim Staking Activities Along Lardeau River

Sandon—With the exception of Silversmith, at Sandon, no Slocan property is today operating on a scale of magnitude. The Silversmith company, in the face of protests from other operators, made a peace with the "One Big Union" in the spring, and is now manned in large measure by members of that organization, which claims to be purely Canadian labor organization, in contradistinction to the International Union of Mine Mill Smelter Workers, successor to the A. F. of M. The Slocan strike situation has therefore resolved itself into a three-corned contest between the One Big Union on the one hand and the old International and majority of Slocan mine operators on the other. Summer conditions have favored the former, but it remains to be seen whether the strike can be maintained during the winter months. Signs are not lacking that the One Big Union is losing ground. But even if the strike was to be abandoned tomorrow it is unlikely that Slocan operations would be resumed on anything like the old time scale until next season. With the Silversmith maintaining a crew of about fifty or sixty

men, and an equal number divided between Noble Five, Bosun, Cunningham properties and a number of leasing syndicates, it can be readily appreciated how hard the blow is that has fallen on British Columbia's silver-lead producing area, when it is stated the average number engaged in metal mining operations in the Slocan district during the past four years has been approximately 800.

Rossland — Rossland camp, at one time British Columbia's leader in metal production, has between 300 and 400 men working in the various gold-copper properties of the Consolidated Mining & Smelting Co. of Canada. There does not appear to be a possibility of an immediate increase in operating forces, as Rossland, in common with other points, must face the labor shortage and all costs must be materially reduced before production of the bulk of Rossland ores could be maintained at a profit. Future developments must in a large measure depend upon the outcome of the Consolidated's plans with regard to construction of a large capacity concentrator, designed especially to treat the lower grade Rossland ores. Immediate construction of this plant, which is to be located not far from the big smelter works at Trail, will likely be held back by high construction costs, but should these break in the near future the carrying out of plans in this connection may be brought under way sooner than now appears possible.

Nelson—Nelson, the business metropolis of the Kootenays, and whose existence was initiated by the proximity of the old Silver King mine, can report mining activity in only one instance, this in connection with the California group, owned and operated by the California Mining Co., Ltd., and which early in the season began remodeling the Athabasca mill, with a view to treatment there of California ores. A few men are employed, with the mill running on a one-shift basis. Some 200 tons have been treated and results are reported as being encouraging. Some development is anticipated at the Perrier group, also close to Nelson, during the coming winter.

The Blue Bell, on Kootenay Lake, almost opposite Ainsworth camp, and the scene of the earliest operations in British Columbia lode mining, is working a crew of about twenty-five men in mine and mill, and treating a small tonnage of oxide lead ore found close to the surface. Up to three years ago this property maintained a crew of about 100 men, but an inrush of water flooded the lower workings, and until this spring, with exception of maintenance of shipment of crude oxides, the property was practically non-operative.

The Florence, on the opposite side of Kootenay Lake from the Blue Bell, maintains regular operations at both mine and mill. Aside from the Florence no operations of any magnitude are being maintained in Ainsworth camp, although lessees are working at the Krao and the Skyline. Some very high-grade silver shipments were made by the former during the summer.

Development on South Kork of Kaslo Creek continues to be maintained at Silver Bell, Silver Bear, Index, Revenue and Martin groups. These are all silver-lead properties. The Gibson, one of the most promising groups in that locality, continues inactive, due to litigation, and it is likely a receiver will be appointed to get things in shape so that creditors can be paid off. Cork-Province remains inactive, with no immediate possibility of resumption of operations. There is no doubt as to the possibilities of the property, but considerable expenditure must be made in underground development before it can rank as the really large producer expectations warrant.

Some measure of success has attended leasing operations, more particularly in the Slocan and Kaslo districts. A case in point is at the Whitewater, 17 miles from Kaslo, where about twenty-two men have been leasing for several years past.

Renewed activity in the staking of placer claims is reported from along the Lardeau River. The area is thought to have possibilities from a dredging standpoint. Operations of this sort have been already attempted, but failed because of lack of proper apparatus for handling of large boulders that line the river bed.

Ymir—Good progress is being made in opening the Yankee-Girl mine. Operations underground are proceeding satisfactorily. Considerable new development has been done and a substantial body of ore blocked out. John W. Shaw, superintendent, has left for Toronto, Ont., to submit a report to the Mining Corporation of Canada, which is behind the enterprise, and in the meantime A. W. Newberry, of New York, is in charge.

Ontario

Temiskaming Shareholders To Consider Proposed Purchase of Coal Lands

Cobalt—A special meeting of the shareholders of the Temiskaming has been called for Oct. 7 to consider the proposal to purchase from the McIntyre, of Porcupine, a half interest in the Blue Diamond Coal Mines, of Brule, Alta., and the Canadian Coalfields, Ltd., on the Hay River, Alta, recently taken over by the McIntyre.

The Cobalt-53 in the Gillies Limit has encountered high-grade ore in drifting at a depth of 60 ft.

Gowganda—The Reeves-Dobie has gone into the hands of a receiver and 213 bags of concentrates valued at about $100 a bag have been seized in course of shipment on a judgment against the company for wages.

A mining plant has been installed on the Silver Bullion property at Leroy Lake where a shaft is down about 50 ft.

Skead Township—A shaft is being put down by hand drilling on the Crawford Skead, which will be carried to the 100-ft. level on a vein varying from 2 to 6 ft. in width. Several other veins have been opened up on the surface. A three-drill compressor will be installed.

Special Australian Letter

Queensland

Lead-Silver Strike Made in 1918 Near Brisbane Proves Interesting

Brisbane—An occurrence of silver-lead ore accidentally discovered towards the end of 1918 in the outskirts of Brisbane is developing interesting features and proving very profitable at least to the holders of the property on which the find was made. The locale is a residential site on a hill in one of the most picturesque suburbs of Brisbane known by the aboriginal name of Indooroopilly, four miles from the centre of the city of Brisbane. The owner of an allotment of land on which he had built a cottage was digging a hole in which to plant a fruit tree when he came upon some material which a mining friend told him was silver-lead ore, some of which he had previously been using in the making of a rockery. Exploration, involving the removal of the cottage, was for a time carried out on a small scale, and up to the end of last year there had been sent to southern smelters more than 100 tons of selected ore averaging 100 oz. of silver per ton, the total recovery up to that time being over 10,000 oz. of silver besides 61 tons of lead. Ore of about the same quality has been taken out during the present year, but a strike at the smelting works has delayed treatment.

The government geologist, who has examined the locality, describes the ore, comprising earthy cerussite near the surface passing below into galena, as occurring in a brecciated schist. Many mining leases have been taken up in the vicinity; from the adjoining allotment five or six tons of high-grade ore have been bagged, and during the present year promising developments are taking place. Work on this adjoining property has shown the direction in which the ore-bearing breccia dips; and in another holding the silver-lead-bearing formation has been met and followed back on to the felsite dike—a discovery which is considered of great interest and probable importance.

A novel feature connected with this new mining center is that a company now holding several of the leases has called in the aid of a southern concern called the Electrical Mines Surveys Proprietary, Ltd., which has made a survey with improved apparatus and methods based on the Willinms and Daft system; and a map has been published showing the lodes indicated by the electrical survey.

Queensland mineral country certainly extends over a wide area. Silver and lead are being mined a little way from the southern (New South Wales) border near Stanthorpe, about 200 miles south of Indooroopilly, and also in the Cairns hinterland, over a thousand miles to the north.

In the Stanthorpe district is situated the Jiblenibar arsenic mine, one of a number of state enterprises upon which the present government has entered. There are many occurrences of arsenic in this state, but at pre-war prices it

did not pay to work them. The prickly-pear pest, which is overrunning the pastoral and agricultural areas of Queensland, can be held in check alone by the use of arsenic, and only profitably when this poison can be obtained at a low price. War-time rates made it quite prohibitive, and to meet the difficulty the government are now mining and treating arsenic ore at their own mine, and selling it to settlers for pear destruction at £10 per ton, when the market price is about £60. The mine is developing well, and is already turning out over 50 tons per month, the product of 11 per cent ore. It is now proposed to increase the capacity of the works, and consequently the output. A privately owned mine in the same district has produced, besides tin and copper, about 10 tons of arsenic, valued at £400, per month.

MICHIGAN

Showing Good in Arcadian's New Baltic Shaft—White Pine Not Closed Down

Houghton—The management of Arcadian Consolidated is very enthusiastic over the showing in the New Baltic shaft. On the 600-ft. level of this shaft the New Arcadian lode has been opened for about 24 ft. in the crosscut and the mineralization is even better than in the upper levels.

The New Baltic shaft will be sunk about 300 ft. further and the vein explored every 100 ft. The 900-ft. level drift will be driven to meet the same level in the New Arcadian shaft. These shafts are about 4,000 ft. apart and this long drift will explore the vein in good shape.

The management proposes to make good progress in this development during the coming winter.

The ore being removed from Ahmeek No. 2 shaft continues very rich. The crosscut at the 16th level on the famous Ahmeek fissure vein continues to open up rich mass copper. In the No. 3 shaft the grade of ore shows no change from the average maintained by this part of the mine. No. 4 shaft continues to open up richer ore with depth.

The White Pine, a subsidiary of the Calumet & Hecla, was reported as closed down some time ago. This is not so, as it is still producing a small amount of copper and silver with a working force of about 700 men, which is but a nucleus of their former organization. The decreased labor supply has been particularly hard on these smaller properties, situated so far from the centers of population in this district.

Menominee Range

Cleveland-Cliffs Takes Over Wickwire Lease on Virgil

Iron River—The Cleveland-Cliffs Iron Co. has taken over the lease of the Virgil mine from the Wickwire Mining Co. The mine has been idle for several years but is to be reopened and developed extensively. The shaft is down 300 ft. It is likely that the mine will be worked in conjunction with the Spies, which adjoins on the east. The latter is also a Cleveland-Cliffs property and is getting out ore at present. There is a strong demand for the non-bessemer ores of the Iron River district this season and it is believed that the demand will continue next year.

Marquette Range

Captain Fay To Prospect Western End of the Range

Ishpeming—Captain M. F. Fay, a well-known Duluth mining man, has secured a lease on iron lands in the vicinity of Humboldt, on the western Marquette Range, and is to explore for ore. He expects to start several drills at work at an early date. The only mine now operating in the western part of the range is the Republic, a producer of high-grade hard ores.

No announcement has been made as yet by Henry Ford as to whether or not he will reopen the Imperial mine at Michigamme, which contains a large tonnage of limonite ore. Mr. Ford came into possession of this property when he purchased the holdings of the Michigan Land & Iron Co. from an English syndicate. The Imperial has a steel headframe and other equipment in place and it would not be a great task to unwater the workings, which are quite shallow. There is one other known ore deposit on the Ford lands, in the village of Alpha, on the Menominee Range, but no development work has been done there. Considerable territory remains to be explored.

MINNESOTA

Improving Great Northern Docks on Allouez Bay

Duluth—Total shipments of iron ore from the Lake Superior docks up to Sept. 1 were 35,349,874 gross tons, as compared with a total shipment of 29,598,048 on the same date last year, an increase of 19.43 per cent. It is estimated that upward of 60,000,000 tons have been contracted for shipment this season, but it is now doubtful if it will be possible to get this amount of ore down the Lakes before close of navigation. There has been great delay to boats at the lower end of the lakes, owing to car shortage at Lake Erie ports, and it is stated that many boats will not be able to fulfill their season's contracts.

Work has been begun on improvements and additions to the Great Northern ore docks on Allouez Bay, which it is estimated will cost $800,000. Peppard & Fulton, of Superior, have been awarded a contract for wrecking and rebuilding the outer end of No. 3 dock and building approach to No. 1 dock. In the reconstruction of No. 3 dock there will be required 7,500,000 ft. of timber, 70,000 lin.ft. of piling, and 1,245 tons of structural steel; 166 spout hoists will be installed and operated by electricity throughout.

Cuyuna Range

Development of Maroco Property Started—Feigh Mine Stockpiling

Trommald—Active development work has been begun on the Maroco property, leased last winter by the Marquette Ore Co., of the E. N. Breitung interests, from the North Range Iron Co. Stripping of overburden was recently started and is proceeding at an average rate of 5,000 cu.yd. per day. The overburden is shallow, ranging from 45 to 55 ft. in depth, and is being removed by hydraulic methods, using pressure giants and sand pumps. An inclined shaft has been completed to the 210-ft. level and will serve for hoisting ore from future pit. A half-unit washing plant is being completed at the property for treating a large portion of the orebody, which is a fair grade non-Bessemer iron ore. An Allis-Chalmers trommel screen, log washer, and turbo are to be installed. Provision made for later installation of tables if early results show advisability of so doing.

The Merritt Development Co. reports the production of 200 tons of high-grade manganiferous iron ore daily from the No. 4 shaft of Merritt mines. The operators have sold 22,000 tons for this season's shipment, manganese to average better than 20 per cent. Stockpile at No. 1 shaft will be shipped this year, and operations may be resumed underground at the No. 1. It has also been reported that Merritt Development Co. is considering taking over a lease on the Ferro mine property, adjoining the Merritt No. 4 orebody on the west.

Ironton—Held up by lack of boats and dock space the Feigh mine has been forced to stockpile its ore for the past two weeks, and the operators report that they do not expect relief for another week. Concrete foundations have been placed for new boiler and hoist house, 47 x 76 ft., and new change house, 33 x 56 ft. An engine generator set will be transferred from the Carpenter mine, Crystal Falls, for auxiliary power.

Coates & Tweed will start construction on a large combined engine-repair, blacksmith, and carpenter shops, at their Hillcrst open pit mine.

The Mahnomen Mining Co. have started driving exploratory drift south from east end of Mahnomen mine pit to crosscut ore formation on the old Mangan No. 2 mine property, taken over last winter from the Mangan Co.

ILLINOIS

Strike Affects Many Properties in Fluorspar District

Elizabethtown—There is a strike on at the Rosiclare Fluorspar & Lead Co.'s mines, also at Fairview Fluorspar & Lead Co., and the Hill Side Mines. All of these mines are located near Rosiclare, Ill., and about three miles from Elizabethtown, Ill. There has been no trouble and no agreement has been reached. There was a strike at Rosiclare and Fairview about four years ago; guns and ammunition was shipped in and a fight followed, the operators then winning.

Fairview and Rosiclare are operating with a very small force of men and are keeping water out and mining a small amount of ore.

The Hill Side mines are a new concern, located on the Rosiclare vein and not yet doing actual mining. They are erecting one of the finest and largest plants ever placed in the fluorspar country. All work is at a standstill.

The Indiana Fluorspar Co., who are operating a diamond drill in their main shaft, recently lost the drill and are now sinking a small shaft to recover the tools. They have shipped very little ore this year.

The Superior Fluorspar Co. near Hicks and north of Elizabethtown, Ill., are running full blast, and are sinking another shaft. They have just purchased another hoisting engine for this purpose. Considerable high-grade ore has been shipped, and several hundred tons are on the dump and in bins, all being sold.

The Diamond Fluorspar Co., near Karbers Ridge, Ill., are operating with a small force of men. They have shipped three barges of high-grade fluorspar recently and are not effected by the strike.

The Spar Mountain Co., of Cave-in-Rock, Ill., have now about an 8-ft. blanket of ore. They are operating both at the mine and mill and are shipping considerable ore of both medium and low grades.

Several of the mines in and about here are closed on account of poor labor and bad conditions in general. Some have been closed for about a year. The mines are about the only means of employment in this section and men have nothing else to work at. This has not been a union section. The miners at Rosiclare and Fairview recently organized and at once made demands on the companies, which were turned down. The strike followed.

SOUTH DAKOTA

Iron Hill Tunnel Cuts Old Workings—Rescue Car No. 5 at Lead

Deadwood—The tunnel that has been driven for the last two years to tap the old workings of the Iron Hill mine in the Carbonate district has been completed. The old workings were cut at a depth of 300 ft. and the entire mine has been drained and exploration of the once famous silver property started. Active development work will be continued.

Lead—U. S. Bureau of Mines Rescue Car No. 5 in charge of B. W. Dyer, engineer, has arrived in the Black Hills and will spend two weeks giving instructions in first-aid and mine-rescue work.

Galena—Work has been resumed at the mine of the New Silver Queen company under the direction of Robert Scholt and regular shipments of lead-silver ores will be made to the smelter. Electric lines are being extended to the mine and the entire equipment will be electrified. Several shipments of high-grade lead silver ores were sent to the smelter early in the year. Production is expected to increase as the installation work is completed.

UTAH

Tintic Standard Explains Passing of Dividend

Salt Lake City—The Cardiff is shipping up to 65 tons of ore daily and expects to add to this tonnage as soon as some of the lower workings have been unwatered.

Eureka—Tintic shipments for the week ended Sept. 17 amounted to 147 cars.

The North Standard is continuing shaft sinking, working two shifts. The shaft is expected to reach the 800-level in six weeks.

A statement issued by Tintic Standard officials explains the passing of the quarterly dividend for the quarter just ended as having been due to making the final payment for the new railroad and to paying 60 per cent of the cost of the mill now being constructed, the total amount paid out amounting to about $360,000. The working force is stated to have been for the last three months 60 per cent of what was required. A dividend is promised at Christmas, after production has been speeded up by the addition of workmen available at the end of the harvest season. It is further stated that development has been hampered by lack of labor, and that some work, such as the sinking of the proposed new shaft, has been given up for the present. Development in general, however, is well ahead of production.

American Fork—The American Consolidated, a merger of the old Bog and Earl-Eagle properties, has taken a bond and lease on the Silver Dipper, lying above the Bog in American Fork Canyon.

Bingham Canyon—The Utah Consolidated is completing its new machine shop and the new change rooms for the men. Grading and concreting for the company's new concentrator in Pine Cañon near the International smelter is being done with a large working force.

IDAHO

The Cœur d'Alene District

Bryan Strike Continues Interesting—Federal Seeks Writ in Star Case

Wallace—The Imperial Mining Co. is starting to raise 700 ft. from the lower tunnel to connect with a winze sunk 50 ft. from the upper tunnel. This winze has been sunk on the vein that shows several feet of ore that assays as high as 6 per cent lead. The lower tunnel, which is 4,200 ft. long, was run with the expectation of cutting this ore body, but failed to do so after two crosscuts had been run aggregating 500 ft. The raise is expected to give a line on the course of the ore and permit its development on the lower level.

The strike on the Bryan, reported several weeks ago, continues to be the center of much interest. Since the discovery was made the ore has been crosscut 15 ft., showing continuous lead-silver ore of good milling grade, some of which will pay to ship crude.

PORTAL OF IRON HILL TUNNEL, DEADWOOD, S. D.

Control of the Bryan is owned by E. R. Day, of Wallace. The minority interest is owned by Charles Burns, also of Wallace, who was preparing to work the property under lease. The Bryan is located in the East Cœur d'Alene district, about five miles from Saltese, Montana. Development will now proceed with every indication that the property will prove up well.

The Sunset mine is being unwatered as a means of entering the West Sunset, formerly known as the Portland group, which is now owned by the West Sunset Mining Company, of which the Days are the controlling factors. The Sunset and West Sunset have a common end line, from which the Sunset shaft is about 250 ft. This shaft has been sunk vertically 800 ft., from which levels have been run both east and west, showing up much low-grade lead-silver and zinc ore. The Sunset is owned by Senator W. A. Clark, of Butte, from whom the Days have secured permission to enter the West

Sunset through the Sunset shaft. The purpose of the Days is understood to be merely to take advantage of this means of investigating the orebodies of the West Sunset at a greater depth than has been obtained by tunnel, and if the showing justifies to drive a deep tunnel for a permanent outlet from some point on Beaver Creek, which will give a depth of 2,000 ft. or more. With the mine unwatered it is believed that the Days will give it a thorough inspection with the view to purchasing and consolidating it with the West Sunset.

The final step in the apex litigation between the Star Mining Company and the Federal Mining & Smelting Company has been taken by the Federal. Having had its application for a rehearing denied by the court of appeals at San Francisco, Federal has now appealed to the Supreme Court of the United States for a writ of certiorari.

MONTANA

Philipsburg District Actively Producing Manganese Ore

Butte—Successful extraction of lead values from residue from the electrolytic zinc plant at Great Falls is proceeding at an old copper stack remodeled to meet the necessities of lead reduction. Fifty tons of residue daily are being treated, but with the success attending the venture it is deemed likely that the tonnage will be increased.

Philipsburg—More than one thousand men are engaged in the production of manganese and silver ore here at the present time. A good sale is being had for all high-grade manganese. Of interest is the fact that Montana is leading the nation in the production of manganese, with the Philipsburg district in the van in the state.

Scratch Gravel District—Reorganization of the Scratch Gravel Gold is under way and it is expected to resume operations within several weeks. The property is located about three miles northwest of Helena.

Comet District—Operations will soon be resumed at the Comet mine, near Wickes, Mont., with a new treatment process for the complex silver-zinc ores.

Libby District—The Lukens-Hazel power plant will be in operation within a few days and it will be possible shortly to begin milling operations.

WASHINGTON

Power Shortage Hampers Work in Oroville-Nighthawk District

Nighthawk—Mining activity in the Oroville-Nighthawk district is being seriously hampered by power shortage. The Similkameen Power Co., which furnishes power to the mines of the district, is building a large power dam across the Similkameen River and planned to furnish additional power by May, 1921. Failure of delivery of the large water wheel for the plant has held up the work and it will be several months before the power will be ready for the mining companies. The new 75-ton mill for the Ruby mine is fully completed and will be put in operation as soon as power can be secured.

At the Kaaba mine the southern extension of the vein is being explored from the 200-ft. level; this work is adding appreciably to reserves.

The Four Metals Co. have sunk a vertical shaft 100 ft. on the Shamrock vein which they encountered in a 30-ft. drift from the bottom of the shaft. On the Alice vein, owned by the same company, a 135-ft. incline shaft has been sunk on the vein and from the bottom of this shaft drifts are being extended to develop a tonnage of ore sufficient to warrant erection of a mill.

OREGON

War Eagle Company, at Gold Hill, To Erect Quicksilver Furnace — Gold Quartz Discovered Above Oakridge

Gates—The storeroom, cook and bunk houses at the North Queen gold property in the Quartzville mining district, southwest of Gates, was recently burned, the loss being about $4,000. The property is owned and operated by A. M. Hammer and John McChesney, Albany, Oregon.

Oakridge—A vein of gold-bearing quartz was recently discovered in the upper Willamette River country, twenty-six miles above Oakridge, where gold has never been found before. The find has caused the usual excitement at Eugene, the nearest shipping point.

Gold Hill—The Chisholm quicksilver mine in the Gold Hill district, which has been closed for several months, has resumed with a small crew. It is equipped with a 12-pipe furnace. Negotiations are still under way for its sale. The prospective purchasers talk of erecting a Scott furnace of large capacity. The War Eagle Mining Co., owners of adjoining property, are assembling material and equipment on the ground to erect a furnace of this type. This will be completed within sixty days. Their present equipment consists of several 12-pipe furnaces.

CALIFORNIA

Reinmiller Claims at Engelmine Being Surveyed

Engelmine—George W. Lloyd and Charles J. Worden have a contract to survey the fifty-six claims owned by the Reinmiller Copper Mines Co. and are now engaged in the work. The claims extend for three miles and include sites for a reduction plant and sawmill. The road to the portal of the tunnel that is to be driven is now being graded and a boiler and compressor will soon be installed. John Reinmiller, president of the company, was in charge of the Engels from 1915 to 1919, when it was developed from a prospect to a dividend-paying mine.

M. H. McKelvey, superintendent, is planning to start driving a tunnel which will cut at about 1,000 ft. depth the big mineralized area on the Plumas Copper King mine, adjoining the Superior mine of the Engels Co. on the south.

NEVADA

Commissary in Tonopah and Divide Districts Cuts Living Cost

Tonopah—In the Tonopah district there is a shortage of skilled miners in the larger mines. Wages are high and living conditions excellent, and the healthy condition of the camp in general is indicated by the ever increasing number of houses that are being moved into town from Goldfield. The commissary established by the companies of the Tonopah and Divide districts is operating successfully and has cut living costs about 20 per cent. The volume of business handled is direct evidence of appreciation by the workmen of these districts.

The Tonopah Mining Co. shipped 1,500 tons last week, which is normal tonnage for the present time. In the Silver Top section of the mine ore is being broken in stopes near the surface, and development and stoping is being done on the Mizpah fault vein, the MacNamara vein and the Mizpah vein with good results.

The Tonopah Belmont mine is producing about 350 tons of ore per day, and in addition the mill is handling an irregular tonnage of custom ore from various parts of the district. No new developments of importance are reported with regular development work being performed from the 700, 800, 900, 1,000, 1,100, and 1,200 levels on several veins.

West End shipments for the last week were about 1,400 tons. Development work was accomplished on the 500, 600, and 800 levels on the West End, Footwall and Ohio veins with normal results.

The Tonopah Extension report shipment of 1,750 tons of ore for last week which is a little higher than usual for the past few months. Sinking of the Victor shaft is progressing satisfactorily and the water flow is being handled with little trouble. Development work was done in the Victor, McCane and No. 2 shaft sections of the mine on different levels, with no discoveries reported.

Divide—In the Tonopah-Divide mine stations on the 800 and 1,000 levels are complete and crosscutting is to be started in a few days. On the upper levels development faces are reported to be looking exceptionally well and a considerable portion of the regular ore shipments is coming from development. On the 165 level the vein is being crosscut at three points about fifty feet apart in ore. Other work on the 270, 375, 480 and 575 levels was done, the majority being reported as being in ore of milling grade.

Pioche—The Pioche Metals Mining Co. recently leased their Point property to Arthur Reall and associates of Pioche. Operations have been started.

The Victoria Nevada recommenced sinking their main working shaft Sept. 10. The shaft at present is 165 ft. deep and will be put down to the 200 ft. point before further drifting is done.

Everett Wade of Salt Lake City, Utah, has taken a lease from the Bristol

Silver Mines Company on the May-Day mine at Bristol.

William Willoughby and Cy Thomas are operating in the Zero territory and are taking out good silver-lead ore. Returns on their last car netted about $500.

At the Deerfoot mine recent prospecting has shown up a promising new orebody which should yield considerable ore of shipping grade. Average assays across the body show 30 oz. in silver, which is the principal value. The Deerfoot is credited with a production of 385 tons during the last eight months.

Arthur Reall, of Pioche, has started operations with a small force of men at the Telephone mine. Recent examination of the underground workings has demonstrated the presence of a body of lead-silver ore which can be opened up with a small amount of development.

The Prince Consolidated is shipping at present over 5,000 tons per month and has produced from Jan. 1, 1920, to date the large total of 36,151 tons. The ore is of the usual fluxing grade, 75 per cent of the total tonnage being derived from the prolific Davidson bed and the remainder being mined from the big bed of the Prince. Arrangement will shortly be completed for resuming sinking of the main shaft to the lower beds. A pleasing improvement is being noticed in the greater efficiency of the underground labor employed. Production is being maintained with fewer men, who are showing a spirit of loyalty to the company which insures economy of operation.

The Virginia-Louise is doing a large amount of development work and the orebodies are proving to be of greater extent than anticipated and well up to average grade. A large tonnage is being shipped and with an improving lead market the product is bringing a satisfactory return.

The Pioche Silver Corporation, whose property adjoins the Virginia-Louise Mining Co. to the south, is planning a development campaign to pick up the extension of the Virginia-Louise ore beds. It is expected that operations will be started in the next sixty days. Charles Lee Horsey is president.

Uncertainty of the application of the new freight rate caused a slight decrease in the tonnage shipped.

Construction work is proceeding at the Southern Nevada mill, which is next to the Pioche R.R. depot. It is expected the plant will be in operation within the next two months. Delay in delivery of some of the essential equipment has entailed much hardship on the management. When completed this plant will treat the milling ores now available in the properties of the Pioche Mines Co., and such other ores as are suitable to the flow sheet.

Como—As a result of a recent boost in the cost of electric power, the high cost of labor and mining supplies, together with discovery of theft of bullion from the mill, Gurney Gordon, manager of the Como Consolidated, has decided to shut that property down for the present at least. The pumps will be pulled.

Tybo—The furnace at the Tybo smelter has been shut down temporarily, as Fred W. Draper, manager found it impossible to get enough miners to produce on a scale that would keep the furnace going and to do development work. He is planning to cut down the size of the furnace, but before doing so wishes to see if the approach of cold weather will not improve the labor situation. The mill is running steadily three shifts and about eight tons of $100 concentrates are shipped daily.

Piermont—A hydro-electric plant for power and lighting is being installed at the Piermont mine in Spring Valley, White Pine County.

Tule Canyon—W. J. Loring, manager of the Silver Hills company, has decided to let leases on the company's property in Tule Canyon, 40 miles southwest of Goldfield.

Jean—The directors of the Christmas Consolidated mine, which is located nine miles southwest of Jean, recently engaged Henry M. Adkinson, a geologist of Salt Lake City, to examine their property and outline a program of development. Mr. Adkinson suggested that the production might be increased by leasing the old workings where much high-grade ore is still to be mined. Special attention was paid to the vanadium deposits which have been uncovered at the Christmas mine and, following Mr. Adkinson's complete report, it is planned to enter upon an active development campaign.

Battle Mountain—Eight sets of lessees are at work on the property of the Maysville Consolidated, 15 miles south of Battle Mountain, and all are said to be in silver ore of shipping grade. Rollins & Williams shipped a carload from their lease in August which ran better than $200 per ton.

Copper Basin—Frank B. Keever is operating the Bentley mine at Copper Basin, south of Battle Mountain, under bond and lease. He is reported to have developed considerable $35 to $40 ore and ships what is taken out in development.

Pyramid Lake—The Nevada Western Gold & Silver Mining Co. are preparing for active operations on their property near Pyramid Lake and have bought a hoist, a Chicago Pneumatic compressor and a Cochise drill from the Western Engineering Co., of Reno. H. W. Dawes is general manager.

Leadville—The mill at the Leadville mine, 40 miles north of Gerlach, which was developed by Johnny Harnan, is again being remodeled and a flotation system is being installed.

Contact—Ed Gray is developing a property at the copper camp of Contact. Contact will be on the line of the proposed railroad from Twin Falls, Idaho, to Wells, Nev., the actual building of which is expected to begin shortly.

ARIZONA

C. D. Ridgeway Takes Over Arabia Mine in Mohave County

Stockton Hill—The C. O. D. shaft has reached the 400-ft. level where station and skip pocket are being cut. The first carload of machinery for the new mill arrived in Kingman on Sept. 15. This shipment included crusher, rolls and ball mill. Hauling to the mine and installation is under way.

The I. X. L. has installed a larger compressor and a contract has been let for sinking the shaft another 100 ft. The new auto road to Berry on the main line is now in use.

Mineral Park—The Golden Star has made a 50-ton test shipment to the smelter of ore recently cut. The ore, while extremely high grade in spots, is variable. Results from this shipment will determine average values.

Chloride—The Pay Roll crew are making good progress in cleaning up and retimbering the shaft. It is hoped that conditions will permit resumption of sinking in the near future.

The Hidden Treasure has added a night shift. Drifting continues along the main vein and a good grade of milling ore is being opened up.

The Dardanelles shaft is now down 175 ft. Hard rock and pumping problems delayed progress during August. It is hoped that crosscutting for the vein on the 200 level will be under way soon after Oct. 1.

The Arabia mine in the Union Pass district has been taken over by C. D. Ridgeway and associates. The mine camp is being overhauled. Grading for new hoisting equipment at the old shaft is under way. The workings will be unwatered and an underground crew put to work as rapidly as possible.

Paradise—The Cochise Mineral Mines Co. have driven their main tunnel 700 ft. Several veins showing upon the surface have been cut so far showing good values in lead-silver. A good vein of manganese has also been cut. H. D. Buford is general manager in charge.

NEW MEXICO

Octo at Lordsburg Cuts Sulphide Vein at 300 Level

Lordsburg—The Octo has cut a strong vein in copper sulphides carrying some red oxides at 170 ft. east of the main shaft on the 300-ft. level, which so far shows a width of 5 ft. with the opposite wall not yet struck. This is the deepest ore showing on what may be termed the north side of the district and confirms favorable surface indications. Fred C. Semmek is manager.

Exploration work on the lead-silver veins on the Monte Rica property is showing excellent results. The veins are strong and the values well disseminated. Tentative arrangements have been made with Virginia parties that may lead to the erection of a mill, which would be well justified by the mineral showings. Lawrence Boyd is manager.

THE MARKET REPORT

Daily Prices of Metals in New York

Sept.	Copper Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N Y	Lead St L	Zinc St L
23	17.90@18.35	41.50	43.50@43.75	7.25@8.00	7.65	7.60@7.70
24	17.80@18.25	41.25	43.50@43.75	7.25@8.00	7.65	7.60@7.75
25	17.75@18.20	41.25	43.25@43.50	7.25@8.00	7.65	7.60
27	17.75@18.15	41.75	43.25@43.75	7.15@8.00	7.65	7.55@7.60
28	17.75@18.10	41.75	43.00@43.50	7.15@8.00	7.65	7.50
29	17.75@18.00	41.50	42.75@43.25	7.15@7.75	7.50	7.45@7.50

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Sept.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
23	96⅛	97⅛	112	268¾	273¾	34⅞	35	41	42⅛
24	95¾	97⅛	112	268¾	274	34⅝	35	40⅞	41¾
25	....	....	....	....	....	....	....	....	....
27	95⅛	96⅛	113	271	276½	34⅞	35	41½	42
28	93⅜	94⅞	113	271⅜	276¾	35	34¾	41⅛	42⅛
29	94	95	113	268½	274½	34⅞	34¾	40¾	41¼

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Sept.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
23	349⅜	99½	94	59⅞	27	349	99½	93	59⅛
24	347½	99½	93	59⅜	28	349⅜	99½	93	59⅝
25	347	99½	93	59½	29	348¼	99½	92¼	59⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Sept. 29, 1920

The industrial reaction which has been such a pronounced feature of the last week's news has not been without its influence on the metal market. Practically all buying except on a hand-to-mouth basis has ceased. Consumers are looking for lower prices on everything, and the fact that many metal prices are already at or below the cost of production is considered no argument why the market should not drop further. The tone of the producers and selling agencies is hopeful, but in almost all instances large tonnages would be sold at markedly cut prices if buyers could be found. The prompt market is quiet, but demand for forward delivery is absolutely dead.

Copper

The larger producers have apparently decided that the time has come when it will no longer be advisable to continue production without selling, and are willing to meet the market half way. No one is now asking more than 18½c., delivered, and this price has to be shaded to attract even small business.

Some electrolytic copper has been sold for export, and the London price has advanced. Five thousand tons of December copper was offered at 18c., delivered, late last week, but found no takers. Many normal buyers of copper whose business is good are not in the market, because they are using scrap metal, large stocks of which continue to be available. Rumors of a pronounced cut in the price of copper sheets have been heard, the normal differential of 3 to 4c. from the price of unfinished forms having been considerably exceeded in recent months.

Lead

Last Thursday the A. S. & R. reduced its contract price from 8⅛ to 8c., New York, and a further reduction to 7¾c. was made today. This should tend to cut off foreign importations, which continue unabated. Imported lead on the dock here was offered late last week at 7.75@7.50c., and early this week at 7.40c. Prompt shipment from Germany is offered at 7c., duty paid. The tone in the Middle West is also easier. Many cancellations and postponed deliveries are being requested, and producers who have been turning away inquirers for the last few months are now scurrying after business. Spot lead continues in fairly active demand for small lots, and quick deliveries obtain a slight premium over our quoted prices.

Zinc

A fair demand has existed, but only at decreased prices. With the freer movement of sheets, demand from galvanizers was expected, but it has not come. Apparently the only galvanizing business demanding zinc is that of wire. One large producer predicts 7c. zinc in the near future. This would of course mean that production would be curtailed, but this would be offset by the absence of export demand, which has been normally about 8,000 tons per month.

Tin

Consumers are being advised to buy a supply of tin at current low prices, as dealers predict an upward tendency soon. Whether the wish is father to the thought remains to be seen. Anyway, the market continues very dull. Some small sales of electrolytic have been made at or fractionally under the price of spot Straits. Producers of high-grade 99 per cent are not willing to sell at present prices.

Straits tin for future delivery: Sept. 23d, 44.25@44.75c.; 24th, 44.50@44.75c.; 25th, 44.25@44.50c.; 27th, 44.25@44.50c.; 28th, 44@44.50c.; 29th, 44.00c.

Arrivals of tin in long tons: Sept. 22d, London, 25; 27th, London, 225; Singapore, 450.

Silver

The silver market remains quiet and dull, with small purchases for China account. India, however, continues to keep out as a buyer. The London quotation today is 59½d., with the market reported sentimentally weaker on the Indian government ceasing to sell sterling drafts on London. Purchases of silver to date by the U. S. Government under the Pittman Act amount to about 16,000,000 oz.

Mexican Dollars—Sept 23d, 71⅞; 24th, 71; 25th, 71; 27th, 71; 28th, 71; 29th, 70¼.

Gold

Gold in London on Sept. 23d, 117s. 6d; 24th, 117s. 9d.; 27th, 117s. 11d.; 28th, 117s. 11d.; 29th, 117s. 9d. Correction: Gold on Sept. 15th, 118s. 6d. instead of 117s. 4d.

Foreign Exchange

The market for European exchange has been very thin, and on that account fairly wide fluctuations during a day's trading are not particularly significant. No important changes have taken place in the last week. On Tuesday, Sept. 28, francs were 6.71c.; lire, 4.19c.; and marks, 1.63c. New York funds in Montreal, 10⅝ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 35c.; 98@99 per cent, 34.8c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Spot metal, 7¼@7½c. per lb. Cookson's "C" grade, 12½c. Chinese and Japanese brands, 7¼@7½c. W. C. C. brand, 9@9½c. Chinese needle antimony, lump, firm at 7½c. per lb. Standard powdered needle antimony (200 mesh), 11½c. per lb. Market dull.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots. Market quiet.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady. Probably no change before Jan. 1.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60. Market probably firm for some time.

Iridium—Nominal, $350@$400 per oz. Heavy demand, but small supplies.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100@$110 per oz.

Platinum—Firm at $115 per oz.

Quicksilver—Market quiet; $75 per 75-lb. flask. San Francisco wires $75. Unchanged.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture. Ores of very low silica content suitable for the manufacture of aluminum oxide and hydrate of alumina command a fancy price.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 70@80c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore—65@75c. per unit, seaport; chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 70@75c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots, against recent price of 65@70c.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, 85, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—$90@$100 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Sept. 25—Zinc blende, per ton, high, $48.55; basis 60 per cent zinc, premium, $45; Prime Western, $15; fines and slimes, $42.50@$40; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $46.15; calamine, $38.27; all zinc ores, $46.09.

Lead, high, $101.15; basis 80 per cent lead, $90@$80. Average settling price, all grades of lead, $94.09 per ton.

Shipments for the week: Blende, 11,560; calamine, 81; lead, 2,030 tons. Value all ores the week, $727,590.

Shipments for nine months: Blende, 430,516; calamine, 7,312; lead, 67,598 tons. Value all ores nine months, $28,164,660. The shipment is 72,223 tons blende and 13,676 tons lead excess over last year, with calamine 2,798 tons less.

Reports from the smelting area south and west indicate more labor trouble early in October.

Lead prices have dropped $32.50 per ton in three weeks. A number of mines have made profit principally from lead sales, and this extraordinary decline will put some of them below the profit line.

Platteville, Wis., Sept. 25—Blende, basis 60 per cent zinc, $49.50 base for high-grade. Lead ore, basis 80 per cent lead, $90 per ton. Shipments for the week: Blende, 1,311; calamine, 30; lead, 40 tons. Shipments for the year: Blende, 51,326; calamine, 2,429; lead, 4,248; sulphur ore, 1,241 tons. Shipped during the week to separating plants, 2,871 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,400@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15 all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $80@$35, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@

[1]Furnished by Coote Mineral Co., Philadelphia, Pa.

$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75, No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $100@$150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 4@5c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses. Tennessee production sold up months ahead.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 in less quantities, including bags.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $2.25 @$2.50 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $175@$180, freight allowed; last half, $170; English, $170@$175, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $80@$85, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.50@$3 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, 90c.@$1.05 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $6.50@$9.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire, 22½@23c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26⅜c.; sheathing, 25⅜c.; rods, 8 to 3 in., 23⅜c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Brick—$100@$110 per net ton, carload lots, eastern points; 9-in. straights, f.o.b. Baltimore, $100@$105.

Clay Brick—First-quality fire clay, f.o.b. New Jersey, $75 per 1,000; second quality, 9-in. straights, f.o.b. Pennsylvania, Ohio and Kentucky works, $50@ $55.

Magnesite Brick — 9-in. straights, f.o.b. Baltimore, $110@$120 per net ton.

Silica Brick—9-in., per 1,000, $65@ $70, Chicago district; $65 Mount Union, Pa.

Iron Trade Review

Pittsburgh, Sept. 28, 1920

Though transportation conditions as affecting the steel industry have been improving as a whole, there are fluctuations from week to week and not a few bad spots. The accumulations of steel at mills have been reduced at least two-thirds, perhaps more, from the high point, and as this reduction has occurred almost wholly within the last four or six weeks, while production has at the same time increased, deliveries of steel have been much heavier. This by itself would account largely for the extreme stagnation in the steel market, but of course there are contributing influences, including the feeling that prices of many commodities are going to decline, while the rate of actual steel consumption is likely to decrease materially before it increases again.

The steel industry is not perturbed by the reduction in automobile prices that has occurred, and resents the conclusion reached in some uninformed quarters that reductions in steel prices will be necessitated thereby. Automobiles sell at 50c. to $1 and more per pound, not all the weight being steel, and the Steel Corporation or Industrial Board prices range from 2.35c. a pound on bars to 5c. to 7c. on special grades, such as cold-rolled strip, special finished sheets, and like forms. Fancy prices 10c. or higher applied only on small tonnages, and, moreover, disappeared some time ago.

Buyers are still taking deliveries freely in most lines of steel, and the mills still see full operation ahead, though for an uncertain period of time. Prices show little change, except that delivery premiums continue to decrease.

Pig Iron—The market is absolutely stagnant, with practically no inquiry for either prompt or forward. Prices are nominal, based on last sales: Bessemer and basic, $48.50; foundry and malleable, $50, f.o.b. Valley furnaces, with $1.96 freight to Pittsburgh.

Steel—Market inactive. Last sales of sheet bars, $65, Pittsburgh. Nominal mill quotation on billets, $60, with resale lots offered at $58 or less.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16@$16.50; foundry, $17@$18.

COMPANY REPORTS

Broken Hill Proprietary Co. Shows Profit

Lead, Zinc, Iron; Australia

The report of the Broken Hill Proprietary Co. for the year ended May 31 states that the net profit amounts to £517,663. The sum of £377,614 has been expended on plant at the steel works, and £500,000 was transferred from profit and loss to reserve, which now stands at £1,065,000, leaving a credit balance of £528,943. Liquid assets total £971,560, exclusive of 200,000 shares in the Broken Hill Associated Smelters Proprietary and 720 shares in Zinc Producers' Association. Outstanding debentures total £748,100, and the credit balance of the sinking fund is £11,622. Owing to the shortage of coastal shipping, the steamship "Iron Prince" and steamship "Iron Baron" were purchased at a cost of £275,000. Owing to a strike at Broken Hill which occurred on May 5, 1919, and which still continues, no productive work was carried on. A conference has just begun at Sydney, and the directors are hopeful that a settlement will be reached.

Maritime troubles extending over eighteen weeks were responsible for much dislocation of the operations at the Newcastle works, resulting in diminished output and increased costs of production. The rod mill is giving excellent results. The works of John Lysaght, Ltd., for the manufacture of corrugated plain galvanized and black steel sheets, should be ready to start operations next month. Rylands, Ltd., are starting works for the manufacture of wire netting and similar products, and have entered into arrangements to take raw material from the company. Further iron-ore leases in close proximity to the Iron Knob tramway have been secured from the government of South Australia, comprising a total of 560 acres, and are now being opened. The two large blast furnaces produced jointly 169,409 tons of pig iron. The foundry furnace produced 1,730 tons of pig iron, 12 tons of spiegel, and 1,271 tons of ferromanganese. Pig iron sold totals 39,677 tons. The openhearth furnaces produced 166,772 tons of steel, the blooming mill 151,681 tons, the 28-in. mill 73,667 tons (including 54,200 tons rails), the 18-in. mill 60,760 tons, the 12-in. mill and 8-in. mill 21,816 tons, and the rod mill 23,011 tons. An additional blast furnace with a daily capacity of 500 tons is being erected with necessary coke ovens.

Las Dos Estrellas Mining Co.

Gold-Silver; Michoacan, Mexico

The annual report of Las Dos Estrellas Mining Co. for the year 1919 states that the production of gold amounted to 3,451.52 kg. and that silver production amounted to 42,307.6 kg. The average price obtained for silver during the year was $1.1216 per oz.

The average cost of all operations, including development work, was 11.55 pesos per dry metric ton. Total operating costs, including development work, amounted to 4,236,751.37 pesos. The net income from operations was 3,369,247 pesos. Dividends paid in 1919 amounted to 763,145.08 pesos, making a total of 34,682,411.89 pesos distributed to the end of 1919. The original capitalization of company was 300,000 pesos, which was refunded to shareholders in 1909. The 1919 production was 366,820 dry metric tons, of an average content of 10.2 grams gold and 168 grams silver per ton. Recovery of metals amounted to 20,783 pesos per ton. The various reserve funds of the company at the end of 1919 amounted to practically six and a half million pesos, whereas there was additionally voted the sum of 500,000 pesos for the purpose of investigating new mining properties.

Tincroft Mines, Ltd., an Example of High Tin Production Costs

Tin; Cornwall, England

The report of the Tincroft Mines, Ltd., operating in the Cornwall tin area of Great Britain for the first half of the present year, shows a loss of £2,435 17s. 5d. The directors call attention to the serious situation of the industry in stating that "at the date of the last meeting in February the price of tin was £380, and a small profit was being made. A fall of more than £150 per ton caused the gravest anxiety to all engaged in the industry, and although prices have improved somewhat of late, it is unreasonable to expect any industry to succeed with its product fetching only 25 to 40 per cent above pre-war levels, while coal, power, and other operating charges average 200 per cent higher. . . .

"Owing to existing prices, practically all development has had to be suspended, despite the fact that at the bottom of the mine a good section of ground is only waiting the necessary funds in order to be opened up."

September Mining Dividends

The following is a partial list of dividends paid by mining companies during September, 1920:

U. S. Mining and Metallurgical Companies	Situation	Per Share	Totals
Ahmeek Mining, c	Mich.	$0.50Q	$100,000.00
American Smelting & Refining	U. S. & Mex.	1.00Q	609,980.00
American Smelting & Refining, pfd.	U. S. & Mex.	1.75Q	875,000.00
Calumet & Arizona Mining, c	Ariz.	1.00Q	642,520.00
Chino Copper	N. Mex.	.37½Q	326,242.50
Consolidated Interstate Callahan, z.l.	Idaho	.5CQ	161,651.50
Copper Range Co.	Mich.	.50Q	200,000.00
Daly-West Mining	Utah	.25Q	62,500.00
Federal Mining & Smelting, pfd.	Idaho	1.75Q	209,757.00
Golden Cycle, g	Col.	02K	30,000.00
Hecla Mining, ls	Idaho	15Q	150,000.00
Iron Cap Copper Co.	Ariz.	.25K	35,526.50
Judge Mining and Smelting	Utah	.12½Q	60,000.00
Kennecott Copper	Alaska	.50QX	1,393,530.00
Nevada Consolidated Copper	Nev	.25Q	499,864.25
Oroville Dredging, g	Cal. & Mex.	9d.Q	£25,745.175
Ray Consolidated Copper	Ariz.	$0.25Q	$394,294.50
St. Joseph Lead	Mo.	.50Q(a)	704,734.00
Utah Copper	Utah	1.50Q	2,436,735.00

(a) Further stock dividend of one share to each ten shares held, ex Sept. 27.

Canadian, Mexican, Central and South American Companies	Situation	Per Share	Totals
Cerro de Pasco Copper	Peru	$1.00Q	$898,229.00
Hollinger Consol. Gold	Ont.	.05X	240,000.00
McIntyre Porcupine, s	Ont.	.05Q	182,014.15
Mexico Mines of El Oro, g.s	Mex.	4 sh.Q	£30,000.000
Mining Corporation of Canada, s.	Ont.	$0.12½Q	$207,506.25
Pato Mines, Ltd., g	Colombia	3½sh. Q	£17,500.00
Holding Companies			
Yukon-Alaska Trust		1.00Q	203,433.00

Q, quarterly; K, semi-annual; X, includes an extra dividend

Isle Royale, of Michigan, voted to pay no dividend at this time owing to production costs and the relatively low market price of copper. The company's last dividend was 50c., paid in September, 1919. Cresson Consolidated also passed its dividend, owing to low grade of ore being mined. Iron Cap Copper Co., however, was feeling easier and declared its first common stock dividend since February, 1919, when it stopped paying 25c. monthly; and Golden Cycle Mining & Refining Co. also resumed, after omitting three monthly payments.

National Lead Co. paid its regular quarterly dividends of 1¾ per cent on the common and 1¾ per cent on the preferred shares.

MINING STOCKS

Week Ended September 25, 1920

Stock	Exch	High	Low	Last	Last Div.		
COPPER							
Adventure	Boston			*50			
Ahmeek	Boston	58	57½	58	Sept '20, Q		50
Alaska-B.C	N. Y. Curb	1	1	1			
Alliouez	Boston	23	23	23	Mar. '19,	1	00
Anaconda	N. Y.	55⅛	51⅞	52⅜	Aug. '20, Q	1	00
Ariz. Com'l	Boston	10	10	10	Oct. '18,		50
Big Ledge	N. Y. Curb	⅜	7/16	⅜			
Bingham Mines	Boston	9	9	9	Sept. '19, Q		25
Calumet & Ariz	Boston	57½	56	56½	Sept '20, Q	1	00
Calumet & Hecla	Boston	235	285	285	June '20, Q	5	00
Canada Copper	N. Y. Curb	7/16	⅜	7/16			
Centennial	Boston	10⅛	10	10	Dec. '18, SA	1	00
Cerro de Pasco	N. Y.	45⅛	41	41½	Sept. '20, Q	1	00
Chief Consol	Boston Curb	4	3⅛	4	Feb. '20, Q		10
Chile Copper	N. Y.	15⅛	14⅛	14⅛			
Chino	N. Y.	29½	26⅛	26½	Sept. '20, Q	37½	
Columbus Rexall	Salt Lake	*38	*36½	*37½			
Con. Ariz	N. Y. Curb			½	Dec. '18, Q		05
Con. Copper M	N. Y. Curb			2½			
Copper Range	Boston	36½	35⅛	35⅝	Sept. '20, Q		50
Crystal Copper	Boston Curb	*41	*38	*40			
Davis-Daly	Boston	8⅛	8⅛	8⅛	Mar. '20, Q		25
East Butte	Boston	11⅛	10⅜	10⅜	Dec '19, A		50
First Nat'l	Boston Curb	*85	*70	*80	Feb '19, SA		15
Franklin	Boston	2⅛	2⅛	2⅛			
Gadsden Copper	N. Y. Curb			*70			
Granby Consol	N. Y.	35⅛	35⅛	35⅛	May '19, Q	1	25
Greene-Cananea	N. Y.	28⅛	27⅛	28⅜	Aug. '20, Q		50
Hancock	Boston			4⅛			
Houghton	Boston Curb			*40			
Howe Sound	N. Y. Curb	3⅛	3⅛	3⅛	July '20, Q		05
Inspiration Con	N. Y.	49¼	44¼	45⅛	July '20, Q	1	00
Iron Cap	Boston Curb			9	Sept. '20, K		25
Isle Royale	Boston	28	27	27⅜	Sept. '19, SA		50
Kennecott	N. Y.	26	24⅜	24⅛	Sept. '20, Q		50
Keweenaw	Boston	1⅜	1⅛	1⅜			
Lake Copper	Boston			3½			
La Salle	Boston	2⅛	2⅛	2⅛			
Magma Chief	N. Y. Curb			*21			
Magma Copper	N. Y. Curb			17	Jan. '19, Q		50
Majestic	Boston Curb	*18	*12	*18			
Mason Valley	Boston			1⅛			
Mass. Con	Boston	3⅛	3⅛	3⅛	Nov. '17, Q	1	00
Mayflower-O.C	Boston	6⅛	5⅞	5⅞			
Miami	N. Y.	20⅛	19⅛	19⅞	Aug. '20, Q		50
Michigan	Boston			3⅛			
Mohawk	Boston	60	58	58	Aug. '20, Q	1	50
Mother Lode (new)	N. Y. Curb	5⅛	5¼	5⅛			
Nevada Con	N. Y.	13⅛	12	12	Sept. '20, Q		25
New Arcadian	Boston			21			
New Baltic	Boston Curb			3			
New Cornelia	Boston	18⅛	18¼	18⅛	Aug. '20,		25
Nixon Nev	N. Y. Curb			*9			
North Butte	Boston	17	13	15	Oct. '18, Q		25
North Lake	Boston			⅛			
Ohio Copper	N. Y. Curb			1⅞			
Oilbway	Boston			1½			
Old Dominion	Boston	25	24⅛	25	Dec. '18, Q	1	00
Osceola	Boston			39½	June '20, Q		50
Phelps Dodge	Open Mar.	†210	†180		July '20, Q	2	50
Quincy	Boston	48⅛	46	47⅛	Sept. '20, Q	1	00
Ray Con	N. Y.	16⅛	15	15	June '20, Q		25
Ray Hercules	Boston Curb			*62			
St. Mary's M. L	Boston	40	38	38	June '20, K	2	00
Seneca	Boston	15⅛	15	15			
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q		25
Shattuck Ariz	N. Y.	9	8⅛	9	Jan. '20, Q		25
South Lake	Boston			2			
South Utah	Boston	*26	*20	*20			
Superior	Boston			4⅛	Apr. '17,	1	00
Superior & Boston	Boston	4	3⅛	3⅛			
Tenn. C. & C	N. Y.	10¼	9⅜	10	May '18, I	1	00
Tuolumne	Boston	*60	*55	*55	May '13,		10
United Verde Ex	Boston Curb	32	30⅛	30⅛	Aug. '20, Q		50
Utah Con	Boston	7⅛	7⅛	7⅛	Sept. '18,		25
Utah Copper	N. Y.	66⅛	61⅞	62	Sept. '20, Q	1	50
Utah M. & T	Boston	1⅛	1⅛	1⅛	Dec. '17,		30
Victoria	Boston	2	2	2			
Winona	Boston	*35	*35	*35			
Wolverine	Boston	13⅛	13⅛	13⅛	Jan. '20, Q		50
LEAD							
Hecla	N. Y. Curb	4⅛	4⅛	4⅛	Sept '20, QN		15
St. Joseph Lead	N. Y.	16⅛	16⅛	16⅛	Sept '20, QN		50
Stewart	Boston Curb			*13	Dec. '15,		05
Utah Apex	Boston	1⅞	1⅞	1¼	Nov. '18,		25
ZINC							
Am. Z. L. & S	N. Y.	13⅛	12⅛	12⅜	May '17,	1	00
Am. Z. L. & S. pf	N. Y.			46½	Aug. '20, Q	1	50
Butte C. & Z	N. Y.	7⅛	7	7⅛	June '18, I		50
Butte & Superior	N. Y.	20⅛	18⅛	18⅜	Sept. '17,	1	25
Con. Interst. Cal	N. Y.	10	9	9	June '20, Q		50
New Jersey Z	N. Y. Curb	179	177	178⅛	Aug. '20, Q	4	00
Success	N. Y. Curb	*4⅛	*3⅛	*4⅛	July '16,		03
Yellow Pine	Los Angeles			*95	June '20, Q		03

Stock	Exch.	High	Low	Last	Last Div.		
GOLD							
Alaska Gold	N. Y.	1⅛	1⅛	1⅛			
Alaska Juneau	N. Y.	1⅜	1⅛	1⅛			
Carson Hill	N. Y. Curb	25	24¼	24⅛			
Cresson Consol. G	N. Y. Curb			1	June '20, Q		10
Dome Ex	Toronto	*40⅛	*37	*40			
Dome Mines	N. Y.	11⅛	11	11⅛	July '20, Q		25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept '20, Q		02
Goldfield Con	N. Y. Curb.	*10	*9	*9¼	Dec. '19,		05
Hedley	Boston			*4½	June '19,		10
Hollinger Con.	Toronto	5 98	5 77	5 77	Sept '20, X		05
Homestake	N. Y.	47½	46	46	Sept '19,		50
Kirkland Lake	Toronto	*49	*48½	*49			
Lake Shore	Toronto	1 13	1 10	1 11	Oct. '19,		02½
McIntyre-Porcupine	Toronto	2 07	2 04	2 05	Sept '20, K		05
Porcupine Crown	Toronto	*25	*22½	*25	July '17,		03
Portland	Colo. Sprgs.	‡		*60	July '20, Q		01½
Reorgan. Booth	N. Y. Curb.	6	4	6	May '19,		05
Silver Pick	N. Y. Curb.	*6	*5	*5½			
Teck Hughes	Toronto	*8	*7	*8			
Tom Reed	Los Angeles	1.02	*97½	*98	Dec. '19,		02
United Eastern	N. Y. Curb	3½	2⅝	3	Apr. '20, Q		21
Vindicator Consol	Colo. Sprgs.	‡		*18	Jan. '20, Q		01
West Dome Consol	Toronto	*6⅞	*6	*6½			
White Caps Min	N. Y. Curb	*9⅛	*8	*8			
Yukon Gold	Boston Curb	1⅛	1⅛	1⅛	June '18,		02½
SILVER							
Arizona Silver	Boston Curb	*21	*15	*20	Apr. '20, M		03
Beaver Con	Toronto	*41	*37½	*41	May '20, K		03
Conigas	Toronto			2 55	Aug. '20, Q		12½
Crown Reserve	Toronto	*27	*27	*27	Jan. '17,		05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Sept '19,	1	00
La Rose	Toronto	*34⅛	*33⅓	*33⅛	Apr. '18,		02
McKinley-Dar	N. Y. Curb.			*55	July '20, Q		03
Mining Corp	Toronto	1 79	1.70	1 75	Sept '20, Q		12½
Nipissing	N. Y. Curb	10	9⅜	9⅜	July '20, Q		25
Ontario Silver	N. Y.	5⅛	5⅛	5⅛	Jan. '19, Q		50
Ophir Silver	N. Y. Curb.	1	½	½	Jan. '12,		10
Peterson Lake	Toronto	*15	*14½	*15	Jan. '17,		01½
Temiskaming	Toronto	*34	*33⅓	*34	Jan. '20, K		04
Trethewey	Toronto	*27½	*23	*26½	Jan. '19,		05
GOLD AND SILVER							
Atlanta	N. Y. Curb.	*2	*1⅛	*1⅛			
Barnes-King	Butte	‡		1.11	Aug. '20, Q		05
Bost. & Mont.	Boston			*63			
Cashboy	N. Y. Curb.	*9½	*8	*8½			
El Salvador	N. Y. Curb.	1⅛	¾	1	Aug. '18, SA		07
Jim Butler	N. Y. Curb.	*16	*14	*15	June '16,		05
Jumbo Extension	N. Y. Curb.	*13	*7½	*9½			
Louisiana Con	N. Y. Curb.	⅛	⅛	⅛			
MacNamara M	N. Y. Curb.			¼	May '10,		02½
N.Y. Hond. Rosar	Open Mar.	†13	†11		July '20, QX		50
Tonopah-Belmont	N. Y. Curb.	1⅛	1 1/16	1⅛	Jan '20, Q		05
Tonopah-Divide	N. Y. Curb.	2 1/16	1⅛	1⅛			
Tonopah Ex	N. Y. Curb.	1⅛	1 1/16	1⅛	July '20, Q		05
Tonopah Mining	N. Y. Curb.	1⅛	1 1/16	1 1/16	Oct. '19, SA		15
West End Con	N. Y. Curb.	1⅛	1⅛	1⅛	Dec. '19 SA		05
SILVER-LEAD							
Caledonia	N. Y. Curb.	*21	*17	*19	July, '20, M		01
Consol. M. & S	Montreal	25⅛	24⅛	24⅛	July '20, Q		62½
Daly Mining	Salt Lake			2 40	July '20, Q		10
Daly-West	Boston			4⅛	Sept. '20, Q		25
Eagle & Blue Bell	Boston Curb	2 1/16	2 1/16	2 1/16	Apr. '20, Q		10
Electric Point	Spokane			*30	May '20, SA		03
Fed. M. & S	N. Y.	12	12	12	Jan. '09,	1	50
Fed. M. & S. pf	N. Y.	35½	33⅓	33⅓	Sept. '20, Q	1	75
Florence Silver	Spokane			*35	Apr. '16,		01¼
Grand Central	Salt Lake			*37½	June '20, K		03
Iron Blossom	N. Y. Curb.			1	Apr. '20, Q		02½
Judge M. & S	Salt Lake			3.97½	Sept. '20, Q		12½
Marsh Mines	N. Y. Curb.	*17	*14	*15			
Prince Consol	N. Y. Curb.	⅜	⅜	⅜	Nov. '17,		02½
Rambler-Cariboo	Spokane	*12	*12	*12	Feb. '19,		01
Rex Con	N. Y. Curb.	*6⅜	*6	*6¼			
South Heela	Salt Lake	*94	*86	*90	Sept. '19, K		15
Stand. S. L	N. Y. Curb.			¼	Oct. '17,		05
Tannrack-Custer	Spokane	2 38	2 30	2.30	Dec. '19, K		03
Tintic Standard	Salt Lake	3 02½	2.52½	2 90	June '20, Q		10
Wilbert	N. Y. Curb.	*5	*3⅛	*4⅛	Nov. '17,		01
NICKEL-COPPER							
Internat'l Nickel	N. Y.	20⅛	18⅛	18⅞	Mar. '19,		50
Internat'l Nick.pf	N. Y.			80⅛	Aug. '20, Q	1	50
QUICKSILVER							
New Idria	Boston			5	Jan. '19,		25
TUNGSTEN							
Mojave Tungsten	Boston Curb	*14	*8	*10			
VANADIUM							
Vanadium Corp.	N. Y.	71⅞	65⅛	68	July '20, Q	1	50
ASBESTOS							
Asbestos Corp	Montreal	100	90	95	July '20, Q	1	50
Asbestos Corp. pf	Montreal	107	100	100⅛	July '20, Q	1	75
MINING SMELTING AND REFINING							
Am. S. & R	N. Y.	64⅛	59⅜	60⅜	Sept '20, Q	1	00
Am. S. & R.pf	N. Y.	92	90	90	Sept '20, Q	1	75
Am. Sm. pf A	N. Y.	74⅛	74⅛	74⅛	July '20, Q	1	50
U. S. Sm. R. & M	N. Y.	59⅜	54⅛	57	July '20, Q	1	50
U.S.S.R.& M. pf	Boston	44⅜	42⅛	42⅛	July '20, Q		87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial X, includes extra

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
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Volume 110 New York, October 9, 1920 *Number* 15

The Gospel of Manual Work

A CORRESPONDENT from Japan charges the Japanese engineers with having a training that is entirely mental, and one in which the manual experience which we in America regard as necessary and complementary is omitted. If this is true, it means that Japan is following out the European handicap, instead of conforming to the practice which has put the United States foremost in engineering and industry—the good old gospel of the two-fisted.

The development of the human hand by evolution has enabled man—otherwise a clumsy animal—to perform an infinite variety of work, and so eventually to shape all nature to his uses. Mental culture followed manual accomplishment, and this relation is so deeply ingrained that education will always be best accomplished along these lines. For this reason, American education, and specifically American mining engineers, have always found that the best engineers were produced from those who began with manual education and kept it up while their mental development was proceeding.

If we want to teach a student a principle of chemistry, an experiment which he performs himself will accomplish at once what repeated memorizing of results obtained by some one else's manipulation will never achieve. The student of agriculture who reads agricultural books exclusively, without putting his hand to the plow and the pruning knife, is, as is well known, wasting his time. If we must choose between the exclusive education through practice and that exclusively through study, we shall always wisely choose the former—hence the general respect in which the "practical" man is held.

There is something deeper than efficiency in this. The sulks of the old world are based upon the friction between these two classes—that consisting of the knights of the horny palm, too often ignorant and improperly developed mentally, and the lily-white palms of the class who are seeking to stultify their heritage by avoiding contact between their hands and the world. In the United States, the general high standard of education makes it the rule rather than the exception that the man who specializes in his hands is as well educated and fundamentally as well poised as the great clerical or white-collar class, who labor mainly with their brains. It also is common that the latter class are quite competent manually, and have passed through an excellent course in the use of their muscles.

The American idea, is, therefore, for an engineer to have personally become competent in the manual work which he has to direct, and be able to take the place of any man under him and show him how his work is to be done. Thereby he incidentally earns the subordinate's respect and loyalty, instead of his antagonism.

Manhood respects manhood. How many of our mining engineers have been trained in the manual craft of mining? We believe that the large majority will qualify. At any rate, it is our universal creed; and we recommend it to Europe and Japan, as not only a technical and an industrial, but a sociological remedy. Thus, we shall become leader and follower—which is an arrangement bred in the heart of human nature—rather than capital and labor. Many of those who in this country, fed full and daft with Old-World ideas, seek to rouse "labor" against the citizen in general, are themselves of the lily-fingered Old-World variety and unacquainted with that healthy manual craft and exercise which go to make the best type of man!

"Passing the Buck"

THERE is in a Western city a sign which has attracted our attention and which made a sufficient impression at the time to be readily recalled. It is:

> Try Murphy's famous drink!
> With beans, roll and frankfurter.
> All for 10c.

An economic lesson is back of the placard and its commercial fulfillment. The individual making this liberal plea to the wayfarer had to made a readjustment in his affairs when prohibition swept the country. Murphy did not strike. Murphy did not starve himself to death. On the contrary, he figured out an acceptable ration; cut his profit to a narrow margin; had his placard painted by some hungry sign painter, no doubt, and went out for business.

Though we don't know Murphy we like his courage and applaud his ingenuity. In sharp contrast is the attitude of some mine workers. A case in point is the strike which is now on at Virginia City, Nev. On Sept. 5, the miners, disregarding their agreements to give the operators the customary thirty days' notice, walked out and signified their willingness to walk back if the ruling wage was increased $1 per day. The operators pointed out their inability to meet this increase, owing to the fact that the properties under their control were not making expenses or were in the preliminary stages of development. They offered to meet the men more than half way. One company offered the men employment on a contract basis which proved sufficiently acceptable to some of the miners to cause them to return to work. The Gold Hill Miners' Union promptly interfered, and work stopped. The operators also, as a group, offered the miners a substantial reduction in living costs by giving them the privilege of buying any of the commodities carried in stock at their general merchandise store at a price 20 per cent below present wholesale prices and thus bring living costs to the level existing in 1919. At latest accounts this has not proved acceptable. In fact, it was indignantly spurned.

Every one has suffered from the high cost of living. "Passing the buck" has been resorted to until the "buck" has been worn out. The Virginia City and Gold Hill miners have passed the "buck" onto the operators in expectation that the operators would pass said buck on to the stockholders. We are glad that the operators in

question, with one exception, refused to go to their stockholders for further increases.

The situation has its critical phases. The stockholders, unless they are different from other men, will not go on indefinitely putting their money into unprofitable enterprises. Operation on the Comstock is dependent upon excellent management and economical operation. At best the profit margins are low, and unless active co-operation is secured from the workers the operations cannot be successful.

We feel that if the workers would attack their own difficulties in the same spirit as the individual whom we have quoted in the beginning of this editorial, there would be measurably less difficulty and more opportunity for work. After all, opportunity for work is one of the greatest blessings that comes to mankind. Anything that destroys that opportunity will eventually reduce the prosperity of a community.

"Passing the buck" has not brought a solution of our economic problem. It will not solve the problem for the miners of the Comstock. Only the spirit of active co-operation and the desire to make individual readjustment can do this.

Bolshevism at Home and Abroad

THE Red Terror at the moment is the most important question on Earth; and, therefore, the one that we first have to consider in looking ahead for business and making our plans for mining. We must look at events dispassionately, and neither tilt back in our rocking chairs in a fool's fancied security, nor be stampeded by a few despicable terrorists. Will our governments and our existing social and financial systems be overthrown? It seemed unbelievable for Russia, yet the thing is done. Italian workmen recently confiscated industrial plants on a wholesale scale, held them uncontested, and only delivered them back for a substantial consideration. In England, the labor organizations frankly support the Russian Reds, and are exerting themselves, with considerable success, to align England with the Bolshevists, through the pussy-footing policy of Lloyd George.

What of the United States? It is our opinion that the danger is past; that the test came last year when the various strikes were declared, to paralyze industry, and failed. American organized labor considered attentively the Red Dragon which had crept into its councils, and cast it out wholeheartedly. Greater intelligence and more widespread education achieved their victory, and common sense took secure possession of workman, farmer, and merchant. If some of us criticise at times some of the attitudes of organized labor, let us not forget to be grateful that it stood between the liberty of our country and the radical, and really made America "safe for democracy." Laying prejudice aside, it would be hard to find a more trenchant and intelligent verdict as to Bolshevism than that repeatedly delivered by American "labor":

"We are living in the Republic of the United States of America, a country by no means perfect, in which, all too frequently, injustice is done. But it is a republic based upon the principles of freedom, justice, and universal suffrage. Our men and women are not likely to throw these rights and principles into the scrap heap for the dictatorship of Moscow's Lenine and Trotzky."

Who shall deny the writer or writers of a proclamation like this a place among American statesmen? There is no ruffling of the surface by details like the anarchistic expulsion of the Socialistic members from the New York Legislature, for it is known and understood that those violators of constitutional freedom who committed the expulsion have been adequately condemned by American public opinion. So much for the safety of the United States then, and radical plotters may set off their bombs and commit their sporadic crimes without long getting even the attention of the respectable citizen.

We note, however, that these insensate doctrines and wild acts are more likely to appeal to the ignorant. The few plotters in our country are largely foreigners, and in countries where the masses are ignorant this get-rich-quick scheme of Lenine's gathers in millions of suckers. Accordingly, we note also the relative success among the Italian and the British workmen, and the failure to make much impression in the Scandinavian countries, Germany, Holland, Belgium and France.

We of the mining profession will, therefore, do well, while concluding that the United States and Canada are fundamentally sound, to consider Mexico, where the years of revolution have not eliminated the difficulties, where the mass of the population is ignorant and foot loose, and where a throttling agrarian system not dissimilar to that existing under Imperial Russia still offers a problem that none of the temporary governments have dared to attack. Lenine's propagandists and spies, working under disadvantage in the United States, have easier sledding in Mexico. Already, we understand, the province of Yucatan is in the hands of the Communists; and they revelled in incendiary public speeches the other day in Mexico City and hoisted the Communist flag without being disturbed. Among the practical suggestions offered by the orators were the construction of barricades in the streets, the sacking of food shops, and the dynamiting of the Archbishop's palace. Truly, when you cross a Russian Bolshevist with a Mexican, you get a fearsome hybrid, a sort of hippopotato.

Another suggestion, to which we are totally opposed, was the erection in the Central Plaza of a guillotine for all journalists. As a mark of our disapproval, we shall postpone the tour of investigation of Mexico which we had planned. Surely, dear Brotherhood, not *all* journalists? There are some we could mention that it might not hurt to guillotine—we doubt if they would realize it anyhow—but there are others of finer mould who are sensitive to a thing like that. And consider the inefficiency—a whole guillotine for half a dozen measly journalists—surely an extravagance; but if you would chop up the guillotine into safety razors it would go much further, and the beneficial effects might be more universal.

Art in Mine-Building Construction

SINCE the inception of mining, the primary thought of the mine operator has been the winning of the ore from the earth. He has followed, in most cases, a well-thought-out plan whereby the margin of profit would be such as to compensate for the effort; he has enlarged upon his scale of operations as the conditions permitted, and in general pursued the course adopted by those engaging in any line of industry.

Consider for the moment the case of a successful operator, a company which has reached a point where its continuance is assured and the policies that have been followed are such that no unsurmountable handicaps stand in the way of advancement. The employees receive broad and liberal treatment, the plants and methods represent the most modern ideas, and the entire organization is a credit to the originators and to the

community. Such a concern exerts a potent influence on other mining companies, and the latter, to a considerable extent, must conform in their ideals to those already established by their contemporary.

For many years little thought was given by mine operators to anything but the business of mining—of getting out the ore, of preparing it for treatment and for the market. Methods were studied and advances in practice were made, and the business was judged purely from the standpoint of mechanical production. Later came the development of an idea which at first appealed to some as being too "élite" for such a vigorous pursuit as mining. "Human engineering," we have pleased to call it, and although the term is somewhat general, it is now fairly well understood and covers a vast amount of work which is being done by all progressive mining companies. The benefits of such welfare work cannot be computed on a dollars-and-cents basis, but that it is a paying proposition is admitted, and further proof is clearly shown by the fact that the movement is growing.

Under this general head comes the construction and improvement of mine buildings with a view to their greater utility and economy. Shall we not go further and include beauty? The artistic mission architecture at Ajo, Ariz., is a convincing example of the utility of beauty; likewise the Cliffs shafthouse at Ishpeming, Mich., and the Quincy hoist house in the copper country. Certainly, if a building is a makeshift or an eyesore, the structure offends us and does not add to our sense of well-being; therefore, a well-planned design can be considered as a part of the general welfare work.

Permanent mine-plant construction requires stability, but does this imply ugliness? How frequently we notice at mine plants that the buildings are solidly constructed, but with absolutely no thought given to general appearance. Need this be so? We are told that stresses, strains, and other functions of the walls and roof eliminate any possibility of securing an artistic effect. But we don't believe it, and one has only to look about in many of the mining districts today to see that the old order is changing and an attempt is being made to discard the earlier types of engine and shafthouses and other mine buildings, and to adopt those designs which are pleasing to the eye. Such ideas are characteristic of the successful company—the builders of standards and those who exert influence.

Who Suffers from Increased Freight Rates?

WHEN you make a big strike or a new hoisting metal sellers, particularly in the East, were kept busy determining just how much the advances would amount to per pound of metal sold. It was rightly pointed out that the changed rates would affect not only delivery charges, which in the case of copper, are paid by the seller, but also would make it more expensive to bring the unrefined metals East, and would increase the cost of materials and equipment necessary to smelt the ores. The total extra cost was of course almost impossible to estimate but it was variously figured at from one-half to one cent per pound of metal sold. Selling agencies considered it no more than right that consumers should stand this expense. This, however, was not to be. Had any producers added even half a cent to their previous prices for copper, for example, they would not have sold a pound. Lead also, owing to importations from Europe, had begun to show an easier tendency before the freight rates took effect. In a buyer's market small possibility existed of marking up prices to offset increased costs no matter how definite or how plausible the reason may have been.

The only alternative, if the smelting and refining companies were not to suffer the loss, was to charge the ore producers more for smelting; or what amounts to the same thing, deduct a certain sum from the quoted price of metals on which settlements are made. This is what has been done by some of the companies. One quarter of a cent is being deducted from the quoted price of lead and copper and one cent from the price of silver. This may or may not be an equitable figure; at any rate it will help to recompense the smelting companies for the increased charges, which, by the way, should be more than offset at no distant date, by the improvement in transportation service which should result.

There remains the poor producer with no one on whom to pass the advance. He cannot say to the miner, "I get less for my concentrates, so you will get 50c. less a day." If he did, the ore would not be mined. As a result of the decreased profits rumors of shutdowns are prevalent, for many small producers were running close to the line. We would urge, however, that the small producer take heart. Prices in many lines are definitely falling and it is almost certain that it will cost him gradually less to operate. His products, however, are not likely to decrease in value, with the possible exception of lead. If he can break even this fall, or can afford to lose a little, it will pay him, we think, to carry on.

Just as You Write to Bill

WHEN you make a big strike or a new hoisting record you enjoy sitting down and writing friend Bill about it. No stilted style nor long letter is required. You simply put down the plain facts in every-day language that Bill will understand. Under the same circumstances, why not do the same thing with those thousands of other engineers who are interested in you and your work and with whom you should be constantly in touch for mutual assistance? New technical developments, minor improvements in method, little devices that mean large savings—all should soon become the property of the profession as a whole, that by mutual helpfulness the entire industry may profit.

You can write about these things just as you would in a letter to your best friend. There is no need of formal style nor literary elegance. Perhaps the most valuable report will be the one which least resembles the classical literature of the essayist.

What your friends want is a clear, simple, and, above all, short description of what you did and why; what you accomplished and what it will save, in either money, time or inconvenience. If you will bear in mind your duty thus to pass on your achievements, you can count upon your fellow-workers to do their share for you in return.

E. & M. J. Index

THE INDEX for Vol. 109 of the *Engineering and Mining Journal* is now ready for distribution and will be mailed only to those who request it. Those who wish a copy of the Index, are requested to send for it promptly. A postcard will do.

WHAT OTHERS THINK

Anarchy in Siberia

As an American mining engineer and constant reader of the *Engineering and Mining Journal* and, moreover, as an engineer of long and intimate experience in Siberia, I feel it my duty to write you this letter on the subject of Bolshevist propaganda. Please accept my assurance that I am writing in no captious spirit, and that I am animated only by the desire that a leading professional publication should not be misled on a vital subject, and thereby, through its authoritative position, mislead its readers.

In your issue of Aug. 14, 1920, you publish a contribution headed "The Mining Opportunities in Siberia Under the Present Régime of Zemstvo-Soviet Government." The article purports to come from the pen of "Ivan Narodny," which, when faithfully rendered into the English language, is "John the Communist," and no more a typical Russian name than "Jack the Ripper" is a typical American name. The article from beginning to end appears to be purely Bolshevik propaganda, and is replete with misinformation, to use no stronger term.

The aim of the article in question is plain. It is an attempt to utilize American abhorrence of the worst features of the Czarist régime to claim for the "Zemstvo-Soviet Government" credit for all the constructive work of the Czar's government, which I can assure you was the only construction work ever done in Russia as it exists. As a matter of fact, there is in Siberia today no government save the few commissars controlling the railway centers. The peasants are in sporadic revolt. It would be easy to refute in detail the statements of "Ivan Narodny," but a few examples will suffice. He states:

"The local co-operative societies had already started the establishment of tanneries, canneries, soap factories, and flour mills."

The truth is that such institutions, both co-operative and private enterprises, have been in existence for decades. He also says:

"The butter produced in the Omsk, Semipalatinsk, and Tobolsk regions only would be twice as much as that of the United States."

The truth is that in 1913, the year of largest output, the whole of Siberia produced 90,000 tons of butter, or 2 lb. per year for each inhabitant of the United States. "Narodny" says, further:

"At many places we can give mines and mills which were operated by the past régime or its favorites. . . . But we will not tolerate criminal exploitation as used to be, or corruption and all the methods of an autocratic government."

I personally know of no "criminal exploitation" nor "corruption" in mining operation in the past, but presume that "Ivan Narodny," as a Communist, believes that all exploitation by private capital is of a criminal nature. By a curious contradiction, however, he makes it plain in the first sentence of this quotation that the alleged opportunities for the investment of foreign capital in Siberia are to be largely provided by property which has been stolen from other foreigners who had courage to try to develop Siberia's resources in the past.

I personally know of such foreign property worth considerably over $100,000,000 and belonging to many thousands of small investors in foreign countries which has been forcibly confiscated, or, to use the Bolshevik term, "nationalized." Although "nationalized," none of these properties are working. The morality of utilizing a theft from one set of foreign investors as a bait for soliciting capital from other foreign investors appears to be as dubious as the failure of such a policy will be certain when once the truth concerning present contentions is made known.

Without going further into details, I would again point out that the *Engineering and Mining Journal* has apparently been made the unwitting instrument of a cunning attempt at mendacious Bolshevik propaganda. I especially regret this at a time like the present when the so-called government of "Ivan Narodny" holds as prisoners many American and other foreign mining engineers and refuses to release them. The facts as to these engineers are known to the Department of State in Washington. Y.

Boston, Sept. 29, 1920.

The "Human Engineering" Number

I wish to congratulate your people in getting out such an issue as you did get out on such a hopelessly inexact and inscientific a thing as "Human Engineering." Psychology is a thing that every newspaper man learns with the ABC's of his business—only he probably would not recognize it as such. And your "human engineering" is, after all, nothing in the world but applied psychology. If the employer of men would only take as good care of the human machinery that is producing his dividends as he does of his lathes and punches and laboratory equipment, he wouldn't have any strikes on his hands. But by "taking as good care of his human machinery" I don't mean handing out a lot of gifts, liberally exuding hot air or "giving" people libraries, gymnasiums, "sanitary homes," and such gratuitous benefits. The proper sort of an upstanding man does not want a whole lot of things "given" to him by someone else.

You know, of course, that Shakespeare is commercially impossible in the theatre. You also know, of course, that Shakespheare wrote the most appealing and most human plays that have ever been written in the English language. Now, why is it that these plays are impossible commercially? Because they have been torn, twisted, dissected and macerated by high school and college professors and students to a point where the average man or woman who has been to school goes out into life weary of Shakespheare and all his works.

I was tickled to death to see such a wide departure from exact science as "Human Engineering" have a place in your magazine. Do it again. That publication is actually becoming one of the most interesting I read.

Chicago, Ill. HUMANIST.

Mineral Wealth of the Kingdom of Jugoslavia

Deposits Worked Since Neolithic Age—Region Is Rich in Base Metals and Has Gold, Silver, And Coal—Repressive Policy of Central Powers Long Held in Bondage The Nations Comprising the New State

By Captain Gordon Gordon-Smith*
Written for *Engineering and Mining Journal*

ONE of the results of the World War has been the creation of a number of new states, the names of which sound unfamiliar to American ears. One of these is Jugoslavia, or, to give it its official title, the Kingdom of the Serbs, Croats, and Slovenes.

The new state has been created by the union of all the countries inhabited by the Serbo-Croatian race. These have grouped themselves around the Kingdom of Serbia, which is the "Piedmont" of this Slav "Resorgimento." These countries were the Kingdom of Montenegro and the former Serbian-speaking provinces of the Austro-Hungarian Empire: Croatia, Bosnia, Herzegovina, Carniola, Carinthia, Slavonia, Dalmatia, part of the Hungarian Batchka, the Baranya, and a part (roughly speaking, one third) of the Banat of Temesvar. The last three sections, made up of, probably, the most fertile region in all Europe, are generally grouped together under the title of the Voivodina.

CAPTAIN GORDON GORDON-SMITH

Jugoslavia Has Population of Thirteen Million

The Voivodina is the most densly peopled portion of the new state, counting eighty inhabitants to the square kilometer. Serbia proper counts sixty; Bosnia thirty-seven; Croatia fifty-five; and Dalmatia and Montenegro have but twenty-five inhabitants to the square kilometer. This gives an average of fifty inhabitants for each of the 260,000 square kilometers the country contains, or a total population of thirteen million, a people closely knit together by race, language, and national aspirations.

If Jugoslavia is to be enabled to fulfill her high mission she needs all the aid and support that the United States can give her. Not political aid or military support. Only in her absolute independence can Jugoslavia fulfill her great destinies. By developing the resources of the country, increasing its wealth and production, its independence will be secured.

Jugoslavia is rich. She has everything that makes a country great. She possesses twenty million acres of virgin forest only awaiting the axe of the lumberman. Her mineral wealth is great. She has gold, silver, mercury, copper, zinc, lead, coal, and iron.

In her mountain streams and her swift-flowing rivers she possesses a reserve of electric force running to the millions of horsepower.

As a railroad center Belgrade has no rival in all Europe. No more favorable field exists for the investment of American capital.

But why, if all this be true, does it come that for half a century no attempt has been made to develop the natural resources of the country? The answer to this is—the dead hand of Austro-German policy.

Serbia lay right athwart the path of German ambitions, and while she remained independent and unsubdued brought the whole grandiose plan to naught. For thirty years, in consequence, nothing was left undone to prevent her increasing her independence by developing her resources.

Now Jugoslavia turns to the United States for aid. For this there are two reasons. The first is political. If Jugoslavia handed over to any European power the development of her immense economic resources she would at once arouse the jealousy of the others, as they would fear that the according of economic advantages would only be the thin end of the wedge for securing political influence and guiding the foreign policy of the new kingdom. No such fear is felt in the case of the United States. The intervention of American capital would be a cold commercial proposition without any *arrièré pensée* of political advantage. The whole matter would resolve itself into dollars and cents, and the Jugoslav people would be able to realize its political ambition, "friendship with all; alliance with none."

A second reason why Jugoslavia looks to the United States is that America is the one country which has not physically suffered from the war and which has all its powers and sources of supply, professional skill, and material and financial resources intact. Without professional skill Jugoslavia is helpless to work out her own salvation. Serbia's intellectual *élite*, men trained abroad in the schools and universities of Austria,

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Germany, France, and England as engineers, electricians, doctors, and professional men generally, were, *noblesse oblige*, all officers of reserve in the army, and were killed off, almost to the last man, in six years of ceaseless war. It is for this reason that she has to appeal to the energy and professional skill of the United States to aid her in the development of her resources. One of the chief of these is the exploiting of her mineral wealth.

The archives of the newly annexed Austrian provinces are still in Vienna, so that I have not at my disposal such exact data as I have in the case of Serbia, but my readers may take my word for it that the mineral wealth of the former Austrian provinces is hardly inferior to that of Serbia and that they offer an attractive field for American mining enterprise. This article, however, will deal with Serbia.

In regard to the mineral wealth of Serbia a great deal of data is to be had, notably a report by Dr. Demetrius J. Antula, the distinguished Director of the Ministry of Mines. Dr. Antula is a geologist and mining authority whose reputation has spread far beyond the frontiers of Serbia.

It is known that the working of the mineral resources of Serbia dates from the most ancient times. The archaeological remains found in the old mercury mines of Avala, near Belgrade, bear evidence that these have been worked from as far back as the Neolithic Age. There are many traces to be found of Roman workings and debris heaps which testify to a large development of the mining industry in Serbia in the ancient past.

MAP SHOWING GENERAL DISTRIBUTION OF MINERAL DISTRICTS OF JUGOSLAVIA

After the fall of the Roman Empire the mining industry disappeared, and was restored only in the thirteenth century, at the time of the Namanya. At the opening of the fourteenth century the industry attained great development. The mines were the principal source of wealth of the ancient Serbian state of the Middle Ages. With the Turkish invasion the mining industry in Serbia, as also in the neighboring countries, began to diminish rapidly. Only the iron industry, on a very small scale, was continued in one or two places. During the Austrian occupation in 1718

mining work was resumed, after an interruption of three hundred years, but came to an end again in 1728. With the restoration of the Serbian state at the beginning of the nineteenth century mining was started at many points, and keen interest was awakened by the favorable results obtained by prospecting the copper, gold, and coal deposits.

Until a few years ago all that was known about gold in Serbia was that placers existed in the gravels of the Timok and the Pek, and of their tributaries. Lode deposits were recognized only in the first years of the present century. There are three principal types:

Gold in Serbia

1. *Gold-Quartz Veins in Crystalline and Granitic Rocks*—Gold occurs in the crystalline rocks of the Department of Kraina, and prospecting has been carried on at various places, especially between Neresnitsa and Maidanpek. There existed in 1911 two mining concessions in this region, besides several prospecting rights. One concession was given to the Serbian Dredging & Mining Syndicate, Ltd., in Neresnitsa, in 1903, extending over 7,500 hectares (18,250 acres), and the other to MM. Georges Weifert and Felix Hofmann at Blagoyenkamen, in 1902 (the St. Barbe concession), covering 410 hectares (1,025 acres). Prospecting established the existence of numerous mineral-bearing quartz veins, containing sulphides of lead, copper, iron, and zinc. All these sulphides, especially the galena, are auriferous.

Quartz veins with auriferous sulphides were found near Ram, on the Danube; near Bela Palanka; and near Stanitchinci, at the foot of the north slope of Kopaonik. In the crystalline schists at Vratarnitsa, near Zayetchar, similar auriferous quartz veins were also found. Auriferous copper deposits are to be found in the granite formation of the districts of Tanda, Crnajka, and Isvor.

2. *Gold-Quartz Veins Occurring in Serpentine and Gabbro*—Gold formations in serpentine rocks are known only in the region of Deli-Yovan, where there are ancient workings, the most important of which is at Rusman-Gindusa, and is eight kilometers in extent. Several parallel veins have been discovered in this ground. These veins in general direction strike north and south, but in certain parts, as in the workings of Gindusa, they spread into a great number of small veins, and the gabbro itself is often impregnated with auriferous pyrites. The workings at Rusman have shown the continuation of a well-defined cross-vein for a length of 300 meters, and this vein extends at least 35 meters below the old workings.

In 1901 a concession was granted on this field covering 2,500 hectares (6,250 acres). The concessionaire built at Rusman a ten-stamp mill for testing the treatment and concentration of auriferous pyrites. The yield of gold in the ore was approximately 9.6 dwts.[1] to the ton.

3. *Gold in Volcanic Rocks*—The presence of gold in the volcanic rocks was proved by the placer workings of the Crna-Reka and its numerous tributaries. Traces of gold have been found in the andesitic rocks themselves, which are impregnated with pyrites. This shows that the andesitic formation of the Timok contains gold deposits whose nature recalls very much the gold deposits of Hungary, but of which it has not yet been possible to ascertain the importance. The extent of the ancient workings in this eruptive formation, however, shows that it would be worth while to investigate further.

Placers

Placer deposits have been discovered in the gravels of the Pek and its tributaries, in the valley of the Mlava, in the basins of the Poretchka and the Timok, and in the valleys of the Plavnitsa and of the Jassenitsa, in eastern Serbia; also in southern Serbia, at the base of Kopaonik, at Stanitchinci, Poppina, and in other places. No systematic research has been made except in the valley of the Pek, on the concession of the Serbian Dredging & Mining Syndicate, and in the valley of the Bela Reka, upon the prospecting concession of M. Weifert.

Tests of the gravels in the valley of Pek showed that these contained a workable quantity of gold; on an average one franc's worth of gold is found in each cubic meter of sand. The gold is found to a depth of five to six meters, which is very suitable for washing. In the valley of the Pek the area which was investigated will suffice for working during twenty-five years by four dredges, which treat about 3,000 cubic meters of gravel per day. The Serbian Dredging Syndicate had two dredges working at the beginning of 1905, which produced ninety-two kilograms of gold. During that year two more modern dredges arrived and began work.

The cost of the extraction of the gold was reduced to 30 centimes per cubic meter, and it may therefore be concluded that these workings will give satisfactory results. The tests made in the valley of the Bela Reka also showed that the gravels of this river contain a considerable quantity of gold. Here also the gold is found to a depth suitable for dredging, and over a sufficient area to make profitable operations possible. Dredges suitable for the washing of gold were set to work in 1905 in this valley. In view of the considerable extent of placer gravels, and the evident importance of ancient exploitation, the government began in 1905 tests of the gravels of the basins of the Poretchka and the Timok.

Mercury Deposits

The gold deposits are far from being the most valuable part of the mineral wealth of the country. There exist, for example, very considerable mercury deposits. Cinnabar is found at Avala, near Belgrade, and in the villages of Brajici, Bar, and Donja Treshnica. The mercury deposits at Avala were the first to attract attention. For some time work was carried on with considerable success, but later all the workings were abandoned. The cinnabar, together with metallic mercury, baryte, and pyrites, is found at Avala in a porous quartz in serpentines.

From 1885 to 1891 a total of 7,796 tons of mercury ore was treated, containing on an average 1.416 per cent of mercury, which produced 79,823 kilograms of mercury.

Lead Mines

Lead deposits are frequently found throughout the country, and some of them contain also silver and gold. They are generally found in the Mesozoic limestones, and especially the volcanic rocks of recent age, or in irregular masses in the limestones, near the igneous rocks. Deposits of lead ore have also been found in old workings, at the contact of alaskites with slates.

[1] Approximately $9.89.—Editor.

THE KATCHANIK PASS IS AN OPENING BETWEEN THE CHAIN OF THE KARA-DAG AND THAT OF THE SCHAR. HEMMED IN BETWEEN HIGH WALLS OF ROCK, AT THE FOOT OF WHICH FLOWS THE LEPENAC, A TRIBUTARY OF THE VARDAR, IT UNITES THE PLAIN OF SKOPLIE TO THAT OF KOSSOVO. THERE IS HARDLY ROOM ENOUGH FOR A ROAD WHICH IN PLACES RUNS ALONGSIDE BUT GENERALLY ABOVE THE RAILWAY LINE

There are several important centers of lead mining which merit being studied separately. These are those of Podrinje, Avala, Kosmaj, Rudnik, Kopaonik, Ruplje, and Kucajna.

At Podrinje the lead ores have been worked continually for centuries. The deposits are worked by the state. The center of these workings is the mountain of Krupanj, lying sixty-three kilometers from the landing stage at Shabats, on the Save, where there is a smelter. In these works the lead ore from Postenje was also treated, and all the lead and antimony ore of the surrounding region was smelted (such as the lead ores of Zavlaka and the antimony ores of Kostajinik and Zayetchar.) At Postenje, a distance of fifteen kilometers from Krupanj, the lead ore is found on limestone near serpentine, in a vein varying in width from a few centimeters to two meters. The ore is carbonate, with some residual primary galena. It is very easily smelted.

There are also important deposits at Selanats, not far from the Drina. Here some veins of mixed sulphides (galena, chalcopyrite, blende, iron pyrite, in quartz and in calcite) are found near igneous rocks and in the schists. The lead from this ore contains from 0.02 to 0.237 per cent of silver. Work was carried on from 1874 to 1900, with few interruptions, and in all 1,548 tons of lead was extracted.

At Avala there are traces of Roman workings, and others of more recent date. Ruins, drifts, shafts, and dumps prove the importance of the old mines. At Ljuta Strana, in the Valley of Tapavac, seven kilometers from the station of Ripanj, lead-bearing veins were found at the contact of Cretaceous limestone and rhyolite. These veins were followed to a depth of 120 meters below the lowest level. The veins contain principally galena, with some blende, pyrite, and chalcopyrite.

Silver-lead deposits are also found in similar geological formations at Zuce and on the Creveni Breg, near Avala. At this latter place the French company Société des Valeurs Industrielles et Minières obtained a concession of 400 hectares (1,000 acres) in 1901. Several rhyolite dikes striking east to west have been followed by the ancient workings, for the deposits themselves are closely related to these rhyolitic veins, being found either in them or at their point of contact with schist and limestone. These veins resemble closely the ore of Ljuta Strana, but with a greater proportion of silver, amounting to from 0.183 to 0.4308 per cent of the lead. A chain of similar deposits leads from Avala toward the south via Kosmaj, Rudnik, and the valley of the Ibir to Kopacnik.

At Rudnik there is a mining field well known in ancient times, where copper, lead, silver, and gold were extracted. Mixed sulphide ores at Rudnik are found at the contact of the alaskites with the Cretaceous limestones and sandstones. Two concessions, amounting to 4,530 hectares (11,325 acres), were given in 1894 to M. Mihailovitch, a former Director of the Mining Section. The work done proved important mixed sulphide deposits, and tests were made with regard to the concentration of the ore.

The mountain of Kopaonik and its mountainous district, near the southern frontier of Serbia, abound in mineral deposits, but these have not been closely studied. Lead deposits and old workings have been found in many localities.

Near the village of Ruplje there are veins at the contact of the alaskites and mica schists. Generally these contain galena, but sometimes blende and pyrites predominate. These ores contain a variable amount of silver, estimated at from 0.3 to 0.4 per cent of the lead. A concession of 800 hectares (2,000 acres) (Djurina Sreca) was granted to M. Weifert and to the French Société Industrielle et Metallurgique.

The workings of the lead deposits of Kucajna go back to a very remote date. The ancient miners apparently knew how to work the high-grade lead carbonate ore and leave the poor ore containing much pyrite and blende. They also ignored all the galena, which was worked by the owner of the mines from 1864 to 1892. The mining field extends to about four square kilometers. The deposits occur rarely in regular veins, more often in lenticular masses of different forms, found at the contact of the Cretaceous limestone and igneous rocks, or between the limestone and a volcanic breccia, or in the limestones themselves.

In these ores lead, iron, and zinc sulphides predominate, as well as the products of their alteration—cerussite, limonite, and calamine. Gold and silver are contained in the ore. From the results of the smelting work it is apparent that 1,081 tons of mineral ore were treated in eight years, which produced 265 tons of lead, 62.5 kilograms of gold, and 1,092 kilograms of silver. The quantity of gold varied considerably from 6 to 650 grams per ton of ore, averaging 57 grams per ton of ore. The average percentage of silver was 1.112, or 455 grams per 100 kilograms of lead. Compared with other lead ores in Serbia, those of Kucajna are the richest in gold and silver; and these metals are associated with the pyrites and blendes. The deposits (of 160 hectares) were granted in 1862 to M. Hofmann.

Zinc Ores

Serbia is rich in zinc. Zinc ores are found in connection with galena, pyrite, and chalcopyrite in many deposits, of which the most noted are those of Kucajna, Zavlaka, and the mountains of Rudnik. The calamine deposits of Kucaja are fissure veins, and calamine is also found in the form of incrustations on the metallic sulphides. The calamine is often pure, and contains from 50 to 55 per cent of zinc, and it is usually associated with limonite. During three years from 1891, 291 tons of zinc ore were treated at Kucajna, with a yield of 121 tons of zinc, which gives an average percentage of zinc of 21.5 in the ore. These zinc deposits were granted in 1862 to M. Hofmann.

Zinc ore is found in many parts of the mountains of Rudnik, occurring with lead. These deposits are sulphides containing 10 to 30 per cent of zinc. Similar deposits are also found between the villages of Zavlaka and Srpulja in irregular masses, in the Triassic limestone, and in proximity to outcrops of trachytic rocks. The proportion of zinc varies from 24 to 56 per cent. It is interesting to note that cinnabar in thin incrustations is found with the calamine of Zavlaka.

Copper Deposits

Copper deposits are found in Serbia, especially near serpentines, in lenticular masses of chalcopyrite and iron pyrite, together with oxides, and also often in association with other minerals in the trachytic rocks, or at the contact of these rocks with the limestone or with the crystalline schist. They also occur in the red sandstone in the form of a copper impregnation.

Copper ore is found in the whole of the serpentine

mass forming the mountains of Suvobor, Maljen, Bukovi, and part of the northern base of Povlen, in the Department of Valjevo. These generally occur at the contact of the serpentine with Cretaceous limestones. These depoosits are lenticular, but because of their constant strike from southeast to northwest they present many of the characteristics of veins. They contain sulphides and oxides of copper. At the mine of Rabelj, in 1903, 3,820 tons of copper ore was treated and 151 tons of black copper obtained—that is to say, 3.5 per cent of copper. In the limestone at its contact with the serpentine irregular masses of cuprite and of chalcocite have been found in the village of Planinitsa, and there

especially in the period of the medieval Serbian state before the Turkish invasion. Documents which are in the archives of the mines of Oravitsa show that the work in the mines of Majdanpek began again during the Austrian occupation, that the production of copper was considerable at that time, and that the ore contained an average of 8 to 10 per cent of copper.

Many authorities who later studied the deposits came to the conclusion that they possessed great importance; in fact, soon after the establishment of the Serbian state the development (1850 to 1860) on a large scale of the iron and copper industry at Majdanpek began. Much money was spent, and at this time Majdanpek was

THE BABOUNA PASS SEEN FROM THE DEFILE. THIS PASS IS THROUGH THE PICTURESQUE MOUNTAINS WHICH DIVIDE THE HEADWATERS OF THE TERNA RIVER FROM A TRIBUTARY OF THE VARDAR

are often masses of native copper weighing from 100 to 150 kilograms.

All the work which has been done as yet is in the nature of prospecting, although the analysis of specimens has shown that they contain a fair amount of copper. On the highland of the Department of Tchatchak there are copper ores in serpentine, and here are found many ancient workings and old dumps. East of Kniajevats there occur in the gabbro rocks quartz veins with chalcopyrite, iron pyrite, and bismuth.

The mineral area of Majdanpek is marked by gossan. It stretches from north to south for more than four kilometers, and its greatest width is about 600 meters. The deposits appear in the form of irregular masses and broken veins, and also as impregnations, which occur at the contact of the andesite with the limestone and the crystalline schists, or in the altered andesite.

Numerous ancient workings and dumps show to what an extent the ancient workings of Majdanpek extended. It was certainly worked in the time of the Romans, and

recognized to be the best organized mine of the east of Europe. Owing, however, to an interruption in the production of iron, the state was discouraged and disposed of the deposits to private individuals. Today the iron industry is completely abandoned, only the copper ore being worked.

At Majdanpek are found ores of copper and iron sulphides and oxides, together with a small amount of zinc and lead sulphates. The chalcopyrites are usually to be found together with iron pyrites and magnetite. There are often great masses of iron pyrites near which are situated masses of covellite containing a great percentage of copper. The decomposition of the primary deposits has produced copper and iron oxide ores. It is in this way, also, that the important limonite deposits which were utilized for a long time for the production of iron were formed. The oxidized ore contains generally more copper than the unchanged sulphides. This is the reason why many of the deposits of iron pyrites have been abandoned, as they contain only from 0.3 to

0.5 per cent of copper, whereas in the oxide deposits there are from 6 to 12 per cent.

The Majdanpek mines, covering 16,000 hectares (40,000 acres) were leased in 1902 to a Belgian limited company. From 1870 to the end of 1903 upward of 115,000 tons of ore were treated, giving 4,350 tons of copper. The average proportion of copper in the ore is therefore 3.78 per cent. The black copper when refined at Brixlegg in 1901 gave 94.10 per cent of copper, 48.6 per cent of iron, 10 grams of gold, and 270 grams of silver per ton of copper. An analysis of the black copper in 1904 gave the following: Copper, 96.4 per cent; iron, 2.10 per cent; sulphur, 0.67 per cent; zinc, 0.53 per cent; silver, 411 grams per 1,000 kilograms; gold, 39 grams per 1,000 kilograms.

There are numerous quartz veins of auriferous chalcopyrite in the granite mass of the Department of Krajina, near the villages of Tanda and Luka. Copper ore occurs in the form of isolated masses in the limestone to the east of Golubats, on the mountain of Ridanj, which is undoubtedly a continuation of the mining region of the Banat, and also extends far toward the south to Vukan, where there are very large dumps, as well as outcrops of copper ore.

The copper deposits of Bor and Krivelj, in the Department of the Timok, occur in connection with the andesitic rock. Here there are also ancient workings, which form the best indication for the study of the various deposits. The ancient galleries and shafts are arranged in a linear direction, and may be grouped into several parallel zones. Their direction is, in general, from north to south, with slight deviations toward the northwest. The general direction of the ancient workings, which follow the metallic veins, is parallel with the general direction of the volcanic dikes which may be followed for a distance of 300 kilometers in Serbia and the Banat.

There are indications in the old workings of this region that the presence of gold had been recognized, and that gold has been recovered by washing. It is therefore probable that the ore interested the old miners only as a source of gold, and that they abandoned the work when they reached the primary ore, which is found at the shallow depth of twenty-five to thirty meters.

The prospecting work has demonstrated five parallel veins, which may be followed by their outcrop, and by the old workings, for a distance of ten kilometers and a width of two kilometers. The most important workings occur in the village of Bor, and had for object the determination of the depth of the deposits. A drift was begun at Bor, thirty-two meters below the ancient workings, and following their direction through a propylitized mass of andesite. The propylitization was so far advanced that only a quartz skeleton remains of the original rock, in which there often occur cavities with the shape of feldspar and ferromagnesian minerals. The percentage of copper in the ore was favorable. Of the thirty analyses made, taken from each meter of the mass of ore, twenty-six gave 8 to 25.6 per cent of copper, eleven from 5 to 8 per cent, and only two 3.2 per cent. All the analyses showed gold from traces to ten grams per ton of ore. The volume in sight amounted to 85,130 cubic meters, or 255,390 tons.

The mineral deposits of Bor are related by their geological conditions and by the period of their origin to the copper deposits of Majdanpek, and also to those of the interior zone of the Carpathians, and they show a certain semblance to those of Nevada and Colorado. On the other hand, the deposits of Bor differ from all these by their mineralization and resemble rather the well-known pyritic masses of Europe (Roros, Ramelsberg, and Huelva). A concession of 2,400 hectares was given in 1903 to a French company. Its exploitations showed that it was one of the richest copper mines in Europe. It was in full operation at the time of the German invasion. During the period of occupation the Germans extracted thousands of tons of copper.

Impregnations of copper ores, malachite and azurite, are found in many parts of the country, but only in small quantities. There are also other outcrops of different kinds of copper ore in various districts, but these have not been carefully studied.

Antimony

Antimony is found in great quantities in Serbia, and the most important deposits have been discovered in Podrinje. At Zayetchar there are two kinds of antimony deposits. The proportion of antimony in them varies greatly. A concession for these deposits, extending over 1,660 hectares (4,160 acres), was granted to a Serbo-French company in 1898. From 1901 to 1903 this company treated 13,537 tons of ore, containing 12 to 14 per cent of antimony, with a yield of 1,460 tons of oxide of antimony, which was transformed into 825.5 tons of regulus. There are also deposits of antimony in other parts of the country, but these have not been studied.

Nickel

Nickel ore occurs in such small quantities as not to be worth working. Chrome exists in the form of chromite on the mountain of Suvobor and near Kraljevo, where it appears in isolated masses in serpentine. Analysis has shown that the ore, of which several hundreds of tons have been obtained, contained an average of 50 per cent of chrome oxide. There are also other chrome deposits, but none have been worked systematically.

Deposits of Iron

The iron industry has not yet come into existence in Serbia, apart from some attempts which have failed, although the country is rich in iron ore. Investigations have been made only on a small scale, and it is impossible to judge the exact nature of the deposits. The most important deposits are of magnetite in the crystalline rocks. There are also iron deposits in irregular masses in the serpentine ore, in conjunction with other minerals, near the eruptive rocks, and isolated deposits in large or small masses or in layers in the sedimentary formation, principally in the cretaceous limestones.

Manganese

There is no doubt that a considerable amount of manganese ore exists in Serbia, generally associated with limonite, but these deposits are as yet little known. One of the deposits of the Department of Kragujevats is, however, known to contain up to 42 per cent of manganese. Natural sulphur is rare in Serbia, and it is never found in masses sufficient for working. Bituminous schists are found in many parts of the country, and many of them deserve to be studied further because of the quantities of bituminous matter they contain.

Coal

There are four kinds of coal fields in Serbia, which should be considered according to their geological age

—coal of the Carboniferous period, Liassic and Cretaceous coal, Tertiary brown coal, and Tertiary lignitic coal. In the Carboniferous basin lying between the Save and the Pek there are several beds of coal, but owing to the lack of adequate study it is impossible to estimate the exact value of these coal beds, which are, however, composed of coal of excellent quality. The fossil plants found in these coal deposits show that this coal is of the same age as that of Moravia, upper Silesia, and the basins of the Saar and the Rhine. Of the many deposits of Liassic coal, several are being worked. These are the mines of Dobra, lying on the Danube opposite to the Drenkova mines in Hungary. The coal formation extends over a length of four kilometers. There are three principal seams, with varying widths of from one to ten meters. Unfortunately, there are layers of sandy clay among the coal, which make it necessary to wash the coal in a special manner, resulting in a loss of 28 per cent. This mine, covering 1,200 hectares, was leased in 1887 to a company, and from 1900 to 1903, a total of 61,491 tons of coal was extracted. Another mine which is being worked is near Zayetchar, the deposits having a length of ten kilometers. There are several beds, but only one, varying from 2 to 3½ meters in width, which is fit for working. From 1888 to 1904 the total production amounted to 275,059 tons.

To the east of the mountain of Rtanj outcrops of coal are found over an area of over forty kilometers in extent. At Boljevats, in the department of the Timok, coal beds one to eight meters in width have been discovered. The coal is of good quality and gives 80 per cent of coke. There are also known coal beds at Vina and Podvis. In the latter place a coal vein of two to three meters has been opened, and analysis shows that the coal possesses 7,000 calories.

Extensive Tertiary Coal Beds

Coal beds of the Tertiary period occur all over Serbia, in basins in the Cretaceous rocks or along the Drina, the Save, the Morava, the Danube, and the Timok. In these river basins only recent lignites are found; outside them there is brown coal. The principal mines of this coal are at Senje. Here is a bed of brown coal having from seven to eight meters as an average width, and with a known length of 900 meters. This mine was opened by the government in 1889, and in 1897 it was handed over to the railway administration, which now possesses a concession of over 450 hectares. From 1897 to 1904 the production of coal amounted to 522,770 tons, and in 1904 the production was nearly 100,000 tons.

In the neighborhood of Senje a coal bed of much greater value has been found, as there is a known quantity of coal of over 2,000,000 tons. There are similar coal beds in all the regions surrounding Senje, especially those of Dilje and Cicevats. At Jelasnitsa, near Nish, and at Jarandol, there are also important deposits, the coal at the latter place being among the best in Serbia. In the valleys of the Drina and the Save there are few known coal beds, although there exist in various localities outcrops of lignite. In the valley of the Morava there is much lignite, and this is worked at several places, notably at Kraljevats, by a Belgian company. The valley of the Danube is much richer, and at Kostolats there is a mine of lignite producing about 20,000 tons annually. The valley of the Timok is also richer in lignite, but has not been seriously studied.

Serbia is remarkable for the wealth and variety of its commercial and industrial stones. There are a great number of kinds of granite, marble, lithographic stone, and millstone, which are in great quantities, and which compare in quality with the best foreign varieties. Largely because of the lack of roads and railways, little has been done in the working of this source of wealth, but it will inevitably develop with the means of communication. Of special interest for other countries is the great amount of lithographic stone, which in one place covers an area of over 95 hectares, with a depth of 200 meters. There are many places where limestones occur suitable for the production of cement, and in Ripanj and Ralja cement plants already exist.

The Control of Mines in Serbia

In all matters relating to mines and mining the administrative and judicial authority is vested in the Ministry of Agriculture, Commerce, and Industry, which acts through the Service of Mines and the Mining Council. All concessions for mines are granted by the Minister. He also introduces the necessary laws, and imposes penalties according to the reports of his special departments. The supreme court of appeal is the Council of State. Concessions are of two kinds—prospecting rights and working rights. The former are divided into simple rights and exclusive rights, and these rights have been granted over an area of 200,000 acres. The concessions granted are comparatively few as yet, and cover about 40,000 acres. The grant of prospecting rights carries with it the ultimate possibility of obtaining a concession if the requisite work is done within the necessary period, if sufficiently rich mineral deposits are located, and if the individual or company applying for the concession can show satisfactory evidence that it possesses financial means to carry on the undertaking.

Despite the undoubted wealth of Serbia in mineral resources, it must be said that the mining industry has not yet begun, and this although 634,000 francs' worth of mineral products in 1895 had increased in value in 1907 to over 3,500,000 francs. This, as I have said, is to be attributed in a large degree to the constant hostility of the Central Powers and their efforts to hamper Serbia's economic progress.

The most interesting development has undoubtedly been the increase in the production of coal, ten years having recorded a production of 1,400 tons of hard coal transformed into an output of over 53,000 tons, and 41,000 tons of brown coal becoming 172,000 tons. The exploitation of the great copper deposits promises in the future an enormous increase in the mining industry of Serbia. What is needed is foreign capital intelligently utilized.

South Australian Iron Ore

The iron ore produced in South Australia, according to Consul H. P. Starrett, comes from the mines at Iron Knob and Iron Monarch, situated thirty-four miles from Hummock Hill. This ore forms two hills, which enables it to be worked by open quarrying. It is estimated that there are about 110,000,000 tons of ore in sight. It is a hematite, 66 per cent metallic iron, with no excess of sulphur, phosphorus, or titanic acid. The ore is not treated in South Australia, but is shipped to the steel works at Newcastle, New South Wales, and it is the chief supply of that plant. It is stated that the amount of ore available is sufficient to meet all Australian requirements for many years.

CAMP AT RED ROVER MINE, CAVE CREEK DISTRICT

Ore Deposits of Cave Creek District, in Arizona

Geology of Area Twenty-eight Miles North of Phoenix Described — Only Deposit Developed of Present Importance That of Red Rover Mine — Characteristics of Principal Type of Outcrops Discussed

By Alfred Strong Lewis
Written for *Engineering and Mining Journal*

WITHIN the last two years I have made several professional trips to the Cave Creek mining district, in Maricopa County, Ariz., for Eastern clients holding mining interests therein. In passing over and through the district, and in connection with my examination of certain specific properties, I was greatly impressed by the appearance of the general surface conditions, and therefore determined to make a careful examination, with the purpose of preparing a geological map of the district. This article is based on such survey and examination.

First I made a thorough search of all possible sources for information relating to the district, but found nothing except that its northeast corner was included in the quadrangle covered by the Bradshaw folio of the U. S. Geological Survey. Careful study was made of the Government geological maps and other data relating to the developed districts both north and south of the Cave Creek district, in which the same surface conditions are disclosed as I found to exist in the latter.

Mapping the District

Having completed the study of the adjoining territory I proceeded to examine the Cave Creek district about July 1, 1919, and by Oct. 1, 1919, I had gone over all of the country which had exposures of the older pre-Cambrian formation. I found large areas within the district to be covered by volcanic agglomerate, which was not mineralized and was therefore of no economic importance. These areas I simply sketched in and did not attempt to differentiate. The final results of my work are embodied in the geological map on page 714.

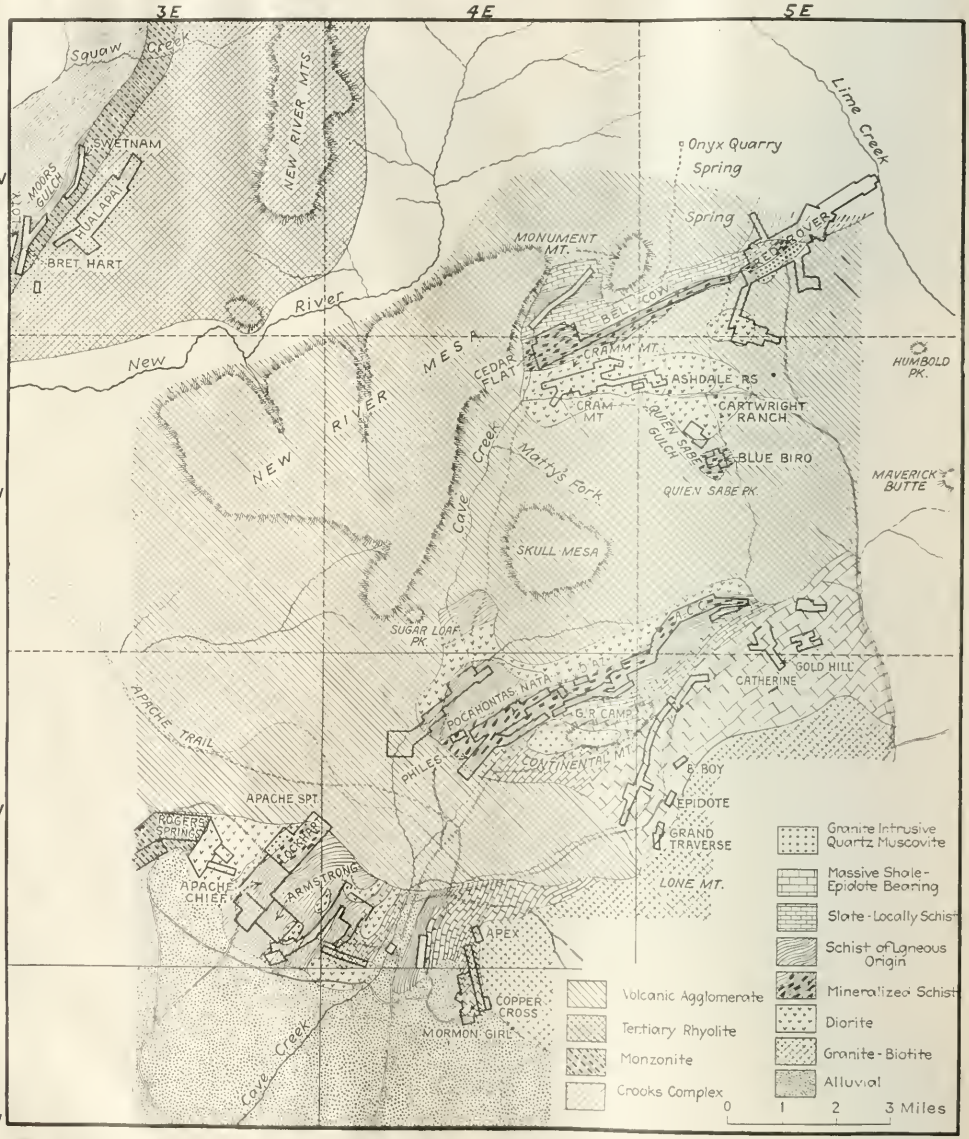
The Cave Creek district is twenty-eight miles due north of Phoenix, Ariz. The road leading out of Phoenix is paved for the first eight miles and from that point passes through the Paradise Valley with slight grades. The elevation of the district varies from 2,100 ft. in the lowest part of the basin to a maximum of 5,000 ft. at the higher peaks. The main outlet for the drainage of the entire district is Cave Creek, which has an average fall of 200 ft. to the mile. At its headwaters near the Red Rover mine it has an elevation of about 4,000 ft. and twenty miles from here it emerges into the desert at an elevation of 2,000 ft.

Evidences of Great Erosion Apparent

Following up Cave Creek, a rim of low mountains is first encountered through which the stream has cut its course. This rim forms the southern boundary of the district. These mountains are abruptly covered at the base of their southern slope by the alluvial material of Paradise Valley. At the foot of the northern slope they are covered by volcanic agglomerate, which covers a basin-like area about three miles wide, feathering out to the east, but widening to the west. High ridges and mesas then succeed one another for several miles. Cave Creek has cut a deep gorge in this part of its course. The ridges and mesas finally give place to open country with an average elevation of about 3,500 ft. and the creek branches out into numerous small washes and ravines. Erosion has been very great, as evidenced by the great depth of the fill in Paradise and Salt River valleys. These hills, which now stand out alone and disconnected, were once part of an enormous mountain system extending from the interior of Mexico diagonally across Arizona and continuing through Nevada. Many thousands of feet have been torn from this mountain system by powerful forces of nature operating through millions of years. This material has been washed down into the great chasms at their feet. The chasms have been filled and leveled into broad valleys of great agricultural activity, and the once lofty peaks have been

dwarfed and diminished into low hills of insignificant size. These tremendous destructive natural agencies have finally exposed at the surface mineralized zones which were originally conceived at profound depth.

The geological ages represented in the district by agglomerate, are for the most part in their original position and are non-mineral bearing as far as known. The Paleozoic beds elsewhere developed in Arizona are entirely absent here. Rocks of igneous origin, however, represent volcanic activity in many geologic periods.



RECONNAISSANCE MAP OF AREAL GEOLOGY OF CAVE CREEK MINING DISTRICT, MARICOPA COUNTY, ARIZ.

sedimentary deposits are confined to the oldest and the youngest of all exposures in Arizona. The pre-Cambrian sediments, which have been highly altered, metamorphosed, folded and finally compressed into shales, slates, and schists, are mineral bearing, but the Tertiary (or Quaternary) deposits, composed of volcanic

Granites of Algonkian age are present; siliceous porphyries originally bedded in pre-Cambrian oceanic sediments, and now forming nearly vertical zones of schist: later granite intrusions in the schists diagonal to its strike: greenstone bedded with the schists and diorites in large marginal masses as well as small and

large dikes irregularly intruded into the schists; and narrow granite prophyry dikes developed for miles in length and running with the strike of the schists, some highly sericitized, some highly siliceous.[1] At certain points as many as six of these dikes running remarkably parallel and spaced from 300 to 600 ft. apart are exposed.

Upon the southeastern margin of the districts is exposed a coarse-grained biotite granite batholith which covers an area of about 2,000 square miles. The granite weathers into peculiar shaped boulders which have almost the identical appearance of the boulder batholith granite exposures of Butte, Mont. The batholith, if of post-Paleozoic age, may have doomed and broken up the Paleozoic beds, rendering them easy prey to the erosive action of the Verde and Salt rivers. Deformation is evidenced by highly contorted rocks in many localities, as well as the change in the strike of the schist zones. There is a remarkable persistency in this strike. The normal strike seems to be N 42° E, and the deformed strike in almost all cases is N 60° E.

Quartz Lenses and Stringers Prominent in Schists

At certain points the schists contain large and small lenses, stringers, and bands of jasper and quartz. Some of these lenses are prominently developed. They are usually from 10 to 50 ft. wide and from 200 to 500 ft. long. They do not occur in straight lines, but are offset in a somewhat regular manner and occur in the softer, more highly sericitized and bleached zones of schist and usually in proximity to the acid-porphyry dikes. Throughout these mineralized zones are distributed many small outcroppings of copper, silver, and gold minerals.

The exposures in the Cave Creek district are similar to those found at the surface in the proven districts of Arizona. An examination of the ore outcrops throughout the district discloses clearly the fact that, in the main, the gold, copper, and silver have been leached, leaving occasional shoots or kidneys of ore which have escaped leaching by reason of some topographical or other condition unfavorable to leaching. Such residual oreshoots are found to carry values in gold, silver, and copper running from $10 to $60 per ton.

Red Rover Deposit Only One of Importance to Date

There is only one property in the district which has done sufficient development work to uncover anything worthy of the term "ore deposit." This property, known as the Red Rover mine, is in the schist zone. The deposit at the surface is in an irregular inclined seam and shows copper carbonates carrying as high as 2,000 oz. of silver per ton. The ore occurs as lenses in the schist and has been developed so far to a depth of 500 ft. A very interesting occurrence is to be seen in the shaft which passes through about 30 ft. of schist impregnated with native copper in the form of thin scales, bright and wonderfully distinct until tarnished by exposure to the air. The principal deposit opened up on the 300- and 500-ft. level shows masses 3 to 4 ft. wide, of copper glance carrying 400 to 700 oz. silver per ton. The other properties in the district have nothing but outcrops to recommend them.

It has been stated many times in recent mining literature that the mines of the future must be found by the application of geological deduction based upon surface and other data available. It therefore seems proper to describe the general characteristics of the principal types of outcrops exposed in this district. For convenient description the district can be divided into three zones.

Copper Carbonates Frequent Along Batholith Contact

The first zone is from one mile to two miles wide and borders the northwestern contact of the granite batholith. It is composed of highly metamorphosed banded shales. Blocky epidote rock is extensively developed in this zone, and in places there are ledges composed of epidote, quartz, and dolomite intimately mixed. This zone gives place to slates along its western margin. Copper carbonates carrying several dollars per ton in gold and silver outcrop at many points within this zone, always in association with quartz or epidote.

The Mormon Girl deposit, in this zone, is formed in contact with and just above an inclined foot wall of

GRANITE POINT—A PREHISTORIC "LOOKOUT" IN THE CAVE CREEK DISTRICT

barren quartz. This quartz is 6 to 8 ft. thick and represents two generations of silicification, one of white quartz, which has been crushed into angular fragments, and the other a dark quartz, which has been deposited around the irregular fragments of the white quartz making the present hard compact foot wall. This foot wall is smooth, continuous, and unbroken. On top of it has been deposited copper-gold-silver-bearing quartz of an average value of $40 per ton and from 4 to 5 ft. thick. A few hundred feet below this the ore disappears.

Little Copper in Second Zone

The second zone begins at the edge or border of the slates and extends to the contact of diorite and igneous complex. It is several miles wide and is all schist. Within this belt is a narrow, highly mineralized area that is exposed for about fifteen miles and is 600 to 1,200 ft. wide. It consists of highly altered soft sericitized schist in places highly twisted and contorted. In coloring it ranges from pearly white through the various shades of yellow and occasionally is deep red. In

[1] The Pre-Cambrian rocks are designated on the accompanying map as "Schist of Igneous Origin," "Mineralized Schist" and "Crooks Complex." The latter formation, shown in the northwestern corner of the map, is the equivalent of the formation so named by the U. S. Geological Survey, in the Folio of the Bradshaw Mountain Quadrangle. It comprises irregular bands of diorite, granite, aplite and schist, with some breccia.—Editor.

other places, it is bleached or gray and full of innumerable quartz stringers. Very little copper is in evidence in the outcrops, but several location cuts exposed copper stain a few feet beneath the surface.

Elsewhere in this area many huge silicified outcrops occur, showing jasper and siliceous hematite. In connection with these there are innumerable outcroppings of carbonate, oxide, and some sulphide of copper occurring in patches or irregular impregnations.

The third zone lies along the contact of the schist and the diorite and other igneous intrusions and is the western part of the mineralized section of the district. There are several brecciated siliceous zones, from 50 to 300 ft. wide and of undetermined extent, which contain ore averaging $2 to $5 in gold per ton. Ore averaging as high as $12 per ton has been taken from narrower enriched channels within the main low-grade orebodies.

In the diorite there are many outcrops showing strong shearing action. In these zones impregnations of copper carbonates are common. One of these at a depth of 225 ft. was crosscut for 30 ft., showing chalcopyrite and bornite disseminated in a hard greenish diorite which carried 1 to 3 per cent copper.

Dimensions and Area of the United States

The gross area of the United States is 3,026,789 square miles. The land area amounts to 2,973,774 square miles, and the water area—exclusive of the area in the Great Lakes, the Atlantic, the Pacific, and the Gulf of Mexico within the three-mile limit—amounts to 53,015 square miles. These and other data determined or compiled by the U. S. Geological Survey, to show the limits of the continental United States, contain some interesting facts.

The southernmost point of the mainland is Cape Sable, Fla., which is in latitude 25° 07′ and longitude 81° 05′. The extreme southern point of Texas is in latitude 25° 50′ and longitude 97° 24′. Cape Sable is therefore forty-nine miles farther south than the most southern point in Texas.

A small detached land area of northern Minnesota at longitude 95° 09′ extends northward to latitude 49° 23′.

The easternmost point of the United States is West Quoddy Head, near Eastport, Me., in longitude 66° 57′ and latitude 44° 49′; the westernmost point is Cape Alva, Wash., in latitude 48° 10′, which extends into the Pacific Ocean to longitude 124° 45′.

From the southernmost point in Texas due north to the forty-ninth parallel, the boundary between the United States and Canada, the distance is 1,598 miles. From West Quoddy Head due west to the Pacific Ocean the distance is 2,807 miles. The shortest distance from the Atlantic to the Pacific across the United States is between points near Charleston, S. C., and San Diego, Cal., and is 2,152 miles.

The length of the Canadian boundary line from the Atlantic to the Pacific is 3,898 miles. The length of the Mexican boundary from the Gulf to the Pacific is 1,744 miles. The length of the Atlantic coast line is 5,560 miles and that of the Pacific coast line is 2,730 miles. The Gulf of Mexico borders the United States for 3,640 miles.

Nearly all maps of the United States show the parallels of latitude as curved lines and are likely to lead the ordinary observer to believe that certain eastern or western states are farther north than some of the central states that are actually in the same latitude. For this reason, one who is asked which extends farther south, Florida or Texas, is very likely to say "Texas," but, as stated, the mainland of Florida is nearly fifty miles farther south than the southernmost point in Texas. For the same reason errors are likely to be made in estimating position or extent in longitude. Few realize that the island of Cuba, for example, if transposed directly north, would extend from New York City to Indiana, or that Havana is farther west than Cleveland, Ohio, or that the Panama Canal is due south of Pittsburgh, Pa., or that Nome, Alaska, is farther west than Hawaii.

Ontario's Metalliferous Production Increasing

Returns received by the Ontario Department of Mines for the six months ending June 30, 1920, are tabulated below, and for purposes of comparison the quantities and values are given for the corresponding period in 1919. Tons throughout are short tons of 2,000 lb.

Product	Quality 1920	Quality 1919	Value 1920	Value 1919
Gold, oz	277,656	231,729	$5,690,504	$4,666,759
Silver, oz	4,474,322	5,744,172	5,077,028	5,951,362
Platinum metals, oz	184.45	30.08	12,443	1,805
Cobalt (metallic), lb	113,239	59,337	266,045	93,157
Nickel (metallic) lb	4,854,979	5,147,745	1,696,687	1,825,347
Nickel oxide, lb	3,491,544	5,503	814,070	1,567
Cobalt oxide, lb	388,318	202,912	645,783	301,791
Other cobalt compounds, lb.	1,417	26,289	1,029	16,164
Nickel sulphate and carbonate, lb	159,183	133,732	15,308	15,531
Lead, pig, lb	749,820	1,481,204	71,006	54,802
Copper sulphate, lb	89,939	.....	4,497	.....
Copper, blister, lb.	2,918,153	3,080,492	470,949	452,055
Nickel in matte exported tons	9,527	7,072	5,338,120	3,535,915
Copper in matte exported (*a*) tons	4,434	4,341	1,241,520	1,128,753
Iron ore, exported (*b*) tons.	2,189	5,804	18,512	44,309
Iron, pig (*c*) tons	28,771	24,095	738,079	670,512
Totals			22,101,580	18,759,829

(*a*) Copper in matte was valued at 13c. and nickel at 25c. per lb. in 1919. For 1920 the values have been placed at 14 and 28c. per lb. respectively. The total matte produced contained 15,030 tons of nickel and 7,705 tons of copper.

(*b*) Total shipments of iron ore were 13,962 short tons, worth $74,073.

(*c*) Total output of pig iron was 321,826 tons, valued at $8,255,916. Figures in the table represent proportional product from Ontario ore

The aggregate output from metalliferous mines, smelters, and refining works of the Province of Ontario for the six months ended June 30 shows a considerable increase in value over the 1919 figures. For the first time since 1903, when the Cobalt silver camp was discovered, the output of gold exceeds that of silver in value. The new electrolytic refinery of the British America Nickel Corporation is now in operation at Deschenes, near Ottawa.

Japan's Mining Industry Slack

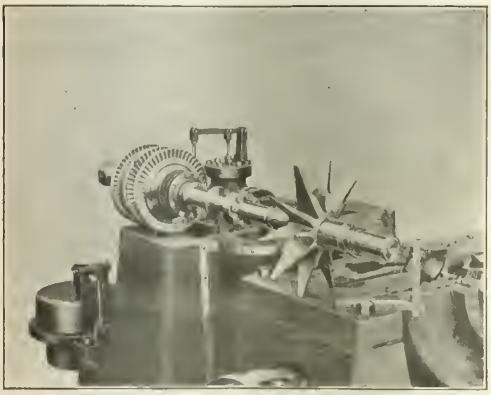
Japanese mining industry, in which more American capital is invested than in any other line of business activity in Chosen, experienced an unusual slackness during 1919. The Mitsubishi Iron Foundry, at Kyomipo, was forced to reduce its output, as was also the Suan mine, worked by the Seoul Mining Co., and the Kapsan copper mine, worked by the Kuhara Mining Co. The reasons for this were difficulties experienced in the matter of transportation through the outbreak of rinderpest among the cattle and which totally stopped all transport, and the heavy death rate among the miners from cholera. The continual rise in the cost of supplies and living expenses gave added cause for the reduced output.

A New High-Speed Turbo Compressor

Many Interesting Features in Machine Designed for an Argentine Copper Smelter—Notable Reduction in Manufacturing Cost of Air Compressors Possible—Low Capacity For Its Type and Wide Range of Volume

By Bancroft Gore
Written for *Engineering and Mining Journal*

IN NORTHWESTERN Argentina, on the eastern slope of the Andes, near Chilecito, at 5,500 ft. above sea level, the Corporacion Minera de Famatina operates a copper smelter. This plant has been recently overhauled and new equipment added to conform to the latest metallurgical practice. Two converters of the Peirce-Smith type are used for the production of blister copper from blast furnace and reverberatory matte.



ROTOR SHAFT OF TURBO COMPRESSOR

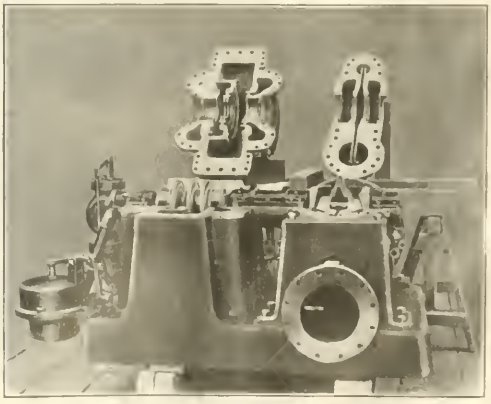
Air enters the tuyères at 12-lb. gage pressure, and the volume required fluctuates from 3,000 to 5,000 cu. ft. per min., according to variations in the operating conditions of the converter department.

As steam, at a pressure of 150 lb. with 100 deg. F. superheat, is available from waste-heat boilers, it was suggested that a turbine-driven blower would be the most desirable substitute for the belt-driven reciprocating unit, which was worn out and of insufficient capacity when both shells were blowing freely. Although the turbo blower, for capacities considerably in excess of these requirements, has generally supplanted cumbersome steam-driven reciprocating units, considerable difficulty was found in placing the order for the machine shown herewith. Owing to its relatively low capacity and the wide range of volume needed to meet the operating conditions it was the general opinion of engineers, all specialists in the design of air compressors, that the first cost of such a machine would be out of proportion to the many advantages easily obvious in the larger units, and that, in addition to its excessive steam consumption, it might result in an unfortunate experiment to the customer.

The design and construction of the machine were finally undertaken by the Rateau Battu Smoot Co. About the time the machine was set up for testing purposes at Ridgway, Pa., one of an almost continuous series of freight embargoes was effective, preventing shipment to the port of New York for export. Advantage was taken of this delay to give the compressor a rigid test, extending over a period of nearly two months. Mechanical engineers designing this class of equipment, who were invited to study the performance of the machine, were much interested.

A notable advance had been made in the construction of air compressors by an aggressive use of peripheral wheel speeds that in a unit of this size had been looked upon by conservative designers as either impossible or extremely risky for continuous operation. As a result of the somewhat unusual shaft velocity, which varies from 22,000 to 26,000 r.p.m., the cost of material used in the construction of the machine and the shop work had been cut to a pre-war basis, considering the capacity. A large proportion of the shop work was chargeable directly against the rotor element, which weighed only 138 lb. Further, it would be but one step more, by use of a two-stage effect on the air end of the rotor, to develop an air compressor for mining requirements that would be remarkable for compactness and weight when compared with a more conventionally designed machine of equivalent output.

In a general way this turbo compressor follows a design adopted in the construction of a blower which has been operating as a gas booster at Omaha, Neb.,



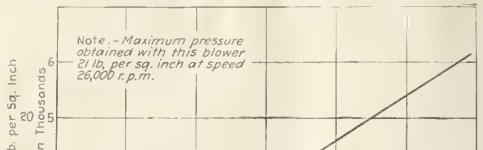
TURBO COMPRESSOR, SHOWING WHEEL CASINGS THROWN BACK

for two years at 20,000 r.p.m. The design of bearings for extreme velocities was much simpler than had been anticipated and the fool-proof qualities of a turbo blower were found actually to increase with the speed of the rotor.

The practical result of this experience applied with further refinements of design to the Famatina compressor is best known by comparison of it with a recip-

rocating machine of standard construction and approved type, rated at 4,000 cu.ft. per min. at 15-lb. gage pressure: Turbo compressor, selling price at factory, one-half; net weight, one-eighth; floor space occupied, one-seventh; concrete for foundations, one-fifth; railway and ocean freight to mine, one-seventh; erection cost, one-third. Aside from these features the blower has an efficient volumetric capacity of 25 per cent over and under its rating of 4,000 cu.ft. at 13-lb. gage pressure.

The general construction of the machine is shown in the accompanying views. The rotor is made of two rigidly coupled sections, forged and machined from nickel-chrome steel having an elastic limit of 80,000 lb. per sq.in. The turbine is of the Rateau two-stage impulse type, the first wheel taking the steam at initial pressure, from which it flows in parallel to each of the low-pressure wheels. The compressor is mounted directly over a Wheeler condenser, giving a vacuum of



STEAM CONSUMPTION AND PRESSURE-VOLUME CURVES

4 in. of mercury, absolute. One view shows the wheel casings thrown back, revealing the method of taking care of the smooth flow of air which enters and leaves the one-stage impeller chamber at a velocity above 1,200 ft. per sec. The bearings are ordinary babbitt-lined, but carry special groovings for the flow of lubricating oil, which circulates under a pressure of 10 lb. per sq. in. from an overhead tank at the rate of 8 gal. per min. This tank is kept overflowing, and an alarm attachment sounds when the oil supply to it fails.

At the maximum speed of 26,000 revolutions the operation of the machine is without vibration, owing in large measure to the satisfactory dynamic balance of the rotating element and the massive construction of the casing and bedplate.

The basic feature governing the smooth running of the compressor is that its critical speed is well above the running speed, in this case the critical speed being above 30,000 r.p.m.

The floor space occupied is 4 x 7 ft. and the height above floor level 4 ft.

Speed regulation is obtained by attaching to the end of the turbine shaft a small control fan, the air pressure from which is proportional to the square of the speed of the rotor. This operates a static regulator controlling the steam supply. Adjustment covers a considerable range of pressure and volume. An automatic stop valve, also controlled by the fan, shuts off all steam at the desired speed limit. A hydrostatic gage from the control fan indicates on a calibrated vertical scale the speed of shaft rotation.

The rate of steam consumption for a fixed speed of rotor, but with variations in the aperture of the air orifice, is shown in the graph in the opposite column. The comparative flatness of the curve between 3,000 and 5,000 cu.ft. shows the remarkable flexibility of the machine when it is operating under varying loads.

Chromite in Asia Minor

Chromite deposits are widely scattered through many parts of Asia Minor. All the orebodies are found in schistose and decomposed serpentine in groups of lens-like or irregular bodies.

The chromite mines of Asia Minor have produced important quantities of ore. From about 1870, when Turkey began to supplant the United States as the world's principal producer of chromite, to near 1900, Asia Minor furnished the bulk of the chromite for the world's consumption. Most of the ore mined has come from the mines in the Brussa region, on the south and southwest slopes of the Mysian Olympus, and from the mines of the Macri region. The Brussa and Kutahia deposits are said to have produced an average of about 20,000 tons annually for many years, of which the Daghardi mine is said to have furnished nearly three-fourths. This deposit consists of high-grade ore, averaging 51 to 55 per cent chromic oxide, and has been estimated to contain about 10,000,000 tons of ore. Probably this is somewhat an exaggeration, although doubtless the deposit is large and important if developed by modern methods.

It has been the policy of Turkey not to allow her mineral properties to fall into the hands of foreigners. Even while the exploitation of the chromite deposits was most vigorous, therefore, the mines, although in many places worked by foreign firms, were largely owned by the Turkish government or by Turkish subjects who leased them.*

French Iron-Ore Production

French production of iron ore during the first quarter of 1920, according to *Commerce Reports*, is given as 3,084,115 tons, by months as follows: January, 990,495 tons; February, 974,847 tons; March, 1,118,773 tons. Owing to the strikes in April the production fell to 613,028 tons.

There were imported into France during 1919 a total of 303,295 tons of iron ore, valued at 22,747,000f. ($3,116,627, at 7.20f. to the dollar, the average rate of exchange for the year).

Countries of origin and amounts were as follows: Belgium, 1,473 metric tons; Spain, 214,983; Italy, 9,113; Algeria, 10,398; other countries, 67,328.

The exports of iron ore during 1919 amounted to 1,697,171 metric tons, valued at 127,288,000f. ($17,436,712 at the above rate of exchange). The countries of destination are not given, but it is presumed that the majority of the iron ore exported went to Germany

*E. C. Harder in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

A Picturesque Mining Experience—V.

The Last Bucket

By Lt.-Col. George Sydney Binckley

IT WAS a snowy day, a good many years ago, when I sat by a fireside up in Sutter Creek, and heard from Mr. Knight this story of the early days of quartz mining in California. We had been discussing a recent accident, and for a while the old gentleman pulled thoughtfully on his pipe.

"While it wasn't just the same kind of a mess, somehow that brings to my mind a curious thing that happened not far from here away back when I was a youngster," he began. "There had been some work done on the property a good while before—in fact, I believe that this was one of the first quartz mines in California—but it had been abandoned a long time before the new crowd came in, sank a vertical shaft a bit over in the hanging, and put in a steam hoist. The rock looked pretty good, and at the time I speak of they had the shaft down about four hundred feet, were drifting on the three hundred level in search of an ore-body that showed in some of the old workings above, and had opened a small stope a short distance from the shaft above the four hundred level.

Caught by Poison Gas

"They were getting on pretty well but were bothered with poor ventilation, and I was over there putting in a ventilating fan and a small engine to drive it. They hadn't struck much water—an hour or so a day of bailing kept the sump clear—and, as I say, the main trouble was powder smoke. So that morning as I was rushing the work on the blower outfit over close to the shaft, I heard them shoot a round in the drift on the three hundred at the regular time. But even before the last shot let go—I instinctively counted them—something ugly happened. There was a sudden roar of falling water in the shaft, and almost immediately there was belched up to the surface a sickening gust of foul gas. The effect was fairly stupefying. There was a sudden rush toward the shaft from all over the place, and as sudden a falling back as the foul, poisonous gas spread. For an instant no one could form any idea of what had happened, but it was plain that no man could be left alive in the mine."

The old man paused a moment, as the full recollection of that sudden horror came back to him. He spoke very slowly as he looked into the fire while the snow whirled outside. "I hardly know how to make you understand how I felt," he began. "In an instant all was quiet—the white-faced men who crowded around the shaft were as quiet as the timbered hills lying there in the sun. From the shaft we could hear the tinkle of a little stream of water that made deeper the silence of those who had died.

"And then the women came—there weren't many children yet—and at once came a clamor to go down and bring up the dead. Dazed as I was along with the rest, I kept my head enough to realize that it was death to go ten feet into that shaft, and I persuaded them to wait until I could get the blower to work and clear the shaft of foul air. Yes," remarked the old man with the ghost of a smile, "I persuaded them. I wore a six-shooter in those days, for it was a handy tool, and could save life as well as take it.

A Swift and Strange Death

"Well, it took but a short time to fix up the blower so it could run (fortunately the pipe was already in place), and soon after we started it up the air was clean enough to let the men go down to the three hundred and bring up those who had been working there. They found them in the little cross-cut where they had gone when they were ready to fire the round of shots that had broken through into a forgotten stope, hidden by an old, waste-covered bulkhead at the bottom of a winze from one of the old levels above. The bodies had not even been washed out by the rush of water as it swept past on its way to the shaft, but the foul gas from the rotting timbers killed all six as they stood. It was a swift and strange death.

"There was a sad and quiet crowd around the collar of the shaft after the six bodies had been brought up and taken to the cabins, and we began to bail out the shaft so as to get at those caught by the water on the four hundred. It wasn't a long job, for there had not been any very great amount of water in the old stope, but it was coming on dusk when we got the water down toward the level, and we saw that soon we could send men down for the bodies there. Then the bailing bucket was lowered for the last time and allowed to fill."

The old man was staring into the fire. Then he looked up at me. "Can you see it? The dusky hills around, the silent white-faced crowd, the black mouth of the shaft? Can you realize the state of mind and body we were in after ten hours of desperate toil, and horror and nervous tension?

Miraculous Escape

"Try and see it all as it was, and then try and imagine the effect on that crowd when, from the bottom of the shaft, from the hands of dead men, slowly, solemnly as the tolling of the bell of Death, came the signal to hoist men! Stroke after slow stroke the gong in the hoist-house gave out the signal . . . . and the crowd melted away. Babbling terror, the Irish hoistman made for the woods, and—I admit it without shame—my knees shook under me as I took his place and brought the bucket to the surface. In the half-light, four men stepped off—to me it seemed in the dusk that I could see the headframe through their bodies, but I guess this couldn't be so, for they were four very solid Cornishmen, who had merely been trapped, with plenty of good air, in the overhand stope on the four hundred. As a matter of fact they suffered little inconvenience, and simply waded out when the water was low enough, climbed on the bucket, and signalled to hoist."

This was the tale told on that snowy day in Sutter Creek, and few stranger tales have I ever heard than this of the early days of the Mother Lode.

The Barman

By C. M. Campbell

THE accompanying pictures represent a phase of mining work of a somewhat more spectacular nature than usual. They show the removal of an unsafe piece of rock from the nearly vertical east wall of the glory hole at the Granby mines, at Phoenix, B. C., recently abandoned.

MORE difficult conditions prevailed underground. The physical character of the ore was such that shrinkage stopes were hardly ever necessary, the method actually employed involving large open stopes with the roof supported by pillars. The backs of these stopes had to be examined as the work progressed, and the lot of the barman who attended to this matter would not seem to be a happy one. There was, however, no lack of applications for these positions, and it is worthy of record that, during the twenty years the mines were operated, neither a fatality nor even a serious accident occurred among the barmen.

AS MAY be seen, each of the men makes use of a rope, one end of which is firmly fastened to a point above the work, the other being placed about the waist of the barman. Should he lose his footing he may be, for the moment, inconvenienced, but the rope is always the means of preventing a nasty fall and offers a safe method of carrying on the work of barring down.

Mining Men of Note

Adolph Lewisohn

FATE picked Butte as the scene of Adolph Lewisohn's entry fifty years ago into the business of mining copper, when, in 1870, the newly organized firm of Lewisohn Bros., of which he was a member, took over the property of the Montana Copper Co., controlled by Behr & Steiner, who had fallen into financial difficulties. Mr. Lewisohn, who was then only twenty-one years old, went to Butte to look over the new acquisition of his company. He found the superintendent pessimistic, and decided to have the mine examined. He chose for this work a distinguished engineer, whose report proved none too glowing. There was some copper, it stated, which perhaps it would pay to take out before shutting down. But operation was continued in the belief that the property had merit, which proved to be the fact, and eventually the Lewisohns organized the Boston & Montana Consolidated Copper Co. Later, when this company was taken over by Boston interests, Lewisohn Bros. contracted to refine and market its copper, and upon the organization of the Amalgamated converted this refining and selling business into the United Metals Selling Co., of which Adolph Lewisohn was president for a number of years.

ADOLPH LEWISOHN

As the original firm prospered it acquired other interests, among them being the Old Dominion, at Globe, Ariz., and the Tamarack and Isle Royale mines, in the Michigan Copper Country, which properties eventually were sold. At this time Lewisohn Bros. had two copper refineries, one at Pawtucket, R. I., and a small one in Connecticut. The growing demand for electrolytic copper caused the firm to build the Raritan Copper Works in 1898—a modern electrolytic refinery. About the same time the firm organized the Tennessee Copper Co., which continued under its management for the next decade. Adolph Lewisohn, however, withdrew from the firm within a few years and opened offices of his own, also continuing as head of the United Metals Selling Co. At present he is the head of Adolph Lewisohn & Sons.

In 1905, Mr. Lewisohn organized the General Development Co., which successfully floated the Miami Copper Co., of which he has been president from the start. The operating control of the Kerr Lake Mining Co., of Cobalt, was also purchased. In 1917, he again took control of the Tennessee Copper Co. and with others helped organize the present Tennessee Copper & Chemical Corporation. A few years ago, in association with the present firm of Lewisohn Bros., who are sons of the late Leonard Lewisohn, he formed the South American Gold & Platinum Co. Mr. Lewisohn's career has been distinguished by a capacity for business and a genius for organization that are apparent in all his achievements. But there is another side to his character that is quite as striking. He is widely known for his philanthropies, especially to a large part of the New York public. He is actively interested in many charitable and educational undertakings. Prominent among his gifts to various institutions is the building of the School of Mines of Columbia University; the great stadium of the City College, in New York, presented by him to the city, which turned it over to the college, and the building and equipment of the new pathological laboratory of the Mount Sinai Hospital in New York. Mr. Lewisohn is one of the reorganizers of the Hebrew Sheltering Guardian Orphan Asylum, to which he gave a large part of the financial needs for the building of its new cottage plan home in the country, where it takes care of dependent children in a model way. He is still president of this institution and is also honorary president of the Hebrew Technical School for Girls, which is doing a great work for the ideal education of girls after they leave the public schools. He is chairman of the Prison Survey Committee, appointed by Governor Smith, and of the National Committee on Prisons and Prison Labor, and has published an essay, "Prisoners: Some Observations of a Business Man." He is also a director in the National Child Labor Committee and the International Child Welfare League.

Mr. Lewisohn is now seventy-one years old, having been born in 1849 in Hamburg, Germany. His genius as an organizer, his example as a useful and honored citizen, and his benefactions as a philanthropist form a fitting memorial of his character and distinction.

By The Way*

Slippery Going

In protesting against the recent increase in freight rates, George D. Morris, manager of the Gila Copper Sulphide Co., at Christmas, Ariz., said that his company "had one foot in the grave and the other on a banana peel." Probably a sliding scale based on market conditions would be more suited to a company in this condition.

Not a Vegetarian

"They do say as 'ow tha price o' food stuffs be droppin'," sez Cap'n Dick, "an', dam-me, I mus' say as 'ow tha news be pleasin' to some. 'Ere a bit ago some o' tha men wuz grumblin' baout 'ow everythin' wuz so 'igh an' any nummer o' schemes were tried h'out to h'economize. Some worked an' some didn't. Jan Tregar's missus tried somethin' on 'im that didn't gaw very well with Jan. One moornin' 'e starts for tha mine, an', dam-me, 'e wuz feelin' pretty good, for 'e naws 'e 'ad a bit o' pasty in 'is dinner bucket. Come along h'eatin' time, an' Jan sits daown to 'ave a bite. H'after 'e'd taken a few bites o' 'is pasty 'e naws somethin' is wrong, for, dam-me, tha pasty doesn't taste right some'ow. An' before 'e's through 'e naws bloody well tha missus 'as lef' h'out tha meat. So 'e wuz mad, an' that night tha firs' thing 'e says to 'is missus, ''Ere, Mary Jane; w'ot's, tha matter with my pasty?' 'W'y, Jan,' sez she, 'w'ot's that matter with un?' 'Well,' sez Jan, 'thee need'nt think thee can make any bloody root-'ouse out o' my stummick. Nex' time, min' you, I want some meat in my pasty.'"

Science and Health

A certain American mining engineer has resided so long in the Republic of Colombia that the natives regard him almost as one of the family. Not long ago while domesticating after a particularly strenuous experience in the field, he felt indisposed to the point of craving a little sympathy. As his wife strove to entertain some callers, the afflicted one reclined in an easy chair and from time to time passed his hand across his brow, muttering *"Aaaie! Aaaie de mi. Aaa---ie!" in the* characteristic manner of Latin-Americans. The clacking of tongues became somewhat hushed; giving way to murmers of pity and promises to the hostess of various home remedies to be dispatched by couriers at the earliest moment. After the room had cleared, the patient's faint self-congratulatory grin faded as Mrs. Gringo turned on him with a playful tirade. "Now, see here, Enrique. I think a good bath and a shave will make you feel all right in *poco tiempo*. I know there is nothing much the matter with you at all. I know it pos-i-tive-ly, because never, never in the world was there anyone really sick who would groan in a foreign language."

EDITORIAL NOTE*

This page is not to be taken seriously. If our attempts at occasional humor are not detected as such, we at least wish to disclaim all responsibility. Our chronicling in a recent issue of the new German scheme for extracting gold from sea water has brought us in an honest offer to raise money for subscriptions. We have thought of labeling each of our whimsical paragraphs "Joke," but have concluded that perhaps a general notice will serve.

Early Operations in Arizona

"Of mining operations in Arizona, during any portion of the Spanish or Mexican period, nothing is practically or definitely known," says H. H. Bancroft in his History of Arizona. "The records are barely sufficient to show that a few mines were worked and that the country was believed to be rich in silver and gold. In several districts have been found traces of these early workings; and these with traditions arising from the Planchas de Plata find, at Arizona proper just south of the line, are for the most part the only foundation for the many lost mines of which much has been vaguely written and more said. I have already remarked that modern writers have greatly exaggerated the country's former prosperity in mining and other industries, and it may be added that they have as a rule given the wrong date to such prosperity as did exist, by assigning it to the earlier years of the Jesuit period. Contrary to what has been a somewhat prevalent impression, there are no clear indications of prehistoric mining, that is, by the Pueblo Indians, when their towns extended over a large part of the territory; and there is no proof either that the Jesuits ever worked any mines, or that in their time there were ever carried on any mining operations except on a very limited scale near the Tubac presidio, though in occasional prospecting tours it is probable that some discoveries were made. In Franciscan times for over two decades the same state of things continued. But from 1790 for twenty or thirty years, the period of comparative peace with the Apaches, the veritable era of Arizona's early prosperity, there can be no doubt that many mines were opened from time to time and that some were profitably worked, though we have no definite record of particulars, and though there is no reason to believe that there were any very extensive or wonderfully rich developments. It is to this period almost exclusively that we must trace the old workings discovered in later years, and also all the traditions of lost mines that have any other than a purely imaginary foundation."

The Peanut Press Replies

As we believe in letting both sides of a question be heard, or as many sides as the question may have, we reprint the following letter, which has been received from an observing reader.

Greeting:

In your Aug. 28 issue I had occasion to observe two important items that should have had additional publicity in your following issue. One item referred to the possibility of raising snakes in Arizona for commercial possibilities and the other article states that the blow-off that hatches and breeds in the unworked or closed mines is a menace to cattlemen of southeastern Arizona. For the benefit of all concerned it should be remembered that since prohibition was cast upon us snakes are becoming prominent and more numerous, hence the commercial possibility of a byproduct in the reptile. Also be it further resolved, that if those cattlemen who are also bankers in Arizona would invest a nickel in legitimate mining once in a while, especially in their own country, the blow-fly would soon blow away, or else get run over with an ore car at a producing operating mine. No—the cattleman will come to the city after he has cleaned up about $50,000 on a roundup, and will let some one clean him up. Then he goes back home and discovers that some of his bulls got killed by a blow-fly—then the big yell "Close the mines tighter!" Let us have a little yelling about opening them up. What do you say boys?"

Yours sincerely,

"PEANUT PRESS."

CONSULTATION

A Prospective Mining Career

"I am a young man seventeen years old, having had only a grammar-school education, and from since I could remember I always wanted to be a mining engineer, but do not know how to go about it; so will you help me by answering the following questions:

"1. I haven't the time to go to college to learn mining engineering, as I have got to work. Do you think I could learn mining engineering through a correspondence course?

"2. Must one pass a state examination to become an engineer?

"3. Will there be a great demand for mining engineers in the next twenty-five years or so?

"4. How much do prospectors and assayers get as a yearly salary?

"5. What must one know to become a prospector and assayer, and what are the necessary qualifications?

"6. Do you think I could learn mining engineering by working in a mining engineer's office, at the same time taking a course in the same?"

The *Engineering and Mining Journal* frequently is called upon to essay the difficult and responsible task of advising young men about to embark upon the career of mining engineer as to their prospects in the profession and concerning the kind of education best suited to their needs.

In this case it will be difficult for the inquirer to enter a mining school, owing to his probable inability to pass the entrance examinations on merely a grammar-school knowledge. Supplementary study will be necessary before the usual rigid requirements of the various universities can be met. There is a choice of studying in spare time, with the object of ultimately entering some mining school or starting a career in the mines immediately, and supplementing the direct experience gained with correspondence-course studies or otherwise, and depending upon sheer determination and ability to succeed. In view of your youth, you can well afford time and mental effort in an attempt to pass the college entrance requirements. Such an effort will be found to pay in any future work. Although many men have become eminent and highly successful mining engineers without a degree attached to their names, the fundamental knowledge acquired through mining-school study cannot be deprecated. Many young men have worked their way through college and benefited by the necessity.

To answer the questions in detail:

1. Mining engineering undoubtedly can be taught through a correspondence course, but a regular program of studies pursued at a recognized mining school, with actual instructural contact, is much more to be desired. If you have time and money to devote to a correspondence course you should be able to find time for a more extended regular curriculum.

2. A few states, such as Oregon and Colorado, require a state examination and license for practicing mining engineers.

3. It is difficult to prophesy the demand for any particular professional service, but as long as the world needs metals and minerals there will be an insistent call for mining talent.

4. Prospectors as a rule do not work on a salary basis but prospect for themselves. In some cases they are "grub-staked"—that is, in return for their "grub" they agree to allow a certain party or parties a portion of their discoveries. Assayers get variable salaries. We note a call for some at $150 per month and others for less. It depends on conditions and circumstances.

5. To learn either prospecting or assaying exclusively, a university education is not essential—both can be readily grasped by practice and a little study.

6. It would be of substantial aid in this case to work in a mining engineer's office, but unless the work were supported by actual field practice it would not be of great benefit.

The following list of books and papers has been compiled by Engineering Council in response to requests, especially from parents and vocational advisers of high-school boys, for information concerning the principal branches of engineering, the education and training requisite therefor, and the possibilities for making a livelihood therein. It is valuable to anyone contemplating an engineering career:

"Engineering as a Career." Edited by F. H. Newell and C. E. Drayer. D. Van Nostrand Co., 1916. A collection of papers originally published in the *Cleveland Plain Dealer* and the *Scientific American* on various phases of engineering work.

"Opportunities in Engineering." By Charles M. Horton. Harper & Bros., 1920.

"Engineering as a Vocation." By Ernest McCullough. David Williams Co., 1911. Subject matter based upon a series of addresses given before technical schools and associations of engineer assistants. Published for information of parents.

"Engineering as a Career." By Percival and A. A. Marshall. P. Marshall & Co., London, 1916.

"Addresses to Engineering Students." Edited and published by Waddell & Harrington, consulting engineers, Kansas City, Mo. Second edition, 1912. The purpose of the book is to give engineering students a broad conception of the profession.

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Manganiferous Zinc Residuum

"Will you kindly tell me where and how much manganiferous zinc residuum was produced in the United States during 1919?"

According to the U. S. Geological Survey, there was produced 80,418 long tons of manganiferous zinc residuum in 1919, compared with 146,796 long tons in 1918, which came from Franklin Furnace, N. J., and was made by reducing the complex manganese-zinc mineral franklinite, occurring in the district. A mechanically and electrostatically separated franklinite product is roasted with anthracite to eliminate the zinc, and the residue, containing about 15 per cent manganese and 40 per cent iron, is smelted to spiegeleisen.

THE PETROLEUM INDUSTRY

The Petroleum Industry in Mexico

Numerous Factors Have Retarded the Full Development of Oil Possibilities Exports for the First Half of 1920 Show an Increase, and Extensive Exploration Is Now Being Done*

A COMPARISON of figures on the production of oil in Mexico, in the United States, and in the world since 1912 shows that the Mexican production has multiplied more than three times in the last seven years. Though in 1913 Mexico supplied only one-fifteenth of the world's production of oil, in 1918 it furnished more than one-eighth.

Statistics show that the world's actual production of oil in 1918 was about 515,000,000 bbl. The potential production of Mexico during 1919 was 547,000,000 bbl. By the term "potential production" is meant the amount of oil that would be produced if each well were permitted to flow without any restraint being placed on it. In 1919 Mexico was potentially able to produce 32,000,000 bbl. more oil than was actually produced in all other countries in 1918, and 170,000,000 bbl. more than the United States production of 377,000,000 bbl. in 1919. The potential production of the wells already drilled and producing in Mexico is estimated at from 1,500,000 to 1,900,000 bbl. daily. But only about 12 per cent of the potential capacity of the wells in Mexico is being actually produced. The full development of the potential possibilities of the industry in Mexico has been hindered by the lack of transportation both for oil and materials, by the lack of sufficient storage facilities, and by the disorganized political conditions of the country. The application of new legislation to the industry, the effect of which it has not been possible to fully ascertain at this time, has tended to halt development operations. Yet the exports of oil from Mexico in the first half of 1920 show a notable increase over the shipments in previous years.

COMPARISON OF MEXICAN AND AMERICAN WELLS

The output of the wells in Mexico can best be illustrated by a comparison with the wells in the United States. The oldest wells in this country are in the Appalachian region and number about 100,000, with an average daily yield of less than two-thirds barrel per well. The newest region is the Rocky Mountain, with 400 wells and an average per well of 40 bbl. daily. The Mid-Continent field of America, with nearly 50,000 wells, averages 9 bbl. daily. The California field, with an annual production of about 100,000,000 bbl., yields an average of 30 bbl. daily per well.

The known oil-producing areas of Mexico may be divided into three main regions, as follows:

The Tampico Region.—The Ebano field is situated forty miles west of Tampico. The oil from this field has a very heavy percentage of asphaltum, and averages about 12 deg. Bé. (0.986 specific gravity). The Panuco field, comprising the productive areas between the Tamesi and Panuco Rivers, is twenty to thirty miles southwest of Tampico. The Panuco or Topila product is a heavy, viscous oil of from 10 to 15 deg. Bé. This field is noted for relatively few failures in drilling. The Huasteca field is south of Tampico and north of the Tuxpam River. This is a field of big producing areas, such as Casiano, Cerro Azul, and Potrero del Llano. The oil is lighter than the Ebano and Panuco grades, averaging from 19 to 21 deg. Bé. (0.9395 to 0.9271 specific gravity).

The Tuxpam Region.—The Tuxpam field is situated south of the river of the same name. The oil is lighter than in the regions farther north, being 19 to 22 deg. Bé. The wells are characterized by long periods of productivity. The Furbero field is about forty miles southwest of Tuxpam. The oil is 24 deg. Bé., but the yield has not been large, and the field is not now producing.

The Tehuantepec-Tabasco Region.—The Tabasco-Chiapas field is noted for the quality of its oil, which has a paraffin base, is very light, and contains a large proportion of illuminating oils. Exploitation of this field has not been active since 1917.

Isthmus of Tehuantepec field produces an oil of from 25 to 32 deg. Bé. The field is characterized by the short period of productivity of the wells and the shallow depth to oil. Operations in this field have not been of great importance in the last few years.

The temperature of the oil as it comes from the various wells in Mexico ranges from 105 deg. F. at Ebano to 165 deg. F. in the water and oil of the Dos Bocas. The pressure per square inch varies from 285 lb. in the Casiano well to 850 lb. in the Potrero gusher.

HISTORY OF MEXICAN OIL DEVELOPMENT

The earliest reference to oil as an industry in Mexico occurs in pamphlets issued in 1857, which record the agreement of a group of merchants in the village of Macuspana, Tabasco, to furnish cacao in exchange for "sheets of forged iron" to be used in storing "illuminating oil" which flowed from a spring near the village. In 1865 the government issued a permit authorizing a certain Spaniard to exploit the deposits of bituminous and oleous substances near San Jose de las Rusias, Tamaulipas. The favorable results obtained by this Spaniard led to the organization of the Development Co. of the Gulf of Mexico in 1868 by a group of Mexican planters for the purpose of exploiting the petroleum seepages and springs situated near Furbero, Papantla, Vera Cruz. This company failed because of financial difficulties. An attempt by Dr. Autrey to continue the development of this field in 1878 was unsuccessful also.

The failure of all these enterprises and those

*Abstract from Latin American Circular No. 71, prepared by the Bureau of Foreign and Domestic Commerce.

immediately following produced a period of pessimism regarding the oil industry in Mexico lasting until about 1900. In that year American oil men, headed by E. L. Doheny and C. A. Canfield, purchased some land at a place now called Ebano, in San Luis Potosi, near the Vera Cruz boundary. In the spring of 1901 a camp was established and drilling began on the first of May. In just two weeks the first profitable well was developed, although its yield was only 50 bbl. a day. There followed three years of continuous and fairly successful drilling by this company, under the name of the Mexican Petroleum Co. A so-called "gusher," yielding 1,500 bbl. daily, was brought in on April 6, 1904, and this well is still flowing at the present time, production being about 800 bbl. daily. The total production of oil in Mexico in the first year of success—1904—was 220,000 bbl.

Early American and British Oil Investors

The development work of the Mexican Petroleum Co. proved so successful that a policy of expansion and exploration was adopted. In 1906 the company acquired several tracts of land situated from 60 to 100 miles south of Tampico. The two English companies holding part of the tracts had failed to discover oil in paying quantities. In July, 1910, a 14,000-bbl. well was brought in by the Mexican Petroleum Co., and the production of oil on a large scale was begun in Mexico. Exports of oil from that country began in 1911.

Soon after Doheny began his operation in the Ebano region an English company, S. Pearson & Son, Ltd., started exploitation on the isthmus of Tehuantepec, and in 1906 extended its activities to the fields south of Tampico. The first well on the isthmus was brought in in 1904, and in 1910 the famous Potrero del Llano was developed in the Huasteca field. This well had a possible daily production of 100,000 bbl. when brought in, and flowed until December, 1918, when it went to salt water. In 1906 S. Pearson & Son, Ltd., contracted with the Mexican government to exploit government lands in the states of Chiapas, Campeche, Vera Cruz, Tabasco, Tamaulipas, and San Luis Potosi. This company has continued to acquire oil lands in Mexico.

Explorations for New Fields of Production

Increasing attention is now being given to the exploration of various other parts of the republic for the discovery of oil. A recent report of the Mexican Petroleum Department, of the Department of Commerce, Industry, and Labor, Mexico City, places the zone of possible production in the Gulf Coast States at over 80,000,000 acres, on the Pacific at about 50,000,000 acres, and in Lower California at about 18,000,000 acres, a total of 148,000,000 acres, or 230,000 square miles. Of this immense area only about 6,500,000 acres have been investigated, which illustrates the scope offered for wildcat operations in Mexico. The combined area of the fields now being exploited in Mexico does not exceed 800 square miles.

The discovery of what is believed to be extensive petroleum deposits on some islands in the Gulf of California has been officially announced by the Mexican government. These islands are close to the shore of Sinaloa, due west of Hermosilla, and the deposit is said to extend to the mainland on the peninsula of Lower California. The southern district of this peninsula has given indications of an extensive petroleum zone, and it is being thoroughly explored.

Exploration is also being carried on in different parts of Mexico, as follows: Durango, in the neighborhood of Mapimi; Colima, in the vicinity of Santa Rosalia and of Manzanillo; Chihuahua, in the vicinity of Casas Grandes, Guzman, Trinidad, Santa Maria, southeast of Ojinaga, and near Juarez; Coahuila, at Ubalde, near Piedras Negras, and at Nuevo Laredo; Chiapas, in the departments of Palenque and Mezcalapa; San Luis Potosi, in the Valles district; Jalisco, vicinity of Lake Chapala; and in various parts of Yucatan.

Ownership of Mexican Wells

Of the total investments in the oil industry of Mexico 97 per cent is held by foreigners. In the petroleum industry of the United States but 4 per cent of the total amount invested is held by foreign capital. In 1918 there were twenty-seven companies in Mexico which produced oil in commercial quantities, seventeen of these being owned by Americans, five by Spanish-Mexican capital, three by Dutch, and two by British interests. Of the total of 63,828,326 bbl. produced in Mexico in 1918, the American interests produced 73 per cent, British 21 per cent, Holland 4 per cent, and Spanish-Mexican 2 per cent. In 1919, however, the British interest materially increased their production. Only American and British interests shipped oil from Mexico during 1918, the oil exports having been 79 per cent American and 21 per cent British.

The refining plants in operation at the present time consist of four in Tampico, one in Tuxpam, one in Vera Cruz, and the oldest one of all in Minatitlan. These refineries have a total capacity of approximately 100,000 bbl. daily. Not more than 22 per cent of the oil exported from Mexico is sent out in the refined state. The future will probably witness the establishment of several new plants of large capacity.

The exports of oil from Mexico in the first six months of the calendar year 1920 amounted to nearly 60,000,000 bbl., representing an increase of 72 per cent over the exports in 1919. If this rate of increase is maintained throughout the year, the total exports for 1920 will reach 135,000,000 bbl., in comparison with 78,000,000 bbl. in 1919.

Destination of Mexican Oil

Of the total exports in June, 1920, the shipments from the Tampico district amounted to 10,566,181 bbl. From Puerto Lobos the shipments were 3,384,513 bbl., and from Tuxpam 1,472,553 bbl. The United States took 71 per cent of the total, South America 8 per cent, Great Britain 4 per cent, Cuba 3 per cent, and Mexico itself 4 per cent, the small remainder going to various countries of North America and Europe. In accordance with its usual record the Huasteca Petroleum Co. was the largest shipper, its exports for the month of June totaling 2,189,750 bbl. Production was somewhat curtailed in June by floods in the lower country, which damaged the oil fields.

The total imports of oil from Mexico into the United States in the fiscal year ended June 30, 1920, reached the record figure of 2,821,693,174 gal., or 67,183,170 bbl. (at 42 gal. to the barrel). This shows a gain of 991,598,069 gal., or 23,609,478 bbl., over the imports of the 1919 fiscal year, which amounted to 1,930,095,105 gal., or 45,954,645 bbl. The gain was 100 per cent over the imports of 1918, when the imports were somewhat more than 1,000,000,000 gal.

NEWS FROM THE OIL FIELDS

Recent Rains in Texas Fields Cause Production Decline

From Our Special Correspondent

In the North and North Central oil fields a considerable decrease in production was recently evident. This was due largely to interference with development work by recent heavy rains. Production changes in these fields lag only slightly behind changes in development. The fields principally affected were Burkburnett, those of Stephens County, and Desdemona, in Eastland County. The Eastland-Ranger district of Eastland County made an increase in production over the preceding week. In and around Burkburnett a number of wells were completed, but all of them were small producers, and their combined production was not sufficient to offset the natural decline in the older wells.

It is reported that Walker & Perkins have sold a 40-acre lease out of the Goodwin tract, one and one-half miles northeast of Breckenridge, for approximately $1,500,000. This lease includes one producing well that came in two months ago making 5,000 bbl. of oil daily. Completions have been made in the Breckenridge Townsite field by the Virginia Oil Co., Ibex Oil Co., Plateau Oil Co., and others, all of these companies bringing in good producers. In some cases the wells were brought in after shooting. Acreage in the northern part of Stephens County in the vicinity of the Leydon field is being leased for as high as $1,000 per acre in some cases.

The Killeen-Mellon well in Bell County is reported to have struck oil and gas in the black lime below 1,850 ft. This is in wildcat territory, and any discovery here will be of considerable importance.

In the Gulf Coastal section the Hull field made the largest increase in production during the week ended Sept. 25, reaching about 18,000 bbl. per day. The Republic Production worked over its No. 20 Dolbear, getting a flow of 4,000 bbl., and completed Nos. 37 and 40 Dolbear, which made initial productions of 1,500 and 350 bbl. respectively. These are all in the 800-acre Dolbear tract. The joint well of the Sun and Texas companies was drilled to 4,070 ft. and then pulled back and casing set from 3,570 to 3,680 ft. The flow gave 300 to 400 bbl. oil and 1,200 to 1,500 bbl. salt water. This is one of the deepest wells in the field and the most southerly.

Interest at West Columbia still centers on the No. 1 Abrams well of the Texas Co. which continues to flow 7,000 bbl. through the drill steam. Three wells immediately north of this well are now down below the depth of the Abrams No. 1 without results. These are the Monarch Oil & Refining Stribling well, over 3,280 ft., No. 1 Masterson of the Gulf Production Co., over 3,200 ft., and the No. 1 Robinson of the Humble Oil & Refining Co., 2,900 ft. plus. Production from the West Columbia field was over 20,000 bbl. daily during the week ended Sept. 25. The Humble Oil & Refining Co. completed its No. 28 Japhet well at West Columbia recently. The next morning it was flowing at the rate of 15,000 bbl. daily or better. This well is a little less than 3,400 ft. deep, and is on the northeast corner of the Japhet lease.

An interesting deep test was made in the Goose Creek field by the E. F. Simms Co in its No. 33 Ashbel Smith well which was deepened and tested below 4,000 ft. Considerable gas was obtained and an oil spray. This is the deepest hole in the field. Goose Creek is one of the few sections in the Gulf Coast country believed to be salt domes where salt has not yet been found.

New Well in Mule Creek Field

From Our Special Correspondent

The Western States Oil & Land Co. completed a well in the Mule Creek Field recently, making the third producing well completed during September. Other wells are being drilled in this section. This company also brought in a 350-bbl. well in the Salt Creek field a short time ago.

It is reported that oil has been struck at 400 ft. in a wildcat well being drilled on the Ziller ranch near Cumbe land, Lincoln County, by Oregon men. The oil is said to be of high grade.

The Standard and Midwest refineries at Casper will be supplied with gas for fuel as soon as the 12-in. main can be laid across the Platte River and connections made. The gas will supplant the oil now being burned.

The Sunset Oil & Land Co., it is reported, has struck oil at 3,700 ft. in its well on Sect. 6 of the Lance Creek field. This well is a considerable distance southwest of any previous drilling.

In this same field, the Western States well on Sec. 28, on the far east side of the field, tried to change itself from a pumper to a gusher; two high heads of oil were made on successive days.

The Producers & Refiners Corporation has struck oil in its No. 2 well in the Osage field at 1,500 ft. The well will be drilled in deeper and placed on the pump. This well is 2,000 ft. southeast of the company's No. 1 well. This company is also drilling a wildcat well in the Williams Park district, near Hayden, Routt County, Colorado. The first casing has been set.

Activities in the Tampico Region

From Our Special Correspondent

The damage done by the fire which threatened the Cia Mexicana de Petroleo, "El Aguila," refinery is now estimated at nearly one million dollars. There were five 55,000-bbl. storage tanks, and a 2,000,000-bbl. reservoir of asphalt destroyed before the flames were extinguished. The fire started early Monday morning, September 13, one of the tanks being struck by lightning, and was not controlled until Tuesday evening after the hardest kind of fire fighting. No foamite or steam was available. The entire tank farm and refinery were in serious danger for several hours, as there were a number of gasoline tanks within a hundred yards or so of the flames.

The Aguila company recently brought in another big well in the Los Naranjos field on Lot 134 Chinampa. It was controlled in six and one-half minutes. The well is estimated at 60,000 bbl daily.

There are several new holes being put down on lot 114 Chinampa and there is a great deal of interest in the drilling to see who gets to the pay first. There are already six producing wells on this lot varying from 20,000 to 50,000 bbl. daily.

The tests in Zacamixtle are being closely watched by many, as some of them are starting to look doubtful. This field was reported on by geologists, and is on line between the Amatlan-Chinampa field and the Cerro Azul pool

Deep Pool To Be Tested in Warren County, Ky.

From Our Special Correspondent

Geologists who have conducted a two months' investigation of deep strata in Warren County report that a deep pool lies there which operators will test out soon. A dual structure is said to underlie the field, indicating that a well touching this level will quadruple the present average production per well and will show a depth of sand twice as great as in the present shallow depths. The intersection of the dual structure occurs at Sand Hill and extends two and one-quarter miles in all directions.

The Callis Oil Syndicate brought in a 50-bbl. well Sept. 29 on the George Sledge lease in Warren County. No. 2, on the Jackson lease, one mile south of Bowling Green, has been brought in, pumping 20 to 30 bbl. a day. Both No. 1 and 2 on this lease indicate that the are on the edge of a pool above the shale. Several deep wells will be drilled.

Kerstedder brought in a well Sept. 27 on the Briggs lease, five miles west of Bowling Green, estimated at 25 bbl.

Denver Convention of Independent Oil Men Draws Large Number

Jobbers, Refiners and Supply Men as Well as Producers Discuss Papers Presented--Van. H. Manning's Address a Feature—Many Companies Have Part in Exhibit—Story of Petroleum Shown in Films

BY GEORGE J. YOUNG

THE term "oil man" is as inclusive as the term "mining man." However, it has the significance, when used by the Independent Oil Men's Association, which held its convention in Denver, Col., from Sept. 28 to Oct. 1, that it excludes all companies which are affiliated in any way with the Standard Oil group and includes in its membership companies, that are essentially jobbers, refiners, and supply men. Indirectly producers and the petroleum industry generally are interested in this association because it has to do with the marketing and handling of petroleum and its products. The membership of the association consists of 300 companies. T. J. Gay, of the Gay Oil Co., of Little Rock, Ark., is president.

The organization is not a militant one in so far as the Standard Oil group is concerned. On the contrary, it co-operates with this group in many ways that are important to the welfare of the petroleum industry. Its chief purpose is to fight improper trade standards, improper competition and to advance the interests of both producers and marketers of petroleum products as well as the industry generally.

By the evening of Sept. 27 the badges of the association became conspicuous in numbers. The way the convention opened might be compared with the bringing in of an oil well. First, a rush of water, and then gas, and finally the oil spouts. Although from the announcements in the program the subject of oil was expected to be reached on the first day, the important speakers, Governor S. Bamberger of Utah and Dr. Cottrell of Washington, did not arrive and substitutes took their place. At the luncheon President Gay presided and introduced Governor Oliver H. Shoup of Colorado and D. C. Bailey, mayor of Denver, who welcomed the delegates to Denver. At the conclusion of the addresses all adjourned to the Auditorium, where an interesting exhibit of marketing appliances, motor trucks, tanks, metal hose, pumps and oil-testing apparatus was on display.

The afternoon session was held in the Auditorium, with President Gay in the chair. E. R. Harper, former lieutenant-governor of Colorado, was the first speaker. He discussed the potential resources of Colorado in the large deposits of oil shale and pointed out in an emphatic way the need for almost unlimited capital to carry the oil shale possibilities to commercial success. In closing he briefly touched upon the subject of unfair freight rates, which, in his opinion, discriminated against the users of petroleum products in Colorado. Harry S. Botsford, manager of the Puente Oil Co., of Los Angeles, Cal., was the next speaker. His address was on the subject of the vital need of better American citizenship.

Fred W. Freeman, president of the Elk Basin Consolidated Petroleum Co., then spoke. He said: "The oil business is a wonderful business. This is principally on account of the number of 'experts.' It's the only business that can register 100 per cent. I can prove that there never was a dry well in the United States. It is the tradition of success that lingers around an abandoned well or else the story of the Standard Oil buying up the well and closing it down just when it was ready to produce that proves my assertion. Once I drilled two wells, prospects. One developed a little gas and the next one was a beautiful salt water artesian well. Some years later I was in the same locality and found that attempts were being made to develop oil on the strength of a report that the wells I drilled had been purchased and closed down by a large oil company." He closed his address by calling attention to the large number of grafters afflicting the oil industry and said that it is the duty of the association to put the stamp of disapproval upon the men who exploit the people in the name of the industry.

"FORTY-NINE" ENTERTAINMENT ARRANGED FOR DELEGATES

The entertainment of the evening of Sept. 28 was a "humdinger." Whoever had the arrangements in charge was an expert in human psychology and particularly the psychology of oil men. It was called a "forty-nine" evening. The cathedral room of the Albany Hotel was the stage and all who attended were participants. Of course there was a little outside talent from the "Midnight Follies." There was something doing every minute from the time each eager delegate tied his red bandana about his neck and grasped his corncob pipe, handed to him as he entered, until he cut his way through the smoke-laden air to the door on his way to his hotel. Probably none thought of what an old "forty-niner miner" would have thought if he had had the good fortune to have been present, but we can picture his amazement and we know that, if he retained any power of speech, he would be just able to say "some night, oh boy!"

Wednesday opened up another fair day and the convention began to get down to business. President Gay introduced T. F. Kuper, of Chicago, secretary and treasurer of the Mideo Oil Sales Co., who made an eloquent plea for the establishment of a workable code of ethics for jobbers and refiners. He offered a resolution to the effect that the association appoint a committee to confer with the various divisions of the oil industry and work out a suitable code for adoption by the association.

In the discussion that followed W. F. Farish, of Chicago, called attention to the work already done and in progress by the American Society of Testing Materials. Mr. Kuper in reply stated that the association's committee would work in harmony with the society.

O. W. L. Coffin, of the White Co., Cleveland, Ohio, the next speaker, presented the subject of "Motor Truck Supervision, Lubrication and Maintenance." He went to the heart of the problem by stating that the selection of proper equipment was fundamental and that next was the human element. Good supervision in handling both men and trucks intelligently reduced maintenance. Lastly lubrication conscientiously carried out and controlled by inspection is the remaining factor necessary to keep maintenance at a minimum. W. F. Parish read a carefully prepared paper on the subject of "Specifications and Nomenclature of Lubricating Oils." Colonel H. C. Boyden, of Chicago, closed the morning's program with the subject of "Concrete Tanks for Oil Storage." He pointed out the wide use of such tanks in the California oil fields and the advantages of their use in other oil districts.

BUREAU'S PETROLEUM FILMS SHOWN

In the afternoon the long delayed moving pictures of the Story of Petroleum, a film made by the U. S. Bureau of Mines in co-operation with the Sinclair Oil Co., were shown. These were elementary in nature but gave the general public an excellent idea of the great divisions of the industry and some of the important details. E. E. Grant, secretary and treasurer of the association, presided and introduced L. F. Moore, traffic manager of the association, at the conclusion of the film story.

Mr. Moore briefly discussed the confusion that is now existing in the freight situation due to the recent increase in freight rates. The distribution of oil products is greatly disturbed by great changes in the relativity of rates. This has operated to give some companies undue advantages over others and to make it impossible for other companies to compete in territory which they regularly served. The amount of feeling displayed in the short discussion indicated that our present situation in freight rates is due for a drastic overhauling before it can be considered equitable in its operation.

Felix Renick, secretary of the New York Petroleum Exchange, made the next address on the subject of the "Relation of the New York Petroleum Exchange to the Industry." Mr. Renick rapidly reviewed the work of the exchange in providing a market for oil securities. The plans of the organization provide for the establishment of a market place for trading in oil securities, a rating bureau which shall receive reports from the companies, a statistical department that will collect information from companies and general sources, and a National Petroleum Club, limited to 1,000 life members, with a library and oil map collection as adjuncts. The plan of the organization is similar to that of the New York Stock Exchange, and its operation will be like it, with the difference that it will be confined to the oil industry. Mr. Renick was of the opinion that the exchange would broaden the market for oil securities, reduce the cost of providing capital for enterprises of a legitimate nature and reduce the fraudulent operations of unscrupulous promoters.

J. O. Lewis, chief of the petroleum division of the U. S. Bureau of Mines, presented the subject "Crude Petroleum and the Ever-Increasing Demand for Petroleum Products." He pointed out the inadequacy of the domestic petroleum production to meet the demand without assistance from foreign sources. The solution of the existing problem, he said, was to be found not in any one thing but in a number of things, such as the recovery of existing supplies in oil fields exhausted by present methods, the development of foreign fields, the discovery of new fields, greater economy and efficiency in the use of products, the development of shale oil deposits, the retorting of bituminous coals and the elimination of all preventable losses in storage and transport.

C. B. O'Hare, manager of the *Petroleum Magazine*, of Chicago, followed with a brief plea for co-operation between refiner and jobber. The afternoon session was closed by a summary of the work of the U. S. Bureau of Standards in investigating lubrication. The paper was written by W. H. Hershell and John E. Schulze and was read by H. C. Dickenson.

At the evening session George E. Collins, of Denver, presided. Mr. Collins called attention to the increasing importance of good engineering in the oil industry in introducing A. W. Ambrose, in charge of the Bartlesville experiment station of the U. S. Bureau of Mines. Mr. Ambrose spoke on the subject "Engineering Applied to Oil Field Production Problems."

Dr. V. C. Alderson, of the Colorado School of Mines, was then introduced and briefly presented his impressions of the Scotch shale oil industry.

The next paper of importance was by Martin J. Gavin, of the petroleum division of the U. S. Bureau of Mines, on the subject of "Possibilities of Oil Production from Shale." Mr. Gavin gave a thorough analysis of the conditions under which the shale oil industry is operating in Scotland. He presented an analysis of conditions applying to the exploitation of oil shales in the United States. He stated that all American shale oil so far produced was much poorer in quality than the Scotch shale oil but that there was some hope of remedying such deficiency, in part at least, by further research as to proper conditions for retorting and refining. He pointed out the need for extensive research but expressed the opinion that in the course of a few years results of commercial importance are to be expected. He emphasized the point so often expressed that large capital was necessary and technical direction essential to the successful working out of the complicated problems involved.

Third Day's Sessions Opened

The meeting on the morning of Sept. 30 was opened by M. J. Byrne, president of the Connecticut Oil Co., of Waterbury, Conn. A. H. Callaghan discussed ethical trade practices. John C. Howard followed with a short but interesting review of the history of oil development in Wyoming. In closing, he briefly referred to oil developments in Utah, stating that while the northern part of the state held forth nothing promising, the central and southern parts are the scene of much activity and some of the large operating companies are giving serious attention to the more favorable localities. F. A. Bean, of Ft. Wayne, Ind., discussed the operation and maintenance of filling stations and C. P. Bowie, of the U. S. Bureau of Mines, closed the morning session with a paper on "Oil Storage and Transportation."

In the afternoon E. E. Somers, of the Somers Oil Co., Denver, Col., presided. He introduced J. O. Lewis, who, in the absence of Dr. F. G. Cottrell, read his paper on "Relation of the Bureau of Mines to the Oil Industry."

The next speaker was Dr. Van. H. Manning, of the Petroleum Institute. Dr. Manning discussed the international aspect of the petroleum industry, and in concluding proposed the following:

"1. To make a careful study of the oil resources of the world and the laws and regulations governing these resources (as described).

"2. Congress should enact a general reciprocity measure covering all trade relations with foreign countries.

"3. To encourage our nationals to acquire and develop and market oil in foreign countries: (a) By an assured adequate protection of our citizens engaged in securing and developing foreign oil fields; (b) By promotion of syndication under a charter of the United States of our nationals engaged in foreign business, in order to effectually conduct oil development and distribution of petroleum and its products abroad."

Sheldon Clark, of the Sinclair Refining Co., Chicago, followed Dr. Manning and pointed out the need for American exploitation of foreign oil fields and the necessity for the Government to get back of the oil industry. P. F. Walker, dean of the school of engineering, University of Kansas, discussed methods for conserving oil and gas in the field. A paper by H. H. Hill, of the Bureau of Mines, on "Refinery Problems," closed the session.

In the evening a banquet was held at the Albany Hotel. President Gay presided. The speakers were Senator Charles S. Thomas, Governor Oliver H. Shoup and James C. Berger. A musical program and songs interspersed the program.

At the business meeting on Oct. 1 the following officers were elected: President, T. J. Gay, Little Rock, Ark.; sergeant-at-arms, Albert J. Squier, New York; new directors: W. H. Barber, Minneapolis, Minn.; G. I. Sweeney, Peoria, Ill.; M. W. Collins, Philadelphia, Pa., and J. T. Barry, Kansas City.

The following resolution was unanimously adopted: "Resolved, that the present percentage advance in freight rates is ruinous to the independent oil industry throughout most of the country; that application to the railroads and to the Interstate Commerce Commission should be immediately made to revoke the recent percentage advance in freight rates on petroleum products and to revise the same on a basis of a flat advance in cents per hundred pounds to maintain the market differential between the large pipe line oil companies and the independent oil companies; that questions arising on intra-state freight rates on crude petroleum delivered from fields to refineries in the same state present problems individual to each of the representative states and these questions should be handled on their respective merits by the individual state commissions, and this association urges the immediate attention of the state commissions to those problems."

On Friday afternoon the delegates and their friends were taken on an automobile trip of seventy miles through the mountain parks in the vicinity of Denver. Luncheon was served on one of the high peaks of the Rockies. The closing feature in Denver was a dinner given by the president of the association to the Colorado State Oil Convention Committee. On Saturday a party left on a special excursion to the shale deposits at DeBeque.

National Safety Council Holds Ninth Annual Congress Sept. 29 to Oct. 1

Record Attendance, Number and Variety of Papers and Discussions, and Increased Interest Mark Meeting of Safety Enthusiasts at Milwaukee Mining Section Holds Sessions Which Cover Coal and Metal Mine Methods and Plans Extension of Activities

STAFF CORRESPONDENCE

THE Ninth Annual Safety Congress of The National Safety Council established a new record for large attendance, the registration having exceeded 2,500 on the last day of the conference. There was also a greater number of papers which were presented at the various sessions and it was very evident that added interest has been and is being shown in the safety movement which is being so well promoted by the Council. Following the custom established by the Council, the meeting was made the occasion of a "No Accident Week" in Milwaukee and it was later announced that only one accidental death had occurred as against seven in the corresponding week the year previous.

At the annual meeting held on Monday morning, Sept. 21, an address of welcome was delivered by Mayor Daniel W. Hoan. This was followed by reports of the president, the general manager, and six committees, and then the election of directors. In the afternoon a public mass meeting, of which George P. Hambrecht of the Wisconsin Industrial Commission was chairman, was held. Marcus A. Dow, general safety agent of the New York Central Lines, gave an address on "Safety Service," and Dr. Franklin C. Wells, medical director of the Equitable Life Assurance Society, spoke on the subject, "Human Conservation." Both of these speakers were well received. In the evening a reception and informal dance was held at the Auditorium Arena. Tuesday's meetings opened with a general "Round Table" discussion which was participated in by members of all sections. Following this, there were the sectional meetings which occupied the balance of the day and took up the greater part of the time during the remaining days. The following is a list of the sections which held meetings: Public Safety, Public Utilities, Employees' Publications, Foundations of Safety, Health Service, Mining, Automotive, Cement, Chemical, Construction, American Association of Industrial Physicians and Surgeons, Meat Packers, Metals, Paper and Pulp, Rubber, Steam Railroad, Textile, Woodworking, Safety Bulletins, Education, Engineering, Women in Industry, Electric Railway, Employees' Benefit, and Boy Scouts. No attempt will be made to cover the meetings other than those of the mining section, although many of them were of interest to mining men.

The first session of the Mining Section was held Tuesday afternoon, there being about sixty present from various sections of the country. C. A. Mitke's paper, "Vocational Training as Influencing Safety and Efficiency," was read by the chairman, B. F. Tillson. Mr. Mitke's paper stated that during labor shortages it was difficult to obtain the results from vocational training that were procurable under normal conditions. He recommended that the training should be carried on not only in the classroom but on the actual work underground, and pointed out the success that had been met with in the plans which had been followed to obtain a standardization of drifting and stoping methods. In the discussion of this paper, E. E. Bach of the Pennsylvania Americanization Bureau said that his company was at present conducting a campaign for "English First," and that this step should be promotive to the vocational training idea. J. W. Reed of the Consolidation Coal Co. told of the success his company has had in the establishment of schools, and said that in addition to the courses in reading, speaking and writing English their mining course had attracted considerable attention from the men.

The next paper, "Industrial Nurses in Mining Communities," was read by the author, George Martinson, safety inspector, Pickands, Mather & Co. The following is an abstract:

INDUSTRIAL NURSES IN METAL MINING COMMUNITIES

It has been established beyond any doubt that a contented workman is more efficient than one who is discontented. Inasmuch as the success of an industry depends upon the efficiency of its employees, it is therefore wise to consider their happiness and contentment. If it is within the power of an organization to remove any causes of inefficiency and unrest, it should be done. There are numerous causes of unrest and they present as many problems and remedies. Not the least of these problems is that of keeping the family contented.

The larger proportion of the miners in the Lake Superior districts are of foreign birth. They have settled in the mining communities with their families. Their wives, being of foreign birth, have come to this country, usually leaving their relatives across the water. They have no warm friends, they have missed the social life to which they were accustomed in the country from whence they came. Finding no social life, it seemed to them that an insurmountable barrier prevented the enjoyment of the social diversions they craved. If this condition existed for a considerable period, what would be more natural than to have them become disgusted with America and its industries which, to their minds, was responsible for their unhappiness. This unhappiness would eventually affect the work of the husband, for instead of finding his helpmate waiting for him with a smile, he would be greeted with a tale of dissatisfaction. With these conditions prevailing, it makes no difference how good the working conditions, or how large the pay check, the man will eventually leave the community for one in which he thinks his family will be satisfied. They will move and find conditions in their new home about the same. After a few more moves, always looking for that better place but never finding it, the workman becomes dissatisfied also, and he begins to feel that the industry is responsible for his unhappiness. When this idea begins to enter his mind, he becomes a comparatively easy prey for the sleek-tongued agitator.

It makes no material difference upon whom the responsibility for this condition rests. It concerns the operators as an industry, and they must prevent it. In other words, they must help supply the joy and happiness which will supplant the tears with laughter, the first requisite of the true life.

It is advisable to employ a person who will be able to fulfill the duties of a nurse and social worker as well. By virtue of her professional training, the nurse can be of service to the workers at the time when they are in trouble and most responsive to kindness. After having gained their respect and love in this way, she can begin her social duties.

A brief explanation of the plan followed by Pickands, Mather and Co. in the Lake Superior district might be of interest. The nurses are members of the safety department, and do their work under the direction of the safety inspector. They are also, of course, responsible to the general superintendent or manager of the group of mines in the district in which they work. Their responsibility to the physician concerns only the cases which he is caring for.

In the discussion which followed the presentation of Mr. Martinson's paper, Mr. Tillson desired to know if any

absenteeism on the part of the miners was investigated by the nurses. To this Mr. Martinson replied that such work was done by the local safety men. Mr. Reed also stated that the work of the nurses in his company was purely that of welfare. Much of the discussion following centered about the actual duties that visiting nurses should perform as most of those present were in agreement concerning the employment of such. The "Round Table Discussion" which was scheduled for this session, was postponed owing to the lateness of the hour.

"Smile Party" Substituted for Smoker

In the evening a "Smile Party" was held in the Arena of the Auditorium, and was attended by about two thousand. Several vaudeville acts were staged, a light lunch was served, and the gathering was concluded with an excellent burlesque on the various industrial sections. Several creditable numbers were rendered by the local Elks' chorus and that of the Federal Rubber Co. under the direction of Otto Singenberger.

First Aid Standardization Advisable

The first paper presented at the Wednesday morning session was "Standardization of First Aid Contests," by Major M. J. Shields of the American Red Cross. Major Shields stated that in view of the large labor turnover at mines it was difficult to maintain efficient first aid work unless a permanent plan of standardization in methods was followed. He advocated as standard the prone-pressure method of resuscitation, the use of iodine with a sterile dressing, the prohibition of the washing of wounds and the application of external heat for the treatment of shock. In the matter of judging first aid contests he recommended that all judges should be men who have had experience in the teaching of first aid work or who had previously judged such contests. In order to eliminate the employment of incompetent judges and an extended prolongation of the contest, Major Shields stated that the meets should not be participated in by more than 50 teams and that not more than 20 teams shou'd take part in the final contest. A questionnaire which was sent out to 45 mining companies brought the following returns: 42 gave first aid training to their men; all agreed that first aid was of value; 14 favored, as a textbook, the Red Cross, Miners' Edition; 11 the Bureau of Mines, Advanced First Aid; 15 had no preference; 3 favored other textbooks, and 12 returned no answer. Thirteen companies declared that 5 per cent of their men were trained in first aid; ten trained 10 per cent; two trained 15 per cent; three, 25 per cent, and three other companies extended the training to as many as 50 per cent of their men.

In the discussion following, D. Harrington of the Bureau of Mines, Denver station, expressed himself as being in favor of standardization of first aid contests for he stated that erratic judging had been the means of placing contests in disfavor in some sections. George Martinson said that the reaction which followed contests was, in general, detrimental to the work, as many of the men showed a disinclination to practice. Orr Woodburn of Globe, Ariz., took exception to this and said that on the contrary the men were stimulated by the contests and that this was one method of reviving interest. B. F. Tillson declared in favor of contests and compared them to baseball in that the best team did not always win. Further discussion was participated in by J. W. Reed, Dr. W. H. Lynott, R. H. Seip, Dr. E. R. Hunter, and C. E. Julihn.

The next paper was that of L. F. Mitten, engineer of the Vulcan Iron Works at Wilkes Barre, Pa., "Safety Devices on Winding Engineers."

Examination of Hoisting Engineers Should Be Compulsory

In discussion, Horace F. Lunt of the Colorado Bureau of Mines said that in Utah a physical examination was required of all hoisting engineers, as it was found that many of the men so engaged were deaf. Martin Flyzie of the State Safety Board, Olympia, Wash., said that the safety of men being hoisted was of the greatest importance, and rigid requirements were made of all the hoisting engineers in his district. The men must be suited physically, mentally and temperamentally for the work. William Conibear of the Cleveland-Cliffs Iron Co., Ishpeming, Mich., stated that at the mines of this company the safety of men being hoisted was in the care of the cage-riders. Further discussion was given by Mr. Tillson, Sim C. Reynolds of the Aetna Life Insurance Co., and John T. Bradley.

Following the discussion a paper, "Signalling from Moving Cages," by Carl A. Allen of the Salt Lake station, Bureau of Mines, was read. This paper is an elaboration of an article which Mr. Allen has already published in the Bureau of Mines "Monthly Reports," an abstract of which appeared in the July 31 issue of *Engineering and Mining Journal*.

In discussion, Mr. Conibear stated that he opposed the idea of having the hoisting of a cage interfered with by anyone on the cage. In contrast to this opinion Mr. Harrington quoted the instance of the North Butte fire where the men were unable to signal when attempting a rescue as the landing to which they were lowered was burned out. Other discussion was offered by Mr. Woodburn, Mr. Seip, Mr. Lunt, Mr. Reed, W. W. Gidley of the Phelps-Dodge Corporation, and Mr. Reynolds.

Engineers Visit Local Plants

No session was held in the afternoon, but several members of the section availed themselves of the opportunity to visit the Cutler-Hammer plant. A number of special switches and controllers were shown to the visitors Others visited the plant of the Milwaukee Coke and Gas Co. where a model of a new loading machine invented by S. H. Hunt, chief engineer of the company, was on exhibition. This machine claims to load 116 cars of 2½ tons capacity in eight hours.

Prevention of Gas Explosions Discussed

On Thursday, Sept. 30, the mining session was opened with the paper, "General Rules for Gas Explosion Prevention in Bituminous Coal Mines," by R. A. Walter, superintendent of the Mulga Works, Woodward Iron Co., Mulga, Ala., and this was followed by the reading of the paper, "General Rules for Gas Explosion Prevention in Anthracite Coal Mines," which was prepared by Joseph J. Walsh, District State Mine Inspector, Nanticoke, Pa. Both of these papers were discussed, particularly by those interested in coal-mining fields.

The paper, "Mine Rescue and Recovery Operations," was read by the author, Orr Woodburn, director of the Globe-Miami District Mine Rescue and First Aid Association, Globe, Ariz. Mr. Woodburn outlined the considerations necessary to handle mine fires and other disasters and emphasized the need of proper equipment and organization. He gave a brief summary of the plan which is followed by his association at Globe and detailed the equipment which is maintained by each of the mining companies participating in the association. The general rules to be observed in the event of a mine fire were also given.

Following Mr. Woodburn's paper, Robert H. Seip, Safety engineer of the New Jersey Zinc Co., Franklin, N. J., presented his paper, "Requirements of Rescue Training for Metal Mines."

The Annual Banquet

The annual banquet was held Thursday evening in the Arena on the first floor of the Auditorium and was well attended. The program was arranged with special thought of the historic significance of the occasion, for it was at Milwaukee that the National Safety Council came into being eight years previous. Phil A. Grau, business manager of the Milwaukee Association of Commerce acted as toastmaster. After introducing members of the organization committee and the first executive committee of the Council who had been invited to occupy seats of honor at the speaker's table, Mr. Grau called upon Major H. F. Doidge, who was in attendance as the personal representative of Lord Leverholme, the head of the British Industrial Safety First Association. Major Doidge told of the safety movement in Great Britain and stated that the knowledge of the accomplishments of the Council and their co-operation had been of great assistance in the work. He also read a letter of greeting and congratulation from Lord Leverholme to members of the Council. Arthur T. Morey, president of

the Commonwealth Steel Co., was the next speaker. Mr. Morey characterized the safety movement as the spirit of service and unselfishness and paid special tribute to those men who were instrumental in the formation of the National Safety Council. He then introduced R. W. Campbell, chairman of the Central Safety Committee of the Illinois Steel Co., who was the first president of the National Safety Council. Mr. Campbell outlined the history and the rapid growth of that organization and stated that much of the progress of civilization depends on the continuation of the safety movement. It is necessary, he said, that the idealism of safety be made practical. The toastmaster then introduced H. Walter Forster of the Independence Associates, Philadelphia. Mr. Forster was asked to speak on "Impressions," and in addition to adhering conscientiously to one interpretation of the subject he made a decided impression on those present. He spoke in a light vein and called the attention of his hearers to certain proclivities and peculiarities of his fellow members of the executive committee, all of which was taken in good part. A. T. Morey announced the officers for the ensuing year as follows; president, Charles P. Tolman; first vice-president, W. H. Cameron; second vice-president, W. E. Worth; third vice-president, L. A. De Blois; fourth vice-president, J. A. Oartel; general manager, C. W. Price; secretary and chief engineer, S. J. Williams; treasurer, W. H. Frater; assistant secretary, R. T. Solensten. Following this announcement, Mr. Tolman, the new president, spoke briefly on the aims of the organization. He stated that the American safety movement was a democratic one, and as evidence of this called attention to the fact that there are now in this country about 50,000 workmen on safety committees. Following the adjournment an informal dance was held.

At the fourth session of the mining section, which was held on Friday morning, the papers, "Accidents from Falls of Roof and Ground in Metal Mines," by John L. Boardman and W. S. Bates of the Anaconda Copper Mining Co., and "Accidents from Falls of Roof and Ground in Coal Mines" by H. A. Kudlik, chief safety inspector, Delaware-Hudson Coal Co., Scranton, Pa., were read by Chairman B. F. Tillson. An abstract of the former paper follows:

Accidents From Falls of Rock or Ore

The driving of drifts and crosscuts include mining operations which should, on the face of things, be the least hazardous with reference to falling ground. These operations are usually performed in virgin ground; the back or roof is always within a reasonable distance of the miner and easily reached for barring down. Timbering is simple and easy and all other conditions should tend to make this the safest mining operation. However, figures show that the very safety of this class of work actually tends to a larger accident rate.

Square set stoping, which from the nature of the work should be considered more hazardous and which is estimated at 70 per cent of the total mining work, has caused only 63 per cent of the falling ground accidents. Rill stopes where no timber is used, and where the working floor is on a slope corresponding very nearly to the angle of repose of broken ore, which is estimated at 9.5 per cent of mining work, caused only 10.3 per cent of falling ground accidents. Timbered rills and stull stopes, which on account of the timber used should be considered safer, are responsible for 3.3 per cent of the underground mining and caused only 1.29 per cent of the accidents. Back filling stopes, which are not timbered and where the working floor is on broken ore, are responsible for 1.07 per cent of the mining work and only 0.88 per cent of the falling ground accidents.

From this information it may be deduced that in the more dangerous mine workings the miner by increased vigilance renders himself less liable to injury than does the man working in the "safe place," who puts too much trust in the ground holding up.

In the discussion which followed, Mr. Conibear asked for expressions of opinion concerning the effect on accidents of timber scarcity. Mr. Gidley replied that the scarcity of timber had an appreciable effect upon accidents in the mines of his company and that it was necessary that at all times there be an adequate supply. Mr. Flyzik of the State Safety Board, Olympia, Wash., stated that although there was a good supply of timber in his section it was essential that the delivery of timber at the mines is such that the men can procure it for their working places with a minimum of effort. Mr. Conibear outlined in a general way the plan of safety inspection followed by his company and emphasized the need of contact between the shift bosses and the officials. Each shift boss is virtually a safety inspector and each receives a prescribed course of training in the school that is maintained by the company. Mr. Martinson stated that in the mines of his company the shift bosses were held responsible for the safety of the men in their charge. B. F. Tillson said that excellent results had been obtained in the mines of the New Jersey Zinc Co. by offering inducements to the foremen obtaining the lowest accident records.

During the past year the mining section has given consideration to the need for a paid technical secretary, and Mr. Tillson outlined at this meeting the steps that had been taken. It has been suggested that an employee of the Bureau of Mines be detailed for this work and that the additional expense be defrayed by such allotment as is necessary from the mining section of the National Safety Council. The matter has already been taken up with F. G. Cottrell, director of the Bureau, and he has agreed to give the matter full consideration. C. E. Julihn of the Minneapolis station of the Bureau of Mines said that it was quite essential to bring the work of the Bureau home to the industry. He expressed himself as being in favor of the plan proposed by the mining section and said that such an idea would necessarily accomplish that and also aid in the work that the National Safety Council was doing.

"Hazards Met in Open Cut Mining" was read by the author, D. E. A. Charlton. This paper appeared in the *Engineering and Mining Journal* of Oct. 2. "Hazards Met in Anthracite Stripping," by F. S. Gallus, district superintendent of strippings, Lehigh Coal and Navigation Co., Lansford, Pa., was read by Mr. Tillson. Following this, Mr. Martinson spoke of the method of flood lighting which is now being used in the open-pit mines of his company on night work. Fusees, similar to those used by the railroads, are also used to indicate points in the pits where blasting is being done at night so that the men are advised and can seek proper shelter. W. W. Adams, statistician of the Bureau of Mines, made a plea for prompt statistics on accidents. He told of the work of collecting statistics and added that the work of that part of the Bureau would be greatly facilitated if the reports were sent in promptly.

Medal Offered By Mining and Metallurgical Society

Announcement was made by Chairman Tillson of the gold medal which is to be awarded by the Mining and Metallurgical Society of America for distinguished service in increasing the safety of men in mining and metallurgical operations.

R. Dawson Hall, chairman of the nominating committee, read the report of his committee and named the following officers for the ensuing year: B. F. Tillson, chairman; Dr. A. F. Knoefel, first vice-president; George Martinson, second vice-president; and Guy J. Johnson, third vice-president. The report was accepted and a unanimous ballot cast for the slate as offered by the committee. Before adjournment a vote of thanks was tendered to Mr. Tillson and the other officers for their service during the year.

Of no small interest to the visitors and members of the Council was the Safety Exhibit which was held in Machinery Hall of the Auditorium and remained open during the entire week. Over 200 booths had been prepared and in these were shown most of the safety devices that are on the market today, either as models or full-size working exhibits. Many of these applied to industrial fields other than those of mining, but all were worthy of attention. Among the exhibits shown were mine rescue, breathing, and resuscitating apparatus, safety lamps, electrical safety switches, controlling devices, metal safeguards for machinery, safety goggles, first aid material, safety signs, anti-slip treads for stairways, portable projectors for showing safety work, and drinking fountains and other sanitary equipment.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Anniversary of Discovery of Gold Celebrated at Dawson

The twenty-fourth anniversary of the discovery of gold in the Klondyke, held at Dawson City under the auspices of the Yukon Order of Pioneers, was specially notable. On the same day the aviators engaged in a flight from New York to Nome, Alaska, arrived at Dawson and Right Reverend Bishop N. O. Stringer, known and respected among Yukon pioneers, delivered an interesting address.

Bishop Stringer's speech sketched the history of the north country and truthfully interpreted the spirit of its present residents. He said, in part,

"All honor to the pioneer. We feel a thrill of pride at the thought of the perseverance and endurance and optimism of the trail blazers of bygone days. The experience of the war proves that the present generation shows no deterioration. That men and women are capable of doing great things now as in past ages. It needs only the occasion and demand to bring out the greatest attributes of mankind. So also the qualities that go to make up the pioneer are not extinct. We have today men and women in this country who are as capable and resourceful as the pioneers.

"This is the second Discovery Day celebration since the conclusion of the war. . . . This time of peace is a day of opportunity. The future is before us. We possess a land full of resources and boundless possibilities. Who would have thought in the days when the Harpers, McQuestens, Ladues, Mayos and, later, the O'Briens and many others, wandered over this virgin land seeking for gold, that the time would come as it did when, within eight years (1898-1905) a hundred millions in gold would be taken from the tributaries of the Klondyke, mostly by primitive methods. When and where we shall have another Klondike no one can tell . . . we hope it will be Mayo, but, wherever it is, I believe it will be only the forerunner of other discoveries in days to came. . . . We take it as a matter of course, that this district can produce potatoes and other vegetables successfully, and that certain grains can be ripened, but many people outside are still astonished to hear this and some will scarcely credit it. . . We are only at the beginning of things agricultural.

"I look forward also to the time when the great barren lands of the North will teem with reindeer and other animals suited to the conditions of the country and climate. Whatever success this country may encounter in the future it will be largely due to the pioneers who led the way and who will still carry on in spite of all obstacles."

"How appropriate it is that at this celebration of pioneers we should now be about to welcome the pioneers of the air who alight in our midst for the first time. This feat is prophetic of the time when we shall no longer be isolated from what we call the outside world, when the difficulties of navigation in air will be overcome and when the words "outside" and "inside" shall have lost their meaning and when we shall be connected with the world generally by steel on land and by wings through the air. It is an epochal day for Yukon and for the North generally. All honor to the birdmen.

Gold Premium Bill Endorsed by Colorado Bankers Association

At the annual meeting of the Colorado Bankers Association in Denver, the alarming decrease in gold production was a subject of discussion. The merits of House Resolution No. 13201, known as the Gold Excise or Premium Bill (or McFadden Bill) was considered and the following resolution adopted:

WHEREAS, the constantly shrinking volume of gold available for monetary purposes is attracting the attention of bankers throughout the country and believing this matter to be one which is of serious import, and with a view to stimulating the production of new gold within the borders of the United States, we unqualifiedly endorse House Resolution No. 13201 of the Congress of the United States, known as the McFadden bill, and urge its passage. We consider it of the highest importance that the gold mining industry of this country be fostered and encouraged, to the end that a basis for credit and currency be not curtailed, and public confidence be maintained in our circulating medium;

Therefore, BE IT RESOLVED, that the Colorado Bankers Association, in convention assembled, endorse the McFadden Bill, and urge our representatives in Congress to do all in their power to obtain its passage, and that a copy of this resolution be sent to our representaives in the Senate and in the House.

Coal Deliveries Conforming to Spa Agreement

The French Ministry of Public Works has confirmed a recent statement by *L'Echo des Mines et de la Métallurgie*, to the effect that the coal deliveries by Germany to France are conforming to the Spa agreement. During August these deliveries exceeded 1,600,000 tons (metric). The agreement required 1,550,000 tons. It is stated by the same authority that this proportion held during the early part of September.

Canadian Institute of Mining Meets at Stewart, B. C.

The North Coast Division of the Canadian Institute of Mining & Metallurgy held a two-day meeting recently at Stewart, B. C., and was attended by representatives of all the important mining centers of the section.

E. J. Conway presided and among the speakers were vice-president E. E. Campbell and Peter E. Peterson, both of whom are connected with the Granby Consolidated Mining & Smelting Co. at Anyox. Mr. Campbell declared that the men most needed now were miners and metallurgists who could mine for a dollar when there was but $1.25 in the ore. He reviewed some of the work being done at Anyox and asserted that the operations there were being carried on at a lower cost per ton than at any other mine in the Dominion. The company concentration work, which Mr. Campbell characterized as unique, was dealt with by Mr. Peterson, who described the concentration methods and stated that these not only were adaptable to the treatment of the ores of the Stewart and Alice Arm zones but ultimately would be in use at those places. A. C. Garde of Prince Rupert, discussed the evolution of the mining industry of the Pacific Northwest.

Dr. J. A. Bancroft, professor of geology, McGill University, emphasized the value of the trained geologist in practical mining. He said that the big national mission of the geologist in the mining field was to work out the geology of districts before the coming of the prospector, thereby saving much useless work by indicating where mineral bodies were not to be found.

The session closed with a banquet at which Pat Daly, prospector and mining operator, referred to the closing down of the Big Missouri in the Salmon River district of Portland Canal. Mr. Daly was not inclined to accept as final the negative results of the limited amount of diamond drilling there and the decision to abandon work.

"Pilgrim half dollars," commemorating the tercentenary of the landing at Plymouth, Mass., in 1620, were issued by the Director of the Mint about Oct. 1. On one side the coin bears the head of a typical Pilgrim and on the reverse a view of the "Mayflower" under full sail. The price has been fixed at $1 each, and coins should be ordered through a bank from the distributing agent, the National Shawmut Bank, Boston, Mass. Any balance from the sales will be turned over to the Pilgrim Tercentenary Commission in official charge of permanent memorials at Plymouth, Mass.

MEN YOU SHOULD KNOW ABOUT

W. Young Westervelt, of New York City, has returned from a recent trip.

B. Britton Gottsberger, former general manager of the Miami Copper Co. was in New York City on Sept. 28.

F. A. Blakeslee, of the Institution of Mining & Metallurgy, London, is reported to have gone from England to California.

Cornelius F. Kelley, president of the Anaconda Copper Mining Co., who has been spending the summer at Swan Lake, has returned to New York.

Harry J. Wolf, consulting mining engineer, who has been in Butte, Anaconda, and Great Falls, Mont., recently, has gone to Sudbury, Ontario.

Alan M. Bateman, mining geologist, has been engaged in professional work in Alaska and British Columbia, and has now returned to New Haven, Conn.

Frederic R. Weekes has returned to New York from a two-month professional trip to the Portland Canal and Alice Arm districts, British Columbia.

H. W. Young, research engineer of the gas department of the Midwest Refining Co., Salt Creek, Wyo., attended the Independent Oil Men's convention at Denver.

Frederic Bradshaw, general manager of Tonopah Belmont Development Co., has gone to Colorado to inspect the Belmont-Wagner property of his company.

C. M. Weld, consulting mining engineer, of New York City, has moved his offices from 66 Broadway to new quarters at 2 Rector Street. (Phone: Rector 1421 and 1422.)

Millard K. Shaler, mining engineer, 66 Rue des Colonies, Brussels, left there on Oct. 1, to be absent about six months on an inspection trip to the Belgian Congo.

F. M. Van Tuyl, who has been examining oil lands during the past few months, has resumed his duties as head of the department of geology at the Colorado School of Mines, Golden, Col.

Homer Guck, for many years correspondent for the *Engineering and Mining Journal* at Houghton, Mich., is now associated with the Detroit Life Insurance Co., as assistant to the president.

Prof. Benjamin L. Miller, head of the department of geology, Lehigh University, Bethlehem, Pa., has returned from Panama, where he was engaged in the examination of some manganese deposits.

Hon. Clifford W. Robinson, of Moncton, N. B., formerly premier of New Brunswick, has been appointed Minister of Mines for that province in succession to Dr. E. A. Smith, who resigned recently.

N. L. Stewart, plant engineer, and **A. H. Richards**, both of the Garfield Smelting Co. of Utah, have returned to Garfield, Utah, from a visit to the Stepto plant of the Nevada Consolidated Copper Co.

John D. Galloway, resident engineer for north-eastern British Columbia, has completed an examination of mica property near Tête Jaune Cache, and the Taltapin property on Babine Lake. He has returned to Hazelton, B. C.

J. P. Hutchins, mining engineer, of New York City, has recently spent three months in Italy, including a trip to some of the ancient mines of the Trentino. Mr. Hutchins' present address is care of Hispano-American International Corporation, Juan de Mena, 10, 2do., Madrid, Spain.

Prof. Stanley M. Graham, formerly of Halifax, N. S., and a lecturer on the mining staff of Queens University, Kingston, Ont., two years ago, has been appointed head of the Department of Mining Engineering in that institution. He is the successor to the late Prof. J. C. Gwillim.

Dr. Charles E. Munro, chief explosives chemist, and **Spencer C. Howell**, chief explosives engineer of the Bureau of Mines, are in New York City on detail connected with the recent explosion in front of the U. S. Assay Office in Wall Street.

J. B. McArthur, a British mining engineer connected with the Associated Gold Mines of Western Australia, Ltd., is visiting mines in northern Ontario and will shortly leave for Australia and China, where his associates have extensive mining interests.

A. C. Watts, chief engineer of the Utah Fuel Co., has gone to the Sunnyside mine, at Sunnyside, Utah, to supervise the reopening of the property, and the reclaiming of that part of the mine which has been sealed off for the past month on account of fire.

G. J. Loughlin, the chief of the Division of Mineral Resources of the U. S. Geological Survey, is making an inspection trip to the Western offices of that bureau. He will also study the newly developed ore deposits in the Tintic and Morgan districts of Utah.

Henry N. Thomson, formerly head chemist for the Anaconda Copper Mining Co., and later superintendent of the Tooele smelter, International Smelting Co., has been appointed professor of metallurgy in the University of British Columbia, Vancouver, B. C.

Waldemar Lindgren, professor of geology in the Massachusetts Institute of Technology, has been in Wallace, Idaho, in connection with the pending apex litigation between the Federal Mining & Smelting Co. and the Hecla Mining Co. Professor Lindgren has been retained by the Federal company.

Donald G. Campbell, mining engineer, has returned to Seattle, Wash., after a year spent at Lost River, Seward Peninsula, Alaska, where he has been superintending the erection of several new concentrating mills. His address is care of Campbell, Wells & Elmendorf, Prefontaine Building, Seattle, Wash.

U. S. Bureau of Mines men at the Independent Oil Men's Association convened at Denver, Col., last week, included among others, F. G. Cottrell, director; J. O. Lewis, petroleum technologist; M. J. Gavin, A. W. Ambrose, Roy Collom, H. W. Bell, L. C. Karrick, C. P. Bowie, Frederick Tough, and H. H. Hill.

Collier Cobb, head of the department of geology at the University of North Carolina, is devoting a year's leave of absence to the study of the relations of certain shore line problems to harbor development along the Pacific coast. He spent a part of the summer in Alaska, and is now engaged in field work along the Washington coast.

OBITUARY

Burroughs Edsall, for some years in charge of the Rochester Merger Mines Co., died recently at Dansville, N. Y., after a lingering illness. Mr. Edsall was born in New York City and a graduate of Columbia College and also of Freiburg University, Germany.

Jacob Charles Denton, of Los Angeles, Cal., and formerly general manager for the Grand Pacific Co., of Superior, Ariz., disappeared mysteriously about June 1. His body was recently found buried in a cellar room of his Los Angeles house. He had been shot on an upper floor with a pistol found there. Just previous to the murder Mr. Denton had made telegraphic arrangements to meet friends in Phœnix, Kansas City, and Chicago on his way east on business. He was forty-six years of age.

SOCIETY MEETINGS ANNOUNCED

American Association of Engineers will hold a conference on employment and education at the Congress Hotel, Chicago, Ill., on Nov. 12. All free employment bureaus and agencies, as well as representatives from engineering societies and colleges, are invited to attend. The meeting purpose is to consider the general problems of employment, and a number of significant addresses have been promised. National headquarters is at 63 E. Adams St., Chicago, Ill.

American Mining Congress and affiliated bodies announces its twenty-third Annual Convention will be held at Albany Hotel, Denver, Col., Nov. 15 to Nov. 19, inclusive. It is planned to make this specifically a producers' meeting "for an open, frank, and unhampered discussion of the peculiar problems facing all industrial undertakings in the United States at this time."

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Tjosevig-Kennecott Suit Before U. S. Court of Appeals

Rowe and Tjosevig Fighting Extradition to New York

The U. S. Circuit Court of Appeals, which opened at Seattle recently, took as its first hearing, the case of George Francis Rowe and Christian Tjosevig, indicted by a grand jury in the southern district of New York for alleged use of the mails to defraud the public in regard to certain representations of mining stock in Alaska. The defendants are fighting extradition to New York to answer the indictment.

About fifteen years ago, according to a review of the case, Christian and Nels Tjosevig, brothers, located a group of claims in Alaska opposite the famous Bonanza and Jumbo copper mines of the Kennecott Copper Co. In 1916 Rowe and others became interested and organized the Tjosevig-Kennecott Copper Co. The stock was offered on the New York Curb and was advertised as one of the finest copper properties in Alaska. A large share of the stock was sold.

In October, 1919, following complaints as to the affairs of the company, indictment by the grand jury of the Southern District of New York followed. After a local legal battle Federal Judge Neterer, of Seattle, ordered the removal of Rowe and Tjosevig to New York to answer the indictment. It is this order that is now being appealed.

Anaconda and Granby Shipping Copper East by Water

Both the Anaconda Copper Mining Co. and the Granby Consolidated Mining Smelting & Power Co. are shipping copper to the East by water. Anaconda has several hundred tons in transit which has been sent by rail to Seattle and thence by water through the Panama Canal to its eastern refinery. Granby has arranged with the Robert Dollar Steamship Co. to carry its copper from Vancouver, B. C., to Brooklyn, where it will be lightered to the Laurel Hill refinery of the Nichols Copper Co. Both companies will continue to ship in this manner under present conditions. It is said that the water route is cheaper and also quicker than the overland haul.

Mine rescue car No. 5, of the U. S. Bureau of Mines, will be at Tonopah, Nev., until Oct. 30, and at Goldfield, Nev., on Oct. 31.

WEEKLY RÉSUMÉ

Both Anaconda and Granby have started to ship their copper to the East via Panama instead of by the overland route, expecting thus to save both time and money. Anaconda has closed three mines, whose production is said to be unimportant. The property of the Nenzel Crown Point Mining Co., at Rochester, Nev., has been ordered sold at public auction. In the Coeur d'Alenes, the labor situation is said to be better. Steady improvement in mining conditions in Mexico is also reported from across the border. Purchase of the Croton Magnetite Mines Co. at Brewster, N. Y., has been effected by the Nipissing Mines Co., of Cobalt, Ont. From London comes word that Burma Corporation, Santa Gertrudis and Broken Hill Proprietary are issuing new capital.

It is reported from Washington that Director F. G. Cottrell of the U. S. Bureau of Mines is anxious to resign and various candidates for the position are talked of.

Northwest Mining Convention To Meet Next Winter

The Northwest Mining Convention will be held in Spokane, Wash., as usual next winter. Owing to the annual meeting of the A. I. M. E., in February, which draws many of the Northwest members, it has been decided that the convention will be held during the week of Jan. 31 to Feb. 5, 1921, closing ten days prior to the New York meeting.

The convention has become such an important event that there has been a complete reorganization of the controlling body. A committee of control has been made up of two members from each of the following bodies: Northwest Mining Association, mining committee of the Chamber of Commerce, Columbia Section of the A. I. M. E., Associated Engineers, Washington State Metal Mining Association and Spokane Stock Exchange. The committee's personnel is as follows: L. K. Armstrong, chairman; M. E. Poole, secretary; Sidney Norman, F. M. Smith, Frank A. Ross, Frank C. Bailey, R. S. Ord, A. D. Butler, Ivan De Lashmutt, E. H. Knight, C. E. Mallette, and Elmer G. Watson. Subcommittees from this list and additional members of the societies will be named, a convention hall and exhibit space will be selected and exhibitors will be asked to indicate their intentions.

Nipissing Acquires Iron Mines

The Nipissing Mines Co., of Cobalt, Ont., has purchased the control of the Croton Magnetite Mines Co., at Brewster, N. Y. The property is said to have large reserves of lean ore that can be readily concentrated.

Britain Gaining Supremacy as U. S. Ignores Gold Question, Says McFadden

Production Here Steadily Falling While That of Empire Increases Owing to Premium Paid

In an interview given out Oct. 7 Representative Louis T. McFadden, chairman of the Committee on Banking and Currency of the House of Representatives, has asked the following pertinent question with reference to the gold situation: "Is the United States to continue to ignore the problem of gold production, thus permitting the British Empire to gain an unquestioned supremacy?" The substance of the interview follows:

An estimate of the gold production of the United States based on the output for the first six months of this year indicates that the production for 1920 will be less than half the amount produced in 1915. In 1915 the United States produced 21.5 per cent of the total world's gold output, and the British Empire 3.7 per cent. In 1919 the United States produced but 16.6 per cent of the world's total gold output, while the British Empire produced in excess of two-thirds. Since July 24, 1919, the British Empire has been paying an exchange premium as high as 50 per cent to the gold producers of South Africa, where the bulk of the British gold is produced, while in the United States no assistance has been rendered the gold mining industry. This year the contribution of the United States to the gold production of the world will probably be not more than 12 per cent, about half of that which it contributed in 1915, while the stimulating effect of the exchange premium will probably increase the quota which the British Empire will contribute to 75 per cent.

REASON FOR DECLINE OF UNITED STATES PRODUCTION

As compared to 1914, the purchasing power of the dollar in terms of all commodities in 1919 was 47c. The gold producers' ounce in 1914 had a purchasing power of $20.67, whereas during 1919 the same ounce could purchase in terms of all commodities but $9.70. Since the price of gold is fixed by statute at $20.67 an oz., the gold producer is in the same position as a person who received the same income in 1919 as in 1914 and finds that a $2,000 income has shrunken in purchasing power to $970. "This is the principal reason for the decline of the gold production of the

United States from $101,000,000 in 1915 to less than $50,000,000 this year," said Mr. McFadden.

"The United States Mint sold for industrial consumption during 1919 nearly $22,000,000 more gold than was produced from the mines of the United States, while this year the drain on the monetary gold stock will probably be $40,000,000. The American Bankers Association passed a resolution on Oct. 2, 1919, urging upon the Government the necessity for maintaining a domestic production of new gold in sufficient volume to satisfy the industrial requirements of the arts and trades. To comply with the specifications of this resolution, the soundness of which cannot be questioned, I introduced H. R. 13,201 on March 22, 1920."

Consumers Now Subsidized

Since the industrial consumers of gold are the only ones in the country receiving raw material at the pre-war price, while the general increase in all commodities was 112 per cent in 1919 as compared with 1914, it is evident that they are being heavily subsidized. Mr. McFadden emphasizes that the imposition of this excise tax merely adjusts the cost and price equation between the producer of new gold and the consumer of gold in the industrial arts, and is free from all monetary entanglements. A free gold market is maintained under the provisions of this bill for the reason that the excise tax is collected on the finished product as sold, and not upon the bullion which is sold to the manufacturers. There is nothing in the bill which in any way alters the number of grains in the standard dollar, the unit of our monetary system. The bill creates the governmental machinery by which the consumer of gold in the industrial arts may pay more nearly the cost of production for his raw material. The stimulus to the gold producer specified in this bill is equal to the excise tax imposed, and is no greater than the exchange premium paid by Great Britain in the latter part of 1919 to the South African producer, whose operating conditions are more favorable than those in the United States.

Heavy French Tax Levied

In addition to paying the exchange discount, which in the case of the French industrial consumer of gold would amount to 100 per cent more in francs than the price paid before the war, the French government has imposed a sumptuary tax for the use of gold in the fabrication of articles (other than money) of 60 francs per hectogram ($3.73 per fine ounce) by law of June 25, 1920. Previous to that date the guarantee tax was 37 francs, 50 centimes per hectogram. The French Government justifies this tax in a formal document transmitted by the U. S. Bureau of Foreign and Domestic Commerce, as follows: "Moreover this tax, striking as it does luxury goods, or unessential articles, enters into the category of a sumptuary tax, the levying of which is admitted a legitimate procedure."

It is important that the gold mining industry be kept alive for fear that with greatly reduced production there will be difficulty in retaining the gold standard during a popular campaign for credit restriction accompained by declining prices. The continued depletion of the gold stock by excessive exportation and industrial use will seriously impair the public confidence in the Nation's finance and currency unless a normal gold output is insured.

The gold mining industry will be completely shut down unless constructive aid is provided without delay, in which event it will take years to develop a normal output of gold at a very much greater expense. To allow the gold mines of the United States to cave in and fill with water entails a waste of developed gold resources, which in a most critical hour of financial need will cause want. No argument can be made in favor of waste. The time to act is now before the industry is shut down.

Leadville Mines Co. in Nevada Installing Small Mill

The Leadville Mines Co., 39½ miles north of Gerlach in Washoe County, Nev., is installing a 50-ton concentration plant. An existing plant which consisted of tables has been torn out and new machinery installed. The unit consists of a Marcy No. 54 ball mill operating in closed circuit with a Dorr Simplex classifier, the 48-mesh overflow of which flows to a Colburn vacuum flotation machine. The concentrates from this are partially dewatered in an 8-ft. Callow cone, the thickened concentrate discharge being drawn off by a Dorrco pump and further dewatered by a 3 x 2-ft. Oliver filter. The concentrate cake is directly sacked without drying. The tailings from the flotation machine are dewatered in a 24 x 8-ft. Dorr thickener and discharged to waste. The overflow, together with all overflow from vacuum and cone, is collected in a sump and used again.

The ore is a silver-lead zinc ore which by water concentration gave a ratio of 7 or 8 to 1. With the flow sheet as described the ratio will be from 10 to 12 to 1 with a recovery of 93 per cent of the lead and silver and with the zinc content of the concentrates below the penalty limit. By adjustment of the flotation machine the grade of the concentrates can be closely controlled. This is a matter of considerable importance, as the concentrates have to be hauled 39.5 miles to rail.

The power unit consists of an 80-hp., 4-cylinder engine using distillate and two semi-diesel engines of 100 and 75 hp. respectively. Owing to the altitude the power delivered by the engines is less than the rated power and is 64, 80 and 62 hp. respectively for the three engines. The power plant supplies both the mine and the mill. The mill and plant are being installed by Lindsay Duncan and Curtis Lindley, Jr., mining and metallurgical engineers of San Francisco, Cal.

Mexican Mining Situation Improving Steadily

Six Hundred Companies Added to List of Operators in Last Ninety Days—Extension of Railways Planned

The general mining situation throughout Mexico has greatly improved during the last three months and finds itself at the beginning of October in a much more satisfactory condition. The fact that silver, Mexico's leading mineral product, has maintained itself between 90c. and $1 per ounce establishes a much more stable basis for mining men to figure on and it is eminently more satisfactory than the boom prices which prevailed at the beginning of the year. Especially are conditions more satisfactory to the smelters, which are also heavy mine owners and operators, and upon whose general movement a great deal of the prosperity of the mines depends.

Labor conditions have also improved notably as a whole, in that they have become more normal. This is due in part to the rapid growth of the demand for mine labor, which is exceeding the supply. The natural consequence is an automatic advance in wages. With better wages and reasonable assurance of steady employment the Mexican miner lends small ear to the harpings of labor agitators and professional trouble organizers. Mining camps in this country now furnish barren soil for anything like Bolsheviki propaganda, although considerable headway is being made by the Russian "wing" as well as the I. W. W. in some of the larger centers and in the oil fields, where a great many foreigners are employed.

The recent order of the Secretary of the Treasury removing all Federal taxation on low-grade propositions in order to enable them to temporarily overcome many natural obstacles encountered in a period of reconstruction has heartened the small operators and literally hundreds of small properties, which have been idle for years, are being opened and development is being pushed. The treasury department has appointed a commission to keep "tab" on the general economic situation, with particular reference to mining activities, that is, fuel, transportation, imports, etc., and it is the evident intention to grade the mining taxes according to conditions from time to time.

In a statement just issued by the Secretary of Commerce and Industry of Mexico it appears that there are now in round numbers 30,000 mining properties with proper titles, out of which 4,000 and some odd are actually being exploited. This is an increase in working mines of over 600 in the last ninety days. Most of the renewed activity is in the northern states, though considerable life is shown in the central part of the country, particularly in Guanajuato, Zacatecas and Jalisco.

The same department of Commerce and Industry is giving especial attention to the extension of railway lines in territory which will produce heavy mining outputs. Contracts have been

let, for example, for extension of the branch from Parral, into the Inde and El Oro district, from Rosario, the present terminus; also for an extension of the Mexican Northern, which leaves the Central at Conejos, to the barranca fronting the Inde region; also an extension of the National Line in Durango into the Guanaceví district; also extensions in Zacatecas; from Durango to Mazatlan (now working); from Toluca through the state of Mexico and the state of Michoacan to the Pacific Ocean. In addition to railway extension projects several score contracts have been signed for extending automobile roads where railway lines are impractical or too costly. It will probably be possible by the first of the year to make a run from the City of Mexico to Acapulco, in auto, and return the next morning.

With the exception of cyanide, which has advanced slightly, there has been no appreciable change in prices of mining supplies during the last thirty days. There has been a slight drop in local market prices, that is, in beans, corn, meat, rice and sugar.

Coeur d'Alene Labor Situation Reported Improved

Men Returning from Surface Jobs as Winter Approaches—Open Shop Maintained

A steady improvement in the labor situation in the Cœur d'Alene district of Idaho is noted, and the prediction is made that the next few weeks will find the mines generally working with normal forces and with a corresponding increase in output. The chief difficulty has been that during and since the war the rate of wages for outside work has been as high or higher than that paid in the mines, and in that situation men naturally prefer surface work while weather conditions are favorable, and return to the mines only when driven to it by cold or otherwise disagreeable weather. Before the war wages in the mines were generally higher than for similar classes of work outside, and the increased pay acted as an offset to the objections to underground work. Another good feature of the situation in the Cœur d'Alenes is that the district is comparatively free from radical agitators. The firm attitude of the operators in maintaining the "open shop" system, together with the activity of the peace officers in the enforcement of the Idaho law against criminal syndicalism, have combined to bring about a very satisfactory condition throughout the district.

Kuskokwim River District Makes Record Gold Shipment

Marking a new epoch in northern mining development and representing the largest shipment ever sent out of the Kuskokwim River district between Seward Peninsula and the Aleutian Islands, a consignment of $150,000 in gold dust arrived in Seattle recently. This shipment represents the pioneering of placer miners panning the streams tributary to the Kuskokwim River.

Talk of Starting B. C. Steel Industry More Definite

President of Canadian Collieries Goes East in Interest of Project

By Robert Dunn

In the last few weeks there has been much talk and the indications are that there will be some action with regard to the establishment of an iron and steel industry in British Columbia. For some time H. A. Fleming, president of the Canadian Collieries (Dunsmuir), Ltd., has been in the province investigating local conditions with respect to the iron ore resources of the country and the market that may be relied upon for such a Pacific Coast enterprise. Recently he interviewed William Sloan, minister of mines, in regard to the assistance that might be expected from the government in the event of his company entering upon the enterprise. The minister and Mr. Fleming went into the matter thoroughly and subsequently the latter issued a public statement the purport of which was that he felt convinced that conditions were opportune for making a start along the lines indicated. He said that he was leaving for the East, and would take immediate steps to get the matter forward. It was his hope that within a short time it would be possible to make a definite announcement.

The foregoing incident occurred after it had been announced from Vancouver that Nichol Thompson, a prominent resident of that city, who for some time has been interested in the promotion of an iron and steel industry for his province, had appeared before the Tariff Commission, now touring the Dominion and had there given evidence that there exists on the Pacific Coast a market up to 1,500 tons a day for iron and steel manufactured in British Columbia. It was stated by Mr. Thompson that he had reliable information on which to base this assertion, having just completed a tour of the Coast, made for the special purpose of inquiring into these particular market conditions. Mr. Thompson urged that in the interest of mining in this province the tariff existing on drill steel before the war should be continued. This permitted free importation of steel costing more than 3½c. per lb.

Talking about his experiences while on tour, Mr. Thompson affirmed that there existed a daily demand of from 1,000 to 1,500 tons of pig iron. In answer to inquiries Mr. Thompson explained that 20,000 tons of Texada Island ore had been treated at Irondale, in Washington, and that it had been used in conjunction with other ores in the manufacture of steel for two United States warships. The latter method had proved that the ores of British Columbia could be used to produce iron and steel without importing fluxing ores. The difficulty which had retarded production in the past had been the market.

Merrimac Co., Near Boston, Gets Returns on Silver-Lead Ore Shipment

The Merrimac Development Co., which is operating at Newbury, Mass., 32 miles from Boston, received returns averaging $67 per ton in gold, silver and lead on a car of silver-lead ore on Oct. 2 from the American Smelting & Refining Co. Further shipments are in progress. A new shoot of copper ore cut Oct. 1 on the 220-ft. level east has demonstrated the existence of a new deposit. Todd C. Woodworth is president of the Merrimac company.

Proposed Steel Deal Ratified

Shareholders of all companies concerned have ratified the proposal to sell out to the British Empire Steel Corporation, according to a press dispatch, and consummation of the contracts will be made immediately upon the $25,000,000 preference stock of British Empire Steel Corporation being sold, and the funds becoming available for the use of the new corporation. There has been considerable opposition from the finance department at Ottawa and from other interests in Canada against raising this money in Canada, and it is understood practically the entire $25,000,000 is being underwritten in London, subject to the clearing up of certain legal matters.

Tripoli Mining Near Seneca, Mo., Attracting Attention

Increased interest in the tripoli mining industry is promised for this district. About a year ago the Barnsdall Corporation of New York bought the Seneca Tripoli Co.'s plant and mines near Seneca, Mo., about 15 miles south of Joplin. For several months past, under the name of the American Tripoli Co., it has been combining the two tripoli mills that heretofore had been used in making the filters and tripoli powder, and now has this work virtually completed. The new and enlarged mill is located at Seneca.

This week announcement was made of the organization of the National Tripoli Co., and the purchase by it of a 253 acre tract of land south of Baxter on which an extended run of tripoli has been located, about five feet beneath the surface. Dr. T. A. Smith, formerly of Topeka, Kan., now of Joplin, is at the head of this organization, which plans the immediate construction of a tripoli mill on its lands.

Recent Production Reports

Phelps Dodge produced 7,998,000 lb. copper in September compared with 8,365,000 in August.

Inspiration produced 6,500,000 lb. copper in September compared with 7,200,000 in August.

The shipments of the Consolidated Interstate-Callahan in September were as follows: 4,230,000 lb. zinc concentrates, 2,180,000 lb. lead concentrates, and 21,800 oz. silver; which compare with 4,452,000 lb. zinc, 2,014,000 lb. lead and 20,140 oz. silver in August.

Iron Industry of Germany Reviving

Increase in Orders Slight But Gives Hope That Market Conditions Are Changing for Better

By Our Vienna Correspondent

Vienna, Sept. 10—After months of inactivity in the German iron industry there has recently developed a very slight increase in orders. Slight as it is, the circumstance arouses the expectation that the unsatisfactory market conditions have been overcome, and that by fall more active business will develop and serve to bring the factories safely through the winter. The revival is based on increasing orders of domestic consumers as well as on a very recent increased demand from abroad. There has been considerable decrease recently in stocks held by direct consumers and by dealers who had very considerable supplies a few weeks ago. As the traffic through second and third intermediaries has suffered a considerable decline it is natural that consumers should lose some of their diffidence. At present, however, most of the business has been in the form of inquiries to try out the market conditions, but in view of recent occurrences it may be safely assumed that 15 to 20 per cent of the queries will lead to actual orders. The reaction on the individual products of the market varies: Pig iron needs will be but partly met, chiefly because of the recent greatly diminished deliveries possible from the victor countries; rod, strap, and heavy sheet iron enjoy a continued strong demand; but the trade in light sheet iron continues very depressed. Contracts that had previously been closed at 9,000 or 10,000 marks per ton (metric) are now being made at as low as 4,000 marks. This will hinder the starting of new enterprises. The same holds for the piping market, since the cessation of building operations has stopped the demand for gas-piping. Further lowering of prices is the less to be expected since Exchange has further fallen and the contract prices for pig iron have risen considerably. Deliveries are usually demanded within two or three weeks, which the works rarely can meet.

Numerous orders for export are being received from the northern countries by way of Hamburg, in individual cases amounting to as much as 10,000 tons, and are in very many cases meant for deliveries to Russia. At present Switzerland and Holland are not so strong on the German iron market. In the case of the Netherlands this is due in part to the cheap freights in the German ports. Contracts for the building of 100 railway locomotives of the heaviest type will be closed with Russia, a deal involving 175,000 tons of steel and similar materials. The agreements concerning the delivery of rolling stock to France and Belgium are also on the point of being concluded. The mean degree of activity of the German industry as a whole cannot be estimated.

However, one may safely state that up to about 50 per cent of the normal peace time production and deliveries can be attained. Of late the labor problem has, happily, begun to show considerable improvement. The worst of these difficulties has been passed.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Cottrell Anxious To Resign as Bureau of Mines' Head

Several Mentioned as Possible Successors—Position Should Go to Mine Operator, It Is Held

A change in the directorship of the Bureau of Mines is expected to take place in the near future. At the time the present director, Dr. F. G. Cottrell, accepted the place, he made it very clear that it was to be for a short time only. Dr. Cottrell is understood to be very anxious to take up the duties of chairman of the Chemical Division of the National Research Council, to which he recently was appointed to succeed Wilder D. Bancroft, who has returned to his work at Cornell University.

The suggestion that Pope Yeatman be tendered the place has met with favor among officials in Washington, but it is understood that Mr. Yeatman cannot be induced to accept the office. An effort was made to induce Herbert Hoover to accept the position. Mr. Hoover admits that the place tempts him but he is not in a position to accept it at present.

J. Foster Bain, formerly assistant director of the Bureau, has been sounded out but he has cabled from China that he cannot consider the proposition. His answer is not to be regarded as final, however, and additional efforts are being made to induce him to accept the place.

It is clearly recognized that the mining industry is very desirous that the place go to a man who has been prominently identified with the mining side of the industry. The demand seems to be for a seasoned man with a record of success as a mine operator—one who has shown resourcefulness and vigor and who is familiar with underground mining as distinguished from surface and financial operations. At the same time it is realized that any director of the Bureau of Mines must have an appreciation and leaning toward the scientific matters which are involved in mining. In addition he must be a man who can handle his labor problems in a sympathetic manner. Since the salary of the director is only $6,000, it is recognized that practically any man of that type who takes the position will have to make a decided sacrifice.

A man who will measure up to the foregoing specifications is said to be F. W. Denton, the vice-president of the Copper Range Consolidated Co. Mr. Denton's name has been submitted for consideration but since it was stated by those submitting his name that Mr. Denton had no knowledge of the matter, there is no certainty as to whether he would accept the place if offered it.

There is an increasing tendency on the part of Cabinet officers to look with favor on filling vacancies by promotion within the Bureau. It is known that consideration is being given to such promotions in connection with the selection of a new director for the Bureau of Mines. George S. Rice has seen many years' service as the Bureau's chief mining engineer. E. A. Holbrook is assistant director, the position from which Van. H. Manning was promoted to the directorship. Dorsey A. Lyon, the supervisor of stations, while a metallurgist, has had long experience in intimate contact with other phases of the mining industry. O. P. Hood, the Bureau's chief mechanical engineer, has had a long and successful period of service with the Bureau. His experience has been chiefly with the mechanical problems of mining, which is ninetenths mechanical engineering, it has been said. Speaking generally, there is a desire on the part of division chiefs to round out their service as chief of the bureau, but in the case of the Bureau of Mines succession, none is entertaining the hope that he may be chosen since they are very familiar with the general feeling in the industry that the directorship should go to such a mining man as has been described above.

Silver Purchases Under Pittman Act Proceeding Smoothly

The Director of the Bureau of the Mint is particularly gratified with the satisfactory way in which silver purchases are being made under the Pittman Act. No efforts have been discovered of any attempt to represent foreign silver as being of domestic origin. Now that the procedure of marketing silver under the Pittman law is generally understood, the whole transaction is proceeding smoothly.

Reserve Board Reports on Mining in September

In its report on business conditions during September, the Federal Reserve Board has the following to say in regard to metal mining:

"Metal mining during the period in question still shows some stagnation. The output of gold in California and Nevada continues to fall off on account of the low purchasing power of the metal. Silver mines in Utah and Idaho are working on a basis which will probably be slightly ahead of 1919. Higher prices of silver early in the year probably stimulated production somewhat as compared with present conditions. Copper from the Arizona region will probably be produced in larger vo ume than in 1919. Elsewhere there is no substantial change. The lead output in Utah and Idaho has been small but some mines which were idle are now resuming operations, so that the yield for 1920 may exceed that for 1919. District No. 10 (Kansas City) reports that in the Colorado district there has been very little change during the month of August, but the recent advance in freight rates has produced some discouragement, while increased costs of supplies may further lower production. Zinc and lead, however, have shown considerable improvement in August, both in the volume shipped and the price paid, in the Missouri, Oklahoma and Kansas fields. Shipments of zinc ores increased 20 per cent over the preceding month and lead 12 per cent, the average price of zinc ore advancing $1 and lead $14 per ton. Stocks, however, have increased about 2,000 tons during the month in spite of increased shipments. A car shortage continues to be a serious problem in the shipments of ore, while the new freight rates will result in an increased cost of $4 per ton for slab zinc."

Gold Bonus a Financial Matter Bureau of Mines Holds

The Bureau of Mines is asked from time to time to support plans holding out inducements for greater gold production. In this connection it is pointed out at the Bureau that such matters as a bonus on gold is a financial rather than a Bureau of Mines matter. Half of the country's present gold production is not affected by present conditions, since the recovery of the gold is incidental to the mining of other minerals. The other half of the production may be regarded as teetering in the balance, but since that involves only $35,000,000 it necessarily must be secondary, the Bureau feels, to the effect which will be exerted on the whole business structure which might follow changes in the unit of value. It may be said, however, that the Bureau of Mines is very anxious to assist in eliminating waste and securing greater efficiency in gold mining operations.

War Minerals Awards

Awards in war minerals relief cases were recommended during the week ended Sept. 25 as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): Florence Doty, manganese, $5,316.06, 56 per cent; J. B. Tilford, tungsten, $3,477.50, 68 per cent; Edmonds & McCurry, manganese, $1,774.96, 68 per cent; M. H. Cutter, manganese, $23,911.42, 66 per cent; East Tennessee Mining Co., manganese, $4,620.09, 79 per cent; Newport Mining Co., manganese, $10,551.20, 60 per cent.

Reconsideration was given to the chrome claim of M. A. Dellano, which had been disallowed. An award of $2,956.10, or 74 per cent of the amount claimed, was recommended.

NEWS BY MINING DISTRICTS

Special London Letter

Broken Hill Prop., Santa Gertrudis and Burma Corp. Issue New Capital

BY W. A. DOMAN

London, Sept. 21—Three mining companies are making issues of capital for the purposes of their undertakings, namely, the Broken Hill Proprietary Co., the Santa Gertrudis, and the Burma Corporation. On the question of financial methods, however, a fourth company comes on the screen this week. This is the Northern Exploration Co., formed comparatively recently to deal with coal, iron and marble deposits in Spitzbergen. The promoter was Mr. Salisbury-Jones, and he with a certain banking institution held absolute control of the company. Although substantial cash offers were put forward, no independent finance house could secure a footing. This seemed to prove the confidence of Mr. Salisbury-Jones and his associates in the future. The price of the shares went to the neighborhood of £4, a figure that evidently was too tempting to be resisted, for it is now stated that the control has changed hands. But Mr. Salisbury-Jones hopes to recover it. There are rumors that the Norwegian Government wishes to buy out the English coal companies operating in Spitzenbergen, with the result that Northern Exploration shares which have languished in the neighborhood of 10s. are nearly 20s. again. Certain persons, among whom is said to be Mr. Salisbury-Jones, have circularized the shareholders offering them 1s.—not 1s. a share mind—for the option to call their shares until the end of the year at £2. There is no need to point out who will make money on this arrangement, even if new capital be guaranteed.

Although still very important the mining branch of the Broken Hill Proprietary Co. plays second fiddle to the Newcastle Iron & Steel Works. Upon this undertaking the directors have expended over £3,750,000, and now in order to extend it, are about to issue £1,500,000 of debentures, and 420,000 shares out of 900,000 in reserve at the rate of one for five now held. There are already £748,100 debentures in issue. Until last year the operating results of the mine and of the steel works were shown separately in the accounts; they are now merged, which prevents shareholders from ascertaining whether the steel works are yielding a profit. That there is a fine future open to the works is undoubted, for two or three important English companies are establishing factories in the neighborhood to take advantage of the steel products.

Methods of finance change in mining as in other branches of industry. Years ago a mining company would never have attempted to raise capital on "notes," and it is only relatively recently that this method of providing funds has come into vogue. In one way and another the Santa Gertrudis has big business on hand, for it is about to ask for £300,000 in notes carrying 8 per cent interest, to be issued at 98 and to be redeemable at 115. There is, of course, much that is speculative in the offer, but it is pretty certain to go, for the company is sound and the premium is an attraction.

The Burma Corporation has just raised £1,000,000 in 8 per cent convertible first mortgage debenture stock at par. It is redeemable between 1925 and 1930 at 110. This, again, is distinctly attractive, for the ore reserves, proved and probable, at the property controlled, have a metal value at conservative prices of £100,000,000. The company is removing its domicile to the East in order to escape the high taxation of this country.

Business in mining shares is very quiet, being upset by Paris sales in order to provide funds for the new French loan.

MEXICO

Sonora

San Julian Co. Stoping at Tres Piedras—Remodeling of Mina Mexico Mill Almost Complete

Sahuaripa—Operation of the San Julian mill in the Sahuaripa district continues at one shift. A 90-per cent molybdenite concentrate is being made. Some first-class hand-picked ore is

also being produced. Ore and concentrates are brought from the mine to Nacozari, a distance of 210 miles, by mule-pack trains. The San Julian Mining Co. has recently acquired the Tres Piedras property, which is located about four miles north of the company's main holdings. Stoping operations have been commenced there and the ore is packed over to the mill.

Mina Mexico—At the Mina Mexico the mill is being remodeled. This work is about completed and its operation will shortly be resumed. It is reported that this company has a considerable tonnage of milling ore blocked out. There is also a considerable amount in mine dumps and in the old tailing dumps.

San Xavier—It is reported that the United States Smelting Co. has taken an option on the Los Animos mine at San Xaxier. They are examining the property and doing some development work at this mine and also at the Santa Rosa mine, an adjoining property. Operations by Loughlin and Schroder, owners of the latter property, are continuing as usual.

Suaqui—Work continues at the Progresso property near Suaqui. The mill is being run mainly on ore from the dumps and ore purchased from several small native operators.

Mr. Royer has an option from A. McFarlane on the Promontorio property near Suaqui. Development of the property is being undertaken, it is reported, in the interest of Guggenheim Brothers. The outcrop on which work is being done is a brecciated silicious mass approximately 500 ft. long by 200 ft. wide, the whole of which runs from 10 to 14 oz. of silver per ton.

Alamos—Two churn drill are being taken from Navajoa to Alamos. It is reported that they are to be used in drilling the La Verde property near Alamos.

Wilson and Obermiller are working the La Junta mine in the Minitas district, about 30 miles from Alamos. They are running a five-stamp mill.

Zacatecas

El Oro Investment Co. Contracts for Victoria Group—Option on La Noria Extended

The El Oro Investment Co., an English Corporation with large holdings in Mexico, has signed a contract with G. C. Palmer for the Victoria group of mines in Zacatecas. The property produces a medium grade silicious ore suitable for cyanide process.

The Fergus Allan Corporation has been granted an extension till Nov. 15 of their option to purchase La Noria property in the Sombrerete district. La Noria is one of the well known *antiguas* of this section. It has a vein extending over four kilometers with an average width of about thirty feet carrying silicious lime ore averaging 20 oz. of silver and some gold. The lessees finished unwatering the property on Sept. 15 and are now making active exploration.

CANADA

British Columbia

Lightning Peak Section Being Opened by Trail

Stewart—It is reported from the Alaska side of the Salmon River section, Portland Canal, that considerable interest now is being taken in the development of mining properties in this locality. It is likely that at least three properties will be working all winter. The New Alaska is to be opened up and a diamond drill is being used in exploration work on the property of the Fitzgerald Brothers. This property is located on Fish Creek. On another group of mineral claims, controlled by the Fish Creek Mining Co., a promising vein of ore has been encountered, and it is hoped that it will be possible to ship ore this winter.

Greenwood—The Lightning Peak mining section is being opened up by the construction of a trail, under the terms of the Mineral Survey and Development Act. The Provincial Government has been busy on this during the last season, and the work now is reported to be practically completed. Lightning Peak has an elevation of about 7,500 ft. In this locality are situated a number of mining properties which give promise of developing into importance. Among these is the Waterloo mine in which Greenwood people are interested. With the completion of the trail it will be possible to make the trip with pack horses from Greenwood to the peak in four days.

Victoria—A small force has been employed since last March on the Gabbro Copper Mines, Ltd., situated at Jordan River, Vancouver Island. Several large open cuts have been made. These have established a width of from 5 to 25 ft. of mineralized material having a length of 300 to 400 ft. There is a fair sized orebody averaging 3 per cent copper.

Trail—Shipments received at the Consolidated smelter during the week ended Sept. 21 totaled 8,810 tons. Shippers are given in the following table:

Mine and Location	Gross tons
Bluebell, Riondel	174
Josie, Rossland	223
Mandy, Le Pas	65
Monarch, Field	45
North Star, Kimberley	224
Ruth, Cedar Creek	108
Silver Bear, Zwicky	28
Skyline, Cedar Creek	37
Velvet, Velvet	31
Yankee Girl, Ymir	29
Company Mines	7,846

Ontario

Kerr Lake Finds More New Veins—La Rose Recovers Stolen High Grade

Cobalt—The Kerr Lake has found two new high-grade veins over a width of 8 ft. These veins will probably enter the Crown Reserve ground.

The Mining Corporation has dropped its option on the radium-bearing claims in Butt Township. This company will diamond drill the Foster property in Cobalt, which it has under lease, in order to gain geological information. Steady shipments of mill rock are being made and some high grade has also been found.

Last week $1,500 worth of high grade which had been stolen from the University property of the La Rose was recovered and one of the high graders arrested. There has been a good deal of high grading going on in the camp lately, regularly organized gangs obtaining and disposing of the silver.

The Carr Silver Mines in Carr Township will make a shipment of five tons of ore which is expected to run about 500 ounces a ton. A fair tonnage of high grade mill rock is being broken and a small mill is talked of.

The Tretheway company operating in Gowganda has struck a new vein carrying high grade ore. Ontario smelters which now control the market for Cobalt metal and oxide have raised the price of the metal from $3 to $6 a lb. It remains to be seen if the miners producing the ore will benefit.

Kirkland Lake—Kirkland Lake's August production was $35,261 from 1,281 tons of ore , or an average recovery of $27.50 a ton.

Porcupine—The Vipond mine in Porcupine is to be unwatered, and men are being assembled to start development work.

It is stated that the Associated Gold Fields of Larder Lake is contemplating an increase of capital from $5,000,000 to $30,000,000 on an exchange basis which would leave 10,000,000 shares in the treasury.

Manitoba

Herb Lake—The Bingo Mines, Ltd., have just completed the sinking of a shaft to the 50-ft. level. Another contract has been let to continue the shaft to the 200-ft. level, and also to crosscut at the 100-ft. level. The object of this crosscutting is to determine the value of four veins which appear on the surface within 60 ft. of the main vein.

CALIFORNIA

Plymouth Con. Cuts New Ore—Argonaut Improving Surface Plant

Plymouth—The Plymouth Con. Mining Co. has cut a 12-ft. vein of ore assaying from $10 to $15 per ton on the 3,050-ft. level, and development work so far done on it indicates its likelihood to yield well for some time to come.

Sutter Creek—Drifting north and south from the vein recently cut on the new 3,900 level of the Central Eureka is in progress and ore of good grade is being sent to the mill from this new development. Ore from the 2,700 level is also being profitably milled.

At the Old Eureka (Hetty Green's old property) development work under way on the 3,500 level has uncovered ore of better character than any encountered thus far on other levels since re-opening. The present company has spent a large sum of money in equipping and unwatering and much develop-

ment work has been done. T. C. Gorrie is in charge of operations.

Colfax—The Rising Sun mill has been forced to close until normal power conditions prevail. In the meantime the management is developing the new ore recently cut on six levels.

Scales—Drilling has apparently located the channel on the Poor Boy and Bella Union claims. It will be necessary to tunnel for 3,000 ft. to tap the channel. This will require the installation of compressed air machinery, power plant and other equipment if the plans of the management are to be carried out.

Auburn — Herbert Whittemore, of Newcastle, and E. C. Montgomery, of Auburn, have opened the Old Elizabeth mine near Penryn, which has been closed since 1862.

Jackson—Steady progress is being made at the Argonaut and Kennedy mines in lowering the water. In the meantime the Argonaut is completing extensive improvements at its surface plant. What is practically a new hoist will be installed. The Knight Company, of Sutter Creek, has turned out a large part of this new equipment. All new equipment is at the mine.

Nevada City—The lifting of the ban on the use of electric energy for new mines is awaited with much interest by H. H. Estee, manager of the St. Louis mine, at Willow Valley, who reports that the new mill and the hoist are ready for operating, and that ore on the dump will keep the mill going for two months. The ledge is being developed.

NEVADA

Nenzel Crown Point Holdings To Be Auctioned—Pilot Mill for Eureka Holly

Virginia City—In a winze sunk from the 2,150 level of the Con. Virginia an orebody 5 to 8 ft. wide has been developed for 100 ft. in length, the values running very high, according to Alex Wise, the superintendent.

Simon—A face of good ore was struck in the southwest crosscut on the bottom level of the Simon Silver-Lead mine on Sept. 23, according to a telegraphic announcement sent out by the management. In the initial unit of the reduction plant soon to be erected a combination of wet concentration for the coarse material and oil flotation for the fines is expected to produce the most efficient results. Lloyd White, of Burch, Hershey & White, is consulting metallurgist.

Cortez—The main pipe line of the Consolidated Cortez mine, which extends seven miles to the south of the camp, has been overhauled and an elaborate water supply system installed at the property.

Rochester—All the property of the Nenzel Crown Point Mining Co. is to be sold at public auction on Nov. 17 under a deed of trust given to secure an authorized issue of $300,000 face value first-lien 7-per cent convertible equipment gold notes, the company having defaulted on payment of principal and interest. The Anglo-California Trust Co., of San Francisco, is trustee.

Eureka It is reported that the Eureka-Holly will erect a small pilot mill at the mine which will be used as an experimental plant to perfect a volatilization process for the treatment of carbonate lead ores. The process has met with success in laboratory tests made by W. H. Layng, the company's metallurgist.

Pioche—Ore shipments from the Pioche district for the week ended Sept. 23 totaled 2,555 tons from following shippers: Prince Consolidated, 1,330 tons; Virginia Louise, 780; Combined Metals, 210; Black Metals, 100; Bristol Silver Mines, 95; and Magnolia, 40.

The recently incorporated Silver Horn Mining Co., with property 23 miles northwest of Pioche, will shortly erect a 30-ton cyanide plant. Material has been purchased and will be on the ground in October.

Earl T. Godbe, who recently had charge of the Pioche Assay Office, has associated himself with Everett Wade of Salt Lake City in the May-Day lease. Work will be confined exclusively to the mine and the lease on the May-Day dumps will be operated by Lee Battles as heretofore.

The Pioche Bristol Mining Co. has levied an assessment of one quarter of one cent per share on all outstanding stock to provide funds for deepening its shaft 100 ft. This assessment will be delinquent Oct. 20, 1920, sales date Nov. 12.

ARIZONA

White Metals Mill at Pioneer Completed—Power Shortage Hampers Operations at Some Bisbee Mines

Kelvin—The No. 1 diamond drill hole of the Ray Boston company is down to 1,415 ft. with 35 ft. to be driven to complete the contract. Since passing the 1,240-ft. mark the work has progressed very slowly due to the bad ground passed through. It is expected that the No. 1 hole will be finished by Oct. 10.

John Cresap has recently opened up a promising vein of gold ore on his claims adjoining the U. S. Vanadium Development Co. A streak a foot wide on the foot wall has yielded some spectacular specimens of free gold. The full width of the vein is nearly two feet. The ore carries silver as well as gold.

Kennard & Bierce, engineers of Los Angeles, have completed the mill for the White Metals Mining Co. at Pioneer. The mill is a modern flotation plant of 50 tons capacity and will treat the ores from what was known in the early mining history of Arizona as the Pioneer mine. J. C. Devine is resident manager.

Morristown—Frank Wright is operating under a lease in certain parts of the original Black Jack workings of the Montzuma mine. High-grade lead-silver ore is being taken out for shipment.

The Plomo King continues the extraction of lead-silver ore for shipment to El Paso. About twenty men are now employed and the newly installed mining equipment is operating satisfactorily.

Sombrero Butte—Surveys for patent have been approved on twelve claims belonging to the Magma Chief Copper Co., in the Bunker Hill mining district.

Bisbee—Operations at several of the outside properties in this district have been curtailed or suspended temporarily because of the lack of electric power. The Bisbee Improvement Co. furnishes electric power to the Boras and Night Hawk Leasing Co., the Shattuck concentrator and other operators. Because of a shortage of fuel oil the power company has been forced to discontinue supplying power and is conserving their small supply of oil for making ice and supplying the city with lights. These properties are therefore shut down. Oil is on the way but it will be several days before conditions will be normal and operations can be resumed.

The Night Hawk Leasing Co. has made a new strike on its 650 level. An important body of carbonate ore running from 10 to 12 per cent copper is being opened up. Development work continues on the 750 level.

The Wolverine & Arizona has not yet completely resumed operations. Some repair work is being done in the mine. Their machinery is being thoroughly overhauled. A cylinder of one of the engines has been sent to El Paso for reboring.

The new sulphide orebody on the Boras Leasing Co.'s 600 level continues to open up. The body is now 60 ft. long and 30 ft. wide and averages about 7 per cent copper. Its vertical extent is not yet known. The fourth monthly disbursement of 10c. per share has recently been made. Production is being maintained at approximately 1,250 tons of 8 per cent copper ore per month.

COLORADO

Mary Murphy Finds Rich Silver Ore—Cripple Creek August Output Averages $13 per Ton

St. Elmo—Recent development work in the Mary Murphy mine has opened an 8-ft. vein of ore assaying high in silver.

Cripple Creek—Lessees Boyle and Duar have opened at a depth of 35 ft., on the Hardwood property of the United Gold Mines Co., a flat vein of high grade gold ore. Four 30-ton carloads of the ore have been shipped recently. The ore runs from $130 to $200 a ton.

The production of Cripple Creek mines for August was 36,991 tons, yielding $477,604, or an average of about $13 a ton for all ore including material from mines and dump.

The Forest Queen will sink its shaft to the 1,000-ft. level. An electric hoist has been installed at the 800-ft. level.

Victor—A small vein of high-grade ore has been opened on the 1,600-ft. level of the Cresson, at a point 700 ft. west of the shaft.

MONTANA

Tuolumne Copper Installing New Pumping Equipment—Anaconda Closes Three Mines

Butte—The Tuloumne Copper Co. is installing pumping equipment which represents pioneer work so far as the use of centrifugal pump under high head in the Butte district is concerned. It is planned to install two 5-stage pumps, connected in series, and driven by a centrally located motor, to pump 500 gal. per min. against a head of 1,200 ft. The pumps are made by the Cameron Pump Co.

The Davis-Daly Copper Co. will raise a new ventilating shaft to connect the 1,700 level with the surface. This shaft will be a noteworthy achievement in point of rapid construction, and will present some novel features in so far as timbering and general design are concerned. It will be about 50 ft. from the main hoisting shaft. It will be driven by raising from several levels at the same time, and will be of circular form and cribbed solid with 8 x 8-in. timber, arranged with the horizontal section octagonal in form. The shaft will have a large cross section in proportion to the frictional resistance to air current, and the proposed system of timbering and lining will be more economical than a rectangular shaft lined with square sets, of equivalent ventilating capacity. James L. Bruce is general manager.

The Tropic, Orphan Girl and East Colusa mines of the Anaconda company have been closed. No appreciable amount of ore has been hoisted from any of these mines in the last few months. The men that had been employed at the three properties have been transferred to other mines.

SOUTH DAKOTA

Dakota, Imperial and Reliance Properties Merged

Deadwood—A consolidation of three of the important mining properties in the Bald Mountain district has been perfected. This merger includes the Dakota, Imperial and Reliance mines. The properties will be operated by the Ofer Mining Co. The acquisition of the Reliance property gives the Ofer company a treatment plant and a total of 700 acres of mineral ground, 500 acres of which is situated in the mineralized section of the district. The Reliance cyanide plant will be remodeled and enlarged. The railroad will be extended from Juno spur to the mill and will greatly facilitate the handling of ores from distant mines. A comprehensive plan of mine development will be undertaken and among other things a working tunnel will be driven to cut the various properties and make possible the removal of most of the ore through one opening. The plans also call for the complete equipment of the entire property with modern machinery.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Goodeagle Mine Near Tar River Sold —Bethlehem Mill To Be Moved From Quapaw to Treece

Treece, Kan.—The Bethlehem Zinc Co. has arranged to move its big mill, located just east of Quapaw, Okla., to a site south of the Tampa mine, west of Treece. At its Quapaw location the mill was operated only a short time, very little ore being produced.

Tar River, Okla.—Temple Chapman has sold the Goodeagle mine to the Hartford Mining Co., Harlan H. White, manager. The consideration is understood to have been approximately $250,000. Shortly before the option was taken a field shaft at the mine had been sunk into unusually good ore. This strike was carefully followed up by the Hartford Co., and a large tonnage of dirt has been hoisted to the surface. There is a good mill on the property.

Hockerville, Okla. — The Federal Smelting & Refining Co. has taken over the Farmington mine, and has made a good producer out of it. The Lucky O. K., its local subsidiary, also recently took a 30-day option on the Acme properties, including two mines and one mill east of Picher, and is testing the ground.

The Empire Development Co. is drilling its tract northeast of the town, while maintaining steady operation.

The Hawkins Mining Co. has opened up a second shaft to the north of the shaft where it recently encountered one of the richest lead deposits opened in the district for many months, and is preparing to move a mill from the Sunnyside camp to this shaft.

MICHIGAN

The Copper District

Michigan Smelting Co. To Instal New Pulverized Coal System—Mill Tailings for Roads

Houghton—The Michigan Smelting Co. at its plant at Coles Creek just west of Houghton have started the erection of a new building in which will be installed the Holbeck pulverized coal system devised and manufactured by the Bonnot Company, of Canton, Ohio. The pulverized coal will be conveyed to the large reverberatory melting and refining furnaces replacing the present use of the best grade of bituminous coal. This is the first of such installations in the copper country of Michigan and is considered a distinct advance in the prevalent metallurgical practice.

Concentrator tailings, locally known as "stamp sand," are being largely used as a highway building material in this vicinity. It is used as a top dressing together with crushed rock in tar and water bond macadam construction for roads subject to heavy traffic. For light traffic country roads the "stamp sand" alone is used. It is especially effective when spread on a clay road bed, the clay acting as a cementing material. It is also largely used as railroad ballast, producing a road bed that is practically dustless. It is also employed as a back-fill in old stopes and is ideal for this purpose in as much as it can be blown into the stopes with compressed air, following South African practice in this respect. The long distance of most of the concentrators from the mines here, involving excessive freight charges, has limited the use of tailings for this purpose.

A rough screen analysis of this material is as follows: All through ⅜-in. or ¼-in. diameter round holes; on 10 mesh, 30 per cent; on 20 mesh, 15 per cent; on 40 mesh, 15 per cent, and through 40 mesh, 40 per cent.

Calumet—The 4th level south drift of the Seneca is within about 40 ft. of the Ahmeek Mining Co.'s boundary. The 5th level plant is being cut preparatory to drifting both north and south on this level.

At the Gratiot shaft the 13th level north drift is 850 ft. from the shaft and about 300 ft. from the Mohawk property line.

Chronology of Mining, September, 1920

Sept. 5—Miners at Virginia City and Gold Hill, Nev., struck for $6 per day. Gold Canyon Dredging Co., Silver City, Nev., started dredging near Dayton, Nev.

Sept. 6 — National Tax Association opened annual convention at Salt Lake City, Utah. Rising Sun Consolidated Mines Co., Colfax, Cal., cut its rich main ledge lost years ago.

Sept. 7—Dome Mines Co. stockholders ratified the purchase of Dome Extension Co.

Sept. 9—International First Aid and Mine Rescue meeting opened at Denver, Col.

Sept. 13—Oklahoma State School of Mines, Miami, Okla., opened for its initial session, Lloyd B. Drake president.

Sept. 16—U. S. Assay Office, New York, damaged by bomb explosion, apparently caused by Reds.

Sept. 20 — Alexander McDougal vs. Oliver Iron Mining Co. suit for infringement of a patent came before Federal Court, Duluth, Minn.

Sept. 27—Ninth annual safety congress of National Safety Council opened in Milwaukee, Wis.

Sept. 28—Annual convention of Independent Oil Men's Association opened in Denver.

THE MARKET REPORT

Daily Prices of Metals in New York

Sept	Copper Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N Y	Lead St L	Zinc St L
30	17.75@18.00	41.25	42.25@42.75	7.15@7.75	7.50	7.50
Oct 1	17.65@17.80	42.00	42.75@43.00	7.45	7.45	7.45
2	17.40@17.75	41.50	42.75@43.00	7.45	7.45	7.40
4	17.40@17.60	41.50	42.75@43.00	7.40	7.40	7.40
5	17.25@17.50	41.25	42.00@42.25	7.40	7.40	7.40
6	17.25@17.45	41.50	42.50@42.75	7.35	7.35	7.35

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Sept.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
30	94¼	95¼	113	268	274	34½	34⅜	40¾	41½
Oct 1	94¼	95½	111	271½	276½	34⅜	34¼	40¼	41¼
2	...								
4	96¼	96½	111	271¾	277½	34⅝	34⅜	40¾	41⅞
5	96⅜	96⅝	111	270	275	34⅝	34⅝	40⅞	41⅝
6	97½	97	112	269½	274½	34½	34⅝	40⅝	41¾

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Sept.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York Foreign Origin	Silver London	Oct.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
30	346¼	99½	92	59⅞	4	348	99½	90¼	58¼
Oct 1	347½	99½	91½	59	5	348	99½	89⅛	57⅝
2	348¼	99½	91	58¾	6	350½	99½	88⅝	56¾

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Oct. 6, 1920

Metal markets for many weeks have been unusually dull, but the week just past was one of those in which quietness was especially emphasized. Practically all producers and consumers report a lack of interest in the metals. Price recessions where they have occurred have failed to induce more business, and, as is usually the case in a falling market, purchasers are refraining from participating more than to cover their immediate requirements. The tendency last week was downward as reflected by our quotations. The prompt market is quiet and little interest is manifested in futures.

Copper

The market was particularly quiet Producers report few inquiries, as consumers are evidently content to run on a minimum amount of supplies. It takes a particularly strong producing company to withstand the present low prices. The large producers have come down to 18c., delivered, but without being able to negotiate many sales. These are hard times for high-cost copper producers, who, should this condition be maintained, will have to suspend operations. Copper for forward delivery is being quoted at ¼ to ⅛c. below our quotations.

Lead

It has been conservatively estimated that some 18,000 tons of pig lead entered the United States during September, causing the recent recession in the market. Producers are "catching up" in their shipments, but only a small number of inquiries are coming in. In fact, since the first of the month the market has been exceptionally dull, despite the fact that neither consumers, producers, nor dealers have excess stocks to speak of. Consumption in paint, cable and foil manufacture is good, but pipe and battery consumption has fallen off. The price of lead is now close to that of zinc, and the abnormal disparity between the two metals is disappearing. Spot lead is in little demand. Futures are nominal.

Zinc

Demand from galvanizers has picked up and there has been an increased activity in the market but only at decreased prices. Although zinc is in an excellent statistical position in the United States, the influence of the European market is important, as the United States cost of producing spelter is a secondary consideration with those countries which want to literally convert all their marketable zinc into gold.

Tin

Sales have been made below import costs, little interest is exhibited in futures, and there have been heavy losses in the forced liquidation of speculative tin supplies.

Straits tin for future delivery: Sept.

Monthly Average Prices for September

Copper:	
New York Electrolytic	18.144
London Standard	96.381
London Electrolytic	111.905
Lead:	
New York	8.177
St. Louis	8.160
London	35.452
Silver:	
New York, foreign	93.675
New York, domestic	99.500
London	59.476
Sterling Exchange	350.370
Zinc:	
New York	7.717
St. Louis	7.661
London	39.690
Tin:	
99 per cent	41.940
Straits	44.465
London	270.120
Antimony	7.113
Quicksilver	75.000

30th, 43.25@43.50; Oct. 1st, 43.50@44.00; 2nd, 43.50@43.75; 4th, 43.75@44.00; 5th, 43.25@43.50; 6th, 43.50@43.75.

Arrivals of tin in long tons: Sept. 28th, Singapore, 75; 30th, Singapore, 575; total arrivals for the month of September, 5,335 tons; Oct. 1st, Penang 50; 4th, Singapore, 600; London, 350.

Silver

The silver market since our last report has continued to drop, owing to the weakness of Eastern exchanges, and at the close the tendency is still weak. It has been reported that shipments of Indian rupees have been made to China. Purchases of silver to date by the U. S. Government under the Pittman Act amount to about 18,000,000 oz.

Mexican Dollars—Sept. 30th, 70¼; Oct. 1st, 69⅞; 2nd, 69½; 4th, 68¾; 5th, 68; 6th, 67⅞.

Gold

Gold in London on Sept. 30th, 118s. 4d.; Oct. 1st, 118s. 4d.; Oct. 4th, 118s.; Oct. 5th, 117s. 10d.; Oct. 6th, 117s. 1d.

Foreign Exchange

The European exchange market continues to be steady and fluctuations are relatively small. On the whole the market showed a slight downward tendency. On Tuesday, Oct. 5th, francs were 6.68c.; lire, 4.03c.; and marks, 1.59c. New York funds in Montreal, 9 per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 35c.; 98@99 per cent, 34.8c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Spot metal, 7c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 7c. W. C. C. brand, 8½@9c. Chinese needle antimony, lump, firm at 7@7½c. per lb. Standard powdered needle antimony (200 mesh), 9½c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100 per oz.

Platinum—Firm at $105 per oz.

Quicksilver—Market quiet; $72 per 75-lb. flask. San Francisco wires $73@$75. Market weak.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 75@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore—60@70c. per unit, seaport; [1]chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 70@75c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.50@$5, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $70@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 2—Zinc blende, per ton, high, $48.40; basis 60 per cent zinc, premium, $44; Prime Western, $42.50; fines and slimes, $42.50@$40; calamine, basis 40 per cent zinc, $35@$30. Average settling prices: Blende, $45.04; calamine, $32.92; all zinc ores, $44.08.

Lead, high, $98.30; basis 80 per cent lead, $80@$75; average settling price, all grades of lead, $93.40 per ton.

Shipments for the week: Blende, 14,431; calamine, 275; lead, 1,978 tons. Value, all ores the week, $843,670.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

It is admitted that 1,000 tons of Prime Western blende was purchased on Monday, $45 basis, yet buyers assert it was a purchase on last week's market. Another decline in lead totals a decrease of $37.50 in four weeks. Much of the lead now loading out was sold on $100@$112.50 basis. Purchases on the lower basis offerings of the last three weeks are smaller each week. Sellers claim they cannot produce ore in the face of a continued lowering of the market.

The Van Buren smelter was closed Oct. 1 by a walkout of smeltermen. A repetition is looked for at Fort Smith Tuesday and Wednesday.

Six agencies bought no ore this week, the purchase dropping to 7,500 tons, against 11,500 tons last week.

Platteville, Wis., Oct. 2—Blende, basis 60 per cent zinc, $49.25 base for high grade. Lead ore, basis 80 per cent lead, $80 per ton. Shipments for the week: Blende, 1,276; calamine, 30; lead, 50 tons. Shipments for the year: Blende, 52,602; calamine, 2,459; lead, 4 298; sulphur ore, 1,241 tons. Shipped during the week to separating plants, 2,383 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30@$35, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@

$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content. In Ceylon, some of the largest producers have closed their mines until prices advance to meet increased production costs, and stocks at Colombo were lowered only 3,000 tons in the first five months of 1920. Surplus stocks on Jan. 1 amounted to 20,000 tons.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $4; No. 3, $5.75; No. 2, $7; No. 1, $9; A1, $14; extra large, $25, all f.o.b. New York; ground, $100@$150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 4@5c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses. Tennessee production sold up months ahead.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 in less quantities, including bags.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $170@$180, freight allowed; last half, $170; English, $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $82.50@$85, f.o.b. furnace.

Ferromolybdenum[1]—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, 90c.@$1.05 per lb. of contained tungsten, f.o.b. works.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8.50 per lb. of V contained, f.o.b. works.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire, 22½@23c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26⅜c.; sheathing, 25⅜c.; rods, ⅜ to 3 in., 23⅜c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Clay—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Oct. 5, 1920

In a few instances mills have slightly decreased operations on account of customers requiring less steel than was formerly shipped to them, but as to the great bulk of the steel industry, production has been increasing, on account of better transportation and weather conditions, and it is possible that this month's steel output will break the record that has stood since October, 1918.

Finished-steel prices are not declining to any extent. Special premiums for prompt shipment have disappeared, but the independent market generally is almost as far above the Steel Corporation price schedule as at any other time. The strength of sheets is particularly noteworthy, they being $50@ $60 a ton above the Steel Corporation prices, at about 6.75@7c. for black sheets and 8.50@9c. for galvanized.

Pig Iron—The market is so sluggish that it is not developing the new and lower prices that must come on account of changed conditions. Bessemer and basic remain nominally quotable at $48.50, Valley, although buyers will no longer pay the price. It is reported that two steel interests have offered basic at $45.96, delivered Pittsburgh, or $44, Valley equivalent; also that a middleman has sold over a thousand tons at only a shade above this figure.

Steel—Nominal mill quotations are $60 for billets and $65 for sheet bars, but it is believed $5 under this could be done on a firm bid.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16.50@$17; foundry, $18.

The Price of Zinc

We have been much interested in the comment on our zinc prices for the week ending Sept. 29 which has been made by the editor of the *American Metal Market*. We are glad to mention the subject at greater length because we have found this publication to be one of the most reliable and honest of the journals devoted to the marketing of metals. The prices quoted by *American Metal Market* are likely to be somewhat higher than ours, but we believe that this is because they represent, in general, small lots, and because those responsible for their compilation are not always in the position to be advised of the actual prices at which large tonnages are marketed. Wholesale prices, as we might call them, are naturally lower than retail.

The editor of the *American Metal Market* in his issue of Sept. 30 questions our prices as being too low and takes us to task for being unwarrantably bearish in our attitude. In his issue of Oct. 1, he is more inclined to dismiss the first charge, for he admits that "there are reports that a certain interest has indicated a willingness to sell Prime Western at 7.50c., St. Louis basis." These interests, we might add, were not only willing to sell but did sell a considerable tonnage at that figure, and it was upon these sales that our quotation was based. Then follows an intimation that the dull demand was brought about by our report of a leading producer who predicted 7c. zinc. We believe the demand is no duller than it has been for some time. If it *is* quieter, we feel flattered that any comment of ours should have so serious an effect on the market. We wish that our optimism on copper a few months ago had had a better effect on the demand for that metal. The editor has also been inquiring about to find out who predicted 7c. zinc. In this, of course, he was unsuccessful, although it was not because he did not write to the proper people. The man who made the prediction naturally does not care to make himself known.

The reason zinc is being pushed down, if it is being pushed down, and not just falling down, as a result of the old law of supply and demand, we suspect is because domestic producers are doing their best to keep foreign metal out of this country. If this is the case, it would probably redound to the advantage of the domestic zinc industry in the long run. If importers lose money they will hesitate about trying the same game again. If we could control things, we would boost up the prices on all metals: it would result in better times for our clientele and, therefore, more profit to ourselves.

This matter brings up the subject as to whether we should abstain from publishing all bearish reports and always be sunny and optimistic regarding the future; or, if not that, at least keep still. This is small-town stuff. We consider it our duty to publish the market gossip as we get it, even though our informants have long black hair and claws. We believe that our metal industry generally has progressed beyond the stage where it must be fed on sugar-coated pills.

Japan's Mineral Production

According to figures published by the Tokyo Chamber of Commerce, the output of minerals from the leading Japanese mines for the first four months of the year was generally lower than for the same period of 1919, with the exception of coal, the figures being as follows:

	1919	1918
Gold (momme)	613,411	677,504
Silver (momme)	13,518,115	17,567,640
Copper (kin)	41,475,533	46,056,032
Iron (kin)	22,450	29,249
Coal (ton)	8,538,245	8,261,462
Petroleum (koku)	608,209	690,832
Sulphur (kin)	12,146	23,237

A momme is the equivalent of .008267 lb.; a kin is 1.323 lb.; and a koku is the Japanese denomination of liquid capacity or 39.7032 gal.

Foreign Trade in Metals and Ores for July

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for July, 1920, and the figures for July, 1919, as finally revised, are as follows:

IMPORTS, JULY, 1919, AND 1920
(In pounds, unless otherwise stated)

	July, 1919	July, 1920
Antimony ore, contents	226,246	152,720
Antimony matte, regulus or metal	1,219,458	2,267,058
Copper:		
Ore, contents	4,756,444	1,389,399
Concentrates, contents	2,902,900	2,548,425
Matte, regulus, etc., contents	5,758,470	123,607
Imported from (in part):		
Canada	3,610,480	1,030,824
Mexico	4,029,810	2,606,275
Chile	3,186,163	359,758
Unrefined, black, blister, etc	18,033,812	14,781,480
Refined, in bars, plates, etc	3,116,315	7,938,249
Composition metal, copper chief value	12,177	525,391
Lead:		
Ore, contents	2,711,964	1,346,980
Bullion, contents	12,575,262	9,971,247
Imported from (in part)		
Canada	1,376,588	458,079
Mexico	12,758,243	8,389,023
Chile	385,878	11,042
Pigs, bars, and old	561,053	2,305,038
Manganese ore, long tons	15,585	18,447
Imported from (in part):		
Brazil	9,750	12,462
British India	None	1,600
Tungsten ore, long tons	452	71
Pyrites, long tons	63,088	56,753
Imported from (in part)		
Spain, long tons	36,099	34,874
Canada, long tons	24,889	21,879
Tin ore, long tons	1,975	1,938
Tin bars, blocks, pigs, etc.	113,120	17,584,167
Imported from (in part):		
United Kingdom	None	4,029,725
China	None	167,881
Straits Settlements	113,120	10,097,914
Hongkong	None	2,318,059
Zinc:		
Ore, contents	4,225,849	1,974,322
Imported from (in part):		
Canada	196,515	164,955
Mexico	2,160,540	1,802,826
Blocks or pigs, and old	None	18

EXPORTS OF COPPER, LEAD AND ZINC
(In pounds)

	July, 1919	July, 1920
Copper:		
Ore, contents	3,000	392
Concentrates	None	None
Unrefined, black, blister, etc	3,600	83,277
Refined, in ingots, bars, etc	42,373,791	40,051,623
Exported to (in part):		
France	13,917,000	17,797,752
Belgium		536,638
Germany		5,634,824
Netherlands		191,463
Sweden	7,008,518	3,465,284
United Kingdom	7,676,212	9,200,750
Canada	1,406,066	1,523,997
Japan	7,592,248	940
Composition metal, copper chief value	25,408	6,972
Pipes and tubes	334,563	444,316
Plates and sheets	436,843	2,522,007
Wire, except insulated	6,208,843	3,647,668
Lead:		
Pigs, bars, etc.:		
Produced from domestic ore	637,855	171,202
Produced from foreign ore	4,664,547	574,595
Exported to (in part):		
France		493,315
United Kingdom	3,472,560	112,089
Canada	119,650	13,280
Zinc:		
Dross	72,000	5,980
Spelter		
Produced from domestic ore	18,715,545	16,196,507
Produced from foreign ore	1,103,124	863,622
Exported to (in part):		
France	5,683,424	3,992,888
Italy	112,000	67,238
United Kingdom	11,442,341	10,678,762
Canada	340,494	14,512
In sheets, strips, etc	1,978,580	3,082,276

Algerian Mineral Exports

Mineral exports from Algeria last year were as follows, according to the *Mining Journal*, London, the figures for 1918 being given by way of comparison:

	Metric Tons, 1918	Metric Tons, 1919
Antimony ore	7,920	2,160
Copper ore		1,000
Iron ore	759,217	782,885
Lead ore	17,831	8,316
Zinc ore	29,288	4,261
Mercury (native)	15	8
Natural phosphates	198,539	242,186
Superphosphates	4,852	14,576

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York 1918	New York 1919	New York 1920	London 1918	London 1919	London 1920
January	88 702	101 125	132 827	44 356	48 438	79 846
February	85 716	101 125	131 295	42 792	48 027	85 005
March	88 082	101 125	125 551	43 620	48 171	74 194
April	95 346	101 125	119 779	47 215	48 886	68 848
May	99 505	107 135	102 585	48 980	52 104	60 010
June	99.500	110 430	90 957	48 875	53 896	51 096
July	99 625	106.394	9 971	48 813	54 133	53.736
August	100 292	111.370	96.168	49 077	58 835	59 875
September	101.125	114 540	93.675	49 500	61 668	93 6 5
October	101 125	119 192		49 500	64 049	
November	101 125	127 924		48 969	70 065	
December	101 125	131.976		48 492	76 432	
Year	96 772	111.122		41.516	57.059	

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York Electrolytic 1919	New York Electrolytic 1920	London Standard 1919	London Standard 1920	London (b) Electrolytic 1919	London (b) Electrolytic 1920
January	(a)	18 918	92 238	118 095	106.619	123 238
February	16 763	18 569	78 700	120 188	95 700	126 950
March	14 856	18 331	76 821	109 533	82 071	118 348
April	15 246	18.660	77 300	103 025	82 200	111 500
May	15 864	18 484	77.767	96 750	81 227	109 700
June	17 610	18 065	83 062	87 864	85 900	101 909
July	21 604	18 76	99 576	9) 1*8	103.046	106.455
August	22 319	18 346	97 300	93.935	106.429	111 143
September	21 755	18 144	100 767	96 381	......	111 905
October	21 534		103 418			
November	19 758		98 894			
December	18 295		103.708			
Year	18 691		90 796			

(a) No market. (b) See note on page 743.

Lead

	New York 1919	New York 1920	St. Louis 1919	St. Louis 1920	London 1919	London 1920
January	5 432	8 561	5 316	8 300	37 227	47 095
February	5 057	8 814	4 784	8 601	28 675	50 256
March	5 226	9 145	4 992	8 894	27 952	46 054
April	4 982	8 902	4 722	8 618	24 888	39 225
May	5 018	8 576	4 773	8 352	23 852	38 488
June	5 340	8 323	5 070	8 169	22 544	34 330
July	5 626	8 338	5 408	8.283	23 457	34 960
August	5 798	8 687	5 583	8.725	25 330	36 304
September	6 108	8 177	5 853	8 160	28 473	35 452
October	6 487		6 249		34 731	
November	6 808		6 649		41 202	
December	7 231		6 955			
Year	5 759		5 530		28 590	

Tin

	New York 1919 99%	New York 1919 Straits	New York 1920 99%	New York 1920 Straits	London 1919	London 1920
January	67 702		61 596		248 557	376 512
February	66 801		58 466	59 932	223.963	395 750
March	67 934		61 037	61.926	236 843	369 489
April	72 500		61 120	62 115	225.275	345 450
May	72 500		53 230	55 100	234 398	294 813
June	71 240		46.125	48 327	238 263	250 614
July	68 000		45.798	49 154	253 272	261 886
August	57 226	..	43.856	47 620	273.625	274 048
September	54 482		41 940	44 465	280 102	270 1[illegible]0
October	54 377				279 239	
November	53 307				283 556	
December	53 870				314 113	
Year	63 328				257 601	

Zinc

	New York 1919	New York 1920	St. Louis 1919	St. Louis 1920	London 1919	London 1920
January	7 272	9 483	6 922	9 133	56 045	[illegible]
February	6 623	9 058	6 273	8 708	46 150	[illegible]
March	6 500	8 881	6 150	8 531	38 500	[illegible]
April	6 465	8 534	6 114	8 184	36 118	[illegible]
May	6 429	7 938	6 079	7 588	35 477	[illegible]
June	6 901	7 815	6 551	7 465	36 763	[illegible]
July	7 873	8 070	7 523	7 720	41 815	[illegible]
August	7 789	8 185	7 160	7 835	39 338	[illegible]
September	7 510	7 717	7 473	7 661	40 955	[illegible]
October	7 823		7 827		43 630	
November	8 177		8 350		46 588	
December	8 700		8 350		53 101	
Year	7 338		6 988		42 879	

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer ‡ 1919	Bessemer ‡ 1920	Basic ‡ 1919	Basic ‡ 1920	No. 2 Foundry 1919	No. 2 Foundry 1920
January	$33 60	$40 47	$31 40	$39 88	$32 40	$39 86
February	33 60	42 95	31 40	42 61	32 40	43.40
March	32 54	43 40	31 40	42 90	29 12	43 40
April	29 35	43 72	27 15	44 22	28 15	43 90
May	29 35	44 00	27 15	44 88	28 15	45 36
June	29 35	44 89	27 15	45 41	28 15	46 40
July	29 35	47 21	27 15	47 42	28 15	46 56
August	29 35	48 90	27 15	49 88	28 15	49 35
September	29 35	50 46	27 15	50 46	28 15	51 9[illegible]
October	29 35		27 15		28 30	
November	31 60		31 56		32 16	
December	36 57		35 32		36 86	
Year	$31 11		$29 26		$28 35	

‡ As reported by W. P. Snyder & Co.

Antimony, New York; July, 7.500c., August, 7 177c., September, 711[illegible]

Quicksilver, New York; July, $90 333, August, $85 355, September $75 [illegible]

Monthly Copper Production

The crude-copper content of blister copper of the principal producers, in pounds, for May-August, 1920, follows:

MONTHLY CRUDE COPPER PRODUCTION, 1920

	May	June	July	August
Alaska shipments	7,331,590	7,213,820	5,797,645	5,762 5[illegible]
Arizona				
Arizona Copper	3,000,000	3,000,000	3,000,000	3,000,00[illegible]
Calumet & Arizona	4,760,000	4,764,000	4,232,000	5,200,00[illegible]
Cons. Ariz. Smelting	1,250,000	940,000	750,000	975,00[illegible]
Inspiration	7,500,000	7,300,000	6,500,000	7,200,000
Magma	918,321	755,601	865,774	556 765
Miami	5,054,760	4,400,000	4,549,298	4,630,72[illegible]
New Cornelia	3,720,000	3,664,000	3,522,000	3 842,00[illegible]
Old Dominion	2,287,400	2,999,000	2,640,000	2,802 00[illegible]
Phelps Dodge	6,761,000	6,125,000	5,955,000	5 875,000
Shattuck Arizona	219,118	198,327	166,938	194 005
Ray	4,260,000	4,520,000	4,500,000	4,505 00[illegible]
United Verde	5,400,000	5,880,000	5,085,140	5,125,00[illegible]
United Verde Extension	3 219,934	2,828,020	3,304,878	5,805 56[illegible]
Michigan:				
Calumet & Hecla	8,803,811	9,022,879	8,312,025	7 520 107
Other Lake Superior	6,200,000	6,200,000	6,200,000	6,000,00[illegible]
Montana				
Anaconda	9,700,000	12,700,000	11 700,000	11,800,00[illegible]
East Butte	1,412,760	1 396 140	1 537,880	1 566 80[illegible]
Nevada				
Nevada Cons	4,350,000	4,650,000	4,650,000	4,650 [illegible]
New Mexico				
Chino	3,930,728	4,010,069	4,360,932	4,000 14[illegible]
Utah				
Utah Copper	9,904,781	10 000,000	8,500,000	4,820,0[illegible]
Eastern Smelters	1,600,000	1,600,000	1,600,000	1,600 00[illegible]
Total reported	101,584,207	104,166,856	97,729,510	101,430,654
Others, estimated	13,380,000	12,000,000	12,000,000	15,000 000
Total United States	114,964,207	116,107,856	109 729 510	116,430 6[illegible]4
Imports, Ore and concentrates [illegible]	1,607,003	35,911,009	3,937,824	
Imports in blister, [illegible]	43,253,540	15,[illegible]19,398	26,553,600	
Grand total	168,824,750	167,638 263	140,220,934	
British Columbia				
Granby Cons	2,131,219	2,079,000	2,400,000	2,47[illegible]
Mexico				
Boleo	650,908	802,474	781,613	618 39[illegible]
C[illegible]	4,300,000	3,750,000	3 500,000	3 500 000
Phelps Dodge Mexican properties	1,141,000	1,427,000	2 402,000	2,490,0[illegible]
Other foreign [illegible]				
[illegible]	3,890,000	3,944,000	3 652 000	4,440,00[illegible]
[illegible]	10,300 000	7,500,000	9,904 000	10,640 0[illegible]
K[illegible]	3,847,027	4,[illegible]23,22[illegible]		
B[illegible] & Johnston	1,726,000	1,382 000	1 458 000	

Domestic copper production for 1918, 1919, and part of 1920 follows:

	1918	1919	1920
January	165,431,568	135,733,51[illegible]	121 903,744
February	160,011,364	111,649,5[illegible]	[illegible]7 450,00[illegible]
March	185,525,168	102,040,4[illegible]	[illegible]20,30[illegible]31
April	1[illegible]3,207,096	98,808[illegible]8	116,078,87[illegible]
May	181,070,350	92,652 975	114,964,2[illegible]7
June	166,723,599	95,856,570	116,1[illegible]7,8[illegible]6
July	159 329,[illegible]31	100,369 [illegible]47	10[illegible],72[illegible]0
August	165,550,799	107,994 [illegible]	116,4[illegible]654
September	1[illegible]7 992,487	108 7[illegible]7	
October	1[illegible]8 038,775	115,14[illegible]43	
November	[illegible]9 217,588	117 28[illegible]7	
December	[illegible]801,916	102 [illegible]	

MINING STOCKS

Week Ended October 2, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	...	...	*50	...	...
Ahmeek	Boston	57	56½	57	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb	⅛	⅛	⅛	...	...
Allouez	Boston	23½	23½	23½	Mar. '19,	1.00
Anaconda	N. Y.	53½	51½	52½	Aug. '20, Q	1.00
Ariz. Com'l	Boston	9	9	9	Oct. '18,	.50
Big Ledge	N. Y. Curb	½	½	½	...	...
Bingham Mines	Boston	9	9	9	Sept. '19, Q	.25
Calumet & Ariz.	Boston	57	54½	56	Sept. '20, Q	1.00
Calumet & Hecla	Boston	284	275	284	June '20, Q	5.00
Canada Copper	N. Y. Curb	⅛	⅛	⅛	...	...
Centennial	Boston	9½	9½	9½	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	41½	38	39½	Sept. '20, Q	1.00
Chief Consol.	Boston Curb	3½	3½	3½	Feb. '20, Q	.10
Chile Copper	N. Y.	14½	14½	14½	...	...
Chino	N. Y.	27½	26	26⅝	Sept '20, Q	.37½
Columbus Rexall	Salt Lake	*37½	*37	*37½	...	...
Con. Ariz.	N. Y. Curb	...	...	½	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	...	...	2¼	...	...
Copper Range	Boston	35½	34	34½	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*40	*30	*37	...	...
Davis-Daly	Boston	8½	7½	7½	Mar. '20, Q	.25
East Butte	Boston	10½	10½	10½	Dec. '19, A	.50
First Nat'l	Boston Curb	*80	*73	*80	Feb. '19, SA	.15
Franklin	Boston	2⅝	2½	2½	...	...
Gadsden Copper	N. Y. Curb	...	...	*70	...	...
Granby Consol.	N. Y.	...	...	35½	May '19, Q	1.25
Greene Cananea	N. Y.	28	27½	27⅝	Aug. '20, Q	.50
Hancock	Boston	...	...	4½	...	...
Houghton	Boston Curb	...	...	*40	...	...
Howe Sound	N. Y. Curb	3½	2⅞	3	July '20, Q	.05
Inspiration Con.	N. Y.	46½	44½	45⅝	July '20, Q	1.00
Iron Cap	Boston Curb	8⅛	8	8	Sept. '20, K	.25
Isle Royale	Boston	26½	25	25	Sept. '19, SA	.50
Kennecott	N. Y.	24½	22⅞	23½	Sept. '20, Q	.50
Keweenaw	Boston	...	...	1⅜	...	...
Lake Copper	Boston	3⅜	2½	2½	...	...
La Salle	Boston	2½	2½	2½	...	...
Magma Chief	N. Y. Curb	...	...	*21	...	...
Magma Copper	N. Y. Curb	...	...	17	Jan. '19, Q	.50
Majestic	Boston Curb	*12	*12	*12	...	...
Mason Valley	Boston	1⅞	1⅛	1⅞	...	...
Mass. Con.	Boston	3⅛	3⅛	3⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅛	5⅛	5⅛	...	...
Miami	N. Y.	19⅝	19	19⅝	Aug. '20, Q	.50
Michigan	Boston	4	3⅞	4	...	...
Mohawk	Boston	58½	57½	57½	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb	5⅞	5⅝	5⅝	...	...
Nevada Con.	N. Y.	11⅞	11⅛	11⅞	Sept. '20, Q	.25
New Arcadian	Boston	...	...	2½	...	...
New Baltic	Boston Curb	...	...	3	...	...
New Cornelia	Boston	19	17	18	Aug '20,	.25
Nixon Nev.	N. Y. Curb	...	...	*9	...	...
North Butte	Boston	15	14⅜	14⅜	Oct. '18, Q	.25
North Lake	Boston	...	...	⅛	...	...
Ohio Copper	N. Y. Curb	...	...	⅞	...	...
Oihway	Boston	...	...	1¾	...	...
Old Dominion	Boston	24½	23	23⅝	Dec. '18, Q	1.00
Osceola	Boston	37	35	35	June '20, Q	.50
Phelps Dodge	Open Mar.	†200	†175	...	July '20, Q	2.50
Quincy	Boston	47	45	47	Sept. '20, Q	1.00
Ray Con.	N. Y.	15	14½	14½	June '20, Q	.25
Ray Hercules	Boston Curb	*50	*50	*50	...	...
St. Mary's M. L.	Boston	37	36	36	June '20, K	2.00
Seneca	Boston	15½	15	15½	...	...
Shannon	Boston	1½	1	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	9	8⅞	8⅞	Jan. *'20 Q	.25
South Lake	Boston	...	...	2	...	...
South Utah	Boston	*15	*15	*15	...	...
Superior	Boston	4⅜	4⅜	4⅜	Apr. '17,	1.00
Superior & Boston	Boston	3⅞	3⅜	3⅜	...	...
Tenn. C. & C.	N. Y.	9⅞	9⅛	9⅛	May '18, I	1.00
Tuolumne	Boston Curb	*50	*50	*50	May '13,	.10
United Verde Ex.	Boston Curb	31	30½	31	Aug. '20, Q	.50
Utah Con.	Boston	7	6⅝	6⅞	Sept. '18,	.25
Utah Copper	N. Y.	61½	60	61⅜	Sept. '20, Q	1.50
Utah M. & T.	Boston	1⅜	1⅛	1⅜	Dec. '17,	.30
Victoria	Boston	1⅞	1⅞	1⅞	...	...
Winona	Boston	...	...	*35	...	...
Wolverine	Boston	13	13	13	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	4⅜	4 1/16	4⅛	Sept '20, QX	.15
St. Joseph Lead	N. Y.	15⅜	14⅜	14⅜	Sept '20, QX	.50
Stewart	Boston Curb	...	...	*13	Dec. '15,	.05
Utah Apex	Boston	2	1⅞	2	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	12	11⅜	11⅜	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	...	...	46½	Aug '20, Q	1.50
Butte C. & Z.	N. Y.	7⅜	7	7	June '18, I	.50
Butte & Superior	N. Y.	19¾	17⅞	19⅛	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	9⅛	9	9⅛	June '20, Q	.50
New Jersey Z.	N. Y. Curb	178½	178	178	Aug. '20, Q	4.00
Success	N. Y. Curb	*5	*4	*4	July '16,	.03
Yellow Pine	Los Angeles ‡	...	...	*95	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	...	...
Alaska Juneau	N. Y.	2⅛	1⅞	2⅛	...	...
Carson Hill	N. Y. Curb	24½	24½	24½	...	...
Cresson Consol. G.	N. Y. Curb	1	¾	1	June '20, Q	.10
Dome Ex.	Toronto	*49	*39	*39	...	...
Dome Mines	N. Y.	11⅛	10⅞	11⅛	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡	...	*75	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb	*9	*8	*8	Dec. '19,	.05
Hedley	Boston	...	...	4½	June '19,	.10
Hollinger Con.	Toronto	5.80	5.70	5.72	Sept. '20, X	.05
Homestake	N. Y.	...	...	46	Sept. '19,	.50
Kirkland Lake	Toronto	*50	*49½	*49½	...	...
Lake Shore	Toronto	1.17	1.10	1.11	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	2.07	2.00	2.06	Sept. '20, K	.05
Porcupine Crown	Toronto	*27½	*26	*27½	July '17,	.03
Portland	Colo. Sprgs.	‡	...	*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb	6	4½	5	May '19,	.05
Silver Pick	N. Y. Curb	*6	*4	*5	...	...
Teck Hughes	Toronto	*9	*8½	*9	...	...
Tom Reed	Los Angeles	‡	...	*98	Dec. '19,	.02
United Eastern	N. Y. Curb	3½	2	3	Apr. '20, Q	.21
Vindicator Consol.	Colo. Sprgs.	‡	...	*18	Jan. '20, Q	.01
West Dome Consol	Toronto	*7½	*7	*7	...	...
White Caps Min.	N. Y. Curb	*10	*8	*8½	...	...
Yukon Gold	Boston Curb	...	...	1½	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*27	*18	*25	Apr. '20, M	.03
Beaver Con.	Toronto	*42½	*40	*40	May '20, K	.03
Conagas	Toronto	...	...	2.55	Aug. '20, Q	.12½
Crown Reserve	Toronto	*29	*27	*27	Jan. '17,	.05
Kerr Lake	Boston	3⅜	3¼	3⅜	Sept. '19,	1.00
La Rose	Toronto	*34	*34	*34	Apr. '18,	.02
McKinley-Dar.	Toronto	*57	*57	*57	July '20, Q	.03
Mining Corp.	Toronto	1.75	1.65	1.65	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	9⅜	8⅞	9	July '20, Q	.25
Ontario Silver	N. Y.	5⅜	5⅛	5⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12,	.10
Peterson Lake	Toronto	*16½	*14	*14½	Jan. '17,	.01½
Temiskaming	Toronto	*36½	*35½	*35⅝	Jan. '20, K	.04
Trethewey	Toronto	*29½	*26	*26½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1⅞	*1⅞	...	...
Barnes-King	Butte	‡	...	1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston	...	...	*63	...	...
Cashboy	N. Y. Curb	*8⅛	*7	*8	...	...
El Salvador	N. Y. Curb	1	¾	¾	...	...
Jim Butler	N. Y. Curb	*16	*14	*16	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*9	*5	*7	June '16,	.05
Louisiana Con.	N. Y. Curb	⅛	1/16	1/16	...	...
MacNamara M.	N. Y. Curb	...	...	¼	May '10,	.02½
N.Y. Hond. Rosar	Open Mar.	†13	†11	...	July '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅜	1⅛	1⅛	Jan. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1 3/16	1 1/16	1 1/16	...	...
Tonopah Ex.	N. Y. Curb	1⅜	1⅛	1 1/16	July '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅜	1⅛	1⅛	Oct. '19, SA	.15
West End Con.	N. Y. Curb	1 1/16	1⅛	1⅛	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*20	*16	*17	July, '20, M	.01
Consol. M. & S.	Montreal	25	24	25	July '20, Q	.62½
Daly Mining	Salt Lake	...	...	2.40	July '20, Q	.10
Daly-West	Boston	4⅜	4⅛	4⅛	Sept. '20, Q	.25
Eagle & Blue Bell.	Boston Curb	2 1/16	2 1/16	2 1/16	Apr. '20, Q	.10
Electric Point	Spokane	*20	*18	*18	May '20, SA	.03
Fed. M. & S.	N. Y.	...	...	12	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	32½	31	31	Sept. '20, Q	1.75
Florence Silver	Spokane	*30	*25	*25	Apr. '19,	.01½
Grand Central	Salt Lake	...	...	*37½	June '20, K	.03
Iron Blossom	N. Y. Curb	½	½	½	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	...	...	3.97½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*17	*14	*17	...	...
Prince Consol.	N. Y. Curb	⅜	5/16	⅜	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*9	*9	*9	Feb. '19,	.01
Rex Con.	N. Y. Curb	*6½	*6	*6	...	...
South Hecla	Salt Lake	*90	*89	*90	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb	½	½	½	Oct. '17,	.05
Tamarack-Custer	Spokane	2.30	2.25	2.30	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.05	2.90	3.00	June '20, Q	.10
Wilbert	N. Y. Curb	*5⅜	*4	*4	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	18⅛	17	18	Mar. '19,	.50
Internat'l Nick.pf.	N. Y.	...	...	80½	Aug '20, Q	1.50
QUICKSILVER						
New Idria	Boston	...	...	5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	...	...	*10	...	...
VANADIUM						
Vanadium Corp.	N. Y.	68¾	64	65⅜	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	98	93	94	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	105	101	101	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	61	57⅜	60⅛	Sept. '20, Q	1.00
Am. S. & R.pf.	N. Y.	90	89⅜	90	Sept. '20, Q	1.75
Am. Sm. pf.A	N. Y.	...	...	74⅜	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	56	54⅛	54⅛	July '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44	43	44	July '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, Semi-annually. BM, bimontbly. K, Irregular. I, Initial. X, includes extra

INDUSTRIAL NEWS

Chemical Industries Exhibit Manifold Accomplishments

The Sixth National Exposition at New York Drew Many Visitors—Some Exhibits Noticed

The chemical industries of the United States and Canada held their most extensive and pretentious exposition in the Grand Central Palace, Lexington Ave. and 46th St., New York City, during the week ended Sept. 25, 1920. The more than 750 booths fully occupied the four floors of the great building, and every booth carried an attractive, interesting display, with its message of one or more successful American applications of chemical science to industrial needs. Every afternoon and evening of the week brought a steady stream of visitors, including the public, teachers, students, and industrialists, representing most of the nations of the globe. Exposition officials estimate the total attendance at 125,000, and every visitor found something worth his attention. The talks and illustrated lectures, but more especially the cinematograph demonstrations of actual plants in operation, drew crowds far exceeding the capacities of the space allotted. Future shows must follow suit.

In the following paragraphs brief note is made of some of the exhibits having special interest for the mining, metallurgical, and allied industries.

William Ainsworth & Sons—This well-established firm of instrument makers exhibited a group of assayer's balances, all of which had varying degrees of sensitiveness and corresponded to their standard grade of balance. There was also shown a compact theodolite with solar attachment.

American Metal Co., Ltd.—This mining company's chief exhibit was a group of raw and finished metallic products, such as zinc ore and zinc slabs, entering into their manifold mining and smelting activities. Manufactured and commercial forms of copper were also shown, and the variety of chemicals made from copper and other ores was illustrated.

Anaconda Copper Mining Co.—A diversified exhibit was presented by this company, and served to indicate the many fields of endeavor included in its operations. Copper, zinc, and lead commercial forms were shown, as well as many rarer metallic and chemical products. Not the least interesting feature of the exhibit was the $11,660 bar of gold (a metal rarely seen nowadays), inclosed in a glass case. The Anaconda Lead Products Co. and the Anaconda rolling Mill Department, allied and subsidiary organizations, joined in the display.

Eagle Picher Lead Co.—As this company's chief product is paint or paint pigment, its exhibit comprised many colored samples of lead pigments contained in an artistic arrangement in glass bottles.

International Nickel Co.—Monel metal, an industrial alloy of nickel, was displayed in many manufactured forms. Nickel chemicals and commercial forms of nickel also received much attention and combined to make an instructive exhibit of the nickel industry.

Lunkenheimer Co. showed a large line of valves and brass specialties of use to the chemical engineering trade which although by no means a complete line of its products, served to indicate the field covered by its activities.

Raymond Bros. Impact Pulverizer Co.—Several well-constructed models of pulverizing machinery were exhibited. One model illustrated the method used by the company to pulverize coal for use in reverberatory furnaces and another showed how a similar apparatus could be used for grinding and separating soft non-metallic minerals such as talc.

Western Electric and Manufacturing Co.—A few switchboards and motor generator sets were the chief display of this company. To have exhibited everything manufactured for use in chemical work would have necessitated much more space than was available.

Worthington Pump & Machinery Corporation—The several lines of centrifugal and direct acting pumps made by this company were given prominence, and various models exhibited.

De Laval Separator Co.—This company, of pastoral origin, demonstrated the great efficiency of its special machines for separating, or reclaiming and purifying all kinds of oil combinations, as its display of tubes of oils made clear. The separator at work was sorting machine oil out of colored water, and of course held the attention of many who are fascinated by these canny devices.

Lead Lined Iron Pipe Co.—It is difficult to make a lively display of such deadly heavy objects as lead-lined pipes, joints, and elbows. This company did as well as could be expected with its complete line of fittings.

Sullivan Machinery Co.—Air lifts, by their nature, are lively devices. This company's display of an air lift of two stages, at work, took advantage of this fact and the transparency of glass to catch everyone's attention and interest. The whirr of the compressor motors and the rush of bubbling waters was most interesting.

Magnesia Association of America.—When fire and heat are under control man needs the insulating coverings provided by this company to maintain his supremacy and direct the chained giant's efforts. This company's display of snowy, high-grade magnesia insulation was capped by a block of 85 per cent magnesia compound.

Mine Safety Appliance Co.—Walking in safety, if not comfort, through the great building, it was hard to realize the conditions of work that sometimes require the use of the complete Gibbs apparatus displayed here. The glistening collection of various pieces of gas-testing apparatus and the multi-colored canisters of absorbents for the Burrell mask seemed particularly to interest those who had experienced gas attacks in the Great War.

Chapman Valve Manufacturing Co.—This firm displayed a very complete line of bronze and iron valves tastefully arranged on either flank of and pointing to a great handsome bronze 28-in. gate valve. The design and general appearance of this centerpiece made it a fitting salesman for the valve builders.

Thwing Instrument Co.—The "hump" method, and particularly the decalescent recording device, were admirably demonstrated by this company's exhibit, where both were shown actually at work. The festoons of graphic records and the glowing little furnaces, with their thermocouples, always caught the eye.

Titanium Pigment Co.—Outdoor weather and indoor factory or mine atmospheres are all inveterate enemies of iron, steel, and wood structures, and the comparative panels displayed by this company seem to show that their "Titanox" paint is a splendid defense against them. Both by weight and by volume this coating shows a superior hiding power. The display of the usefulness of the company's products was heightened by an exhibit of attractive tiles decorated with its terra-cotta titanium pigments.

Herold China & Pottery Co.—The perfection attained by some American makers of chemical and scientific porcelain wares was well illustrated here in a display of carefully made forms ranging from the simplest pestles to complicated and delicate patterns of all sizes.

Magnetic Manufacturing Co.—The uncanny intelligence displayed by electromagnetic machinery is always interesting, and the selective action of this company's ingenious rotating disk, as shown by the half-size working model, attracted much attention when it was in action.

Midwest Engine Co.—The problem of conveying and pumping acids and other corrosives seems to have been solved in an economical way for the rotary pumps made by this company. Certainly they stood up well in contrast with the comparison test pieces displayed beside them.

Becker Christian, Inc.—A line of highly finished analytical balances of various sizes in glass cases is always an attractive showing. In this company's display contrasts were made use of by placing a man-high bullion balance of fine workmanship in the midst of its smallest relatives. A 1-kgm. weight, accompanied by U. S. Bureau of Standards certificate showing it to have no error, emphasized the quality of this firm's work.

The New Jersey Zinc Co. displayed its zinc products and many manufactures of zinc for making which the possibility of using zinc is not generally known. A section of roof covered with zinc shingles, together with leaders and gutters of zinc, caught the attention of the discriminating, though the casual visitor was possibly more attracted by the zinc meter cases, coins, bread trays, lighting fixtures, and the like.

Nichols Copper Co. took advantage of the blue, green and red of its products of copper and nickel sulphates and copper oxide to arrange a striking and artistic exhibit. Pyramids of these colors flanked on each side a larger pyramid made of successive lavers of copper ore, concentrates, matte, blister, and metal. Specimen ingot, wire, and wedge bars and other shapes of refined copper were shown.

The W. S. Tyler & Co. of Cleveland, Ohio, made its presence known over a wide area, from time to time, through the agency of one of its 6-ft. "Hummer" electro-magnetic vibrating screens, which is some hummer when working at its maximum vibration. The familiar displays of woven-wire screen, double-crimped wire cloth, and other products were also shown.

The Refinite Co., of Ardmore, S. D., demonstrated the manner in which it can soften any kind of water with its product, a zeolite mined and prepared in South Dakota. Filters for domestic and commercial use, made by the company, were also displayed, as well as some Phoenix hosiery which is "processed' in Refinite water.

Dings Magnetic Separator Co. attracted the passer by, who usually stopped to test his strength against that of the magnetic pulley which held several monkey wrenches fast against its face. A Rowand-Wetherell E No. 1 X high-intensity separator was also shown, also a type M magnetic separator.

Cleveland-Cliffs Iron Co. was present in its capacity as a manufacturer of wood chemicals. It displayed samples of alchohol (methyl), acetate of lime, and other products, including sulphuric acid. Its factories for making these are at Marquette and Gladstone, Mich., and at Goodman, Wis.

United Lead Co., N. Y., and Georgia Lead Works—The protective lining of pipes, elbows, junctions, and valves, with a heavy lead sheath impervious to corroding fluids, was well illustrated by the many forms of construction displayed by this company.

Nash Engineering Co.—The small-sectioned working model of the "Hytor," a combined air compressor and vacuum and water pump, was an interesting demonstration of the principles of this compact and efficient device. The small volume of the 300 cu.ft. per min. pattern displayed attracted some attention by its compact efficiency.

Allis-Chalmers Manufacturing Co.—The "snapping" bags of this company's dust collector and spray drier usually attracted the attention of the passerby, and the sound of dashing water in the working "Air Conditioner" drew one to a grating whence poured forth a stream of cool, moistened air. Both devices suggested the comment that out-door weather is in the hands of Providence, but indoors Man may largely be the controlling factor.

The Lungmotor Co.—The well-polished aluminum twin cylinders of the Lungmotor hand pump attracted everyone's interest. This portable and simply safeguarded device for rescuing persons overcome by gas or drowning presents many advantages in manipulation.

Foamite Firefoam Co.—The terrors of fire uncontrolled, as shown by lurid pictures and constantly changing stereopticon views, drew everyone's attention to the booth of this company. The sizzling reaction at the table where actual demonstrations of "foamite" were given kept the aisle crowded.

America La France Engine Co.—A bright array of warning and guiding metal placards covered the walls back of the interesting display of the firefighter's aids. Various styles of fire-fighting masks, clothing, and fire extinguishers attracted the interest and attention that these devices always receive.

General Chemical Co.—An attractive feature of this exhibit to mining men, was the diminutive Herreshoff roasting furnace. This was an iron model standing about 7 ft. high, opened and illuminated for inspection. Although not heated, the furnace was in operation, and complete even to the small blower, Herreshoff furnaces have been successfully used at many smelters, notably that of the Calumet & Arizona at Douglas, Ariz.

Groch Centrifugal Flotation, Ltd.—Many were disappointed at not having the opportunity to see this successful Canadian machine. The shipment was delayed in transit.

Hardinge Co.—The Hardinge mill is so well known that an exhibit would seem almost superfluous. The principle of operation was well shown in a small glass model filled with nuts of assorted sizes. A larger iron model about five feet long was also revolving merrily.

Huff Electrostatic Separator Co.—The principle of operation of this company's separator was well shown in an open model about six feet high. The snapping discharge attracted considerable attention.

The Merrill Co.—This exhibit of the Merrill Co. was confined principally to the equipment designed by this firm. Of special interest of course was the new Merco Nordstrom plug valve, of which it can be truly said that "it can't stick and it won't leak." Whether cyanide solutions, lime emulsions or scale-forming fluids are to be handled, the Merrill engineers seem to have solved the valve question.

The Mine & Smelter Supply Co.—An exhibit in motion is always attractive and a laboratory flotation machine built of glass is particularly adaptable for show purposes. The model of the Ruth machine shown attracted wide interest. The small Wilfley table was also a feature and even experienced millmen liked to watch the shower of black concentrates coming off the end.

Oliver Continuous Filter Co.—The Oliver filter is adapted to exhibition purposes as well as to mill operation, particularly when a nice white filter cake can be provided. The model in operation was of about 3-ft. size and gave an excellent exemplification of the way these standard machines work in practice.

Stimpson Equipment Co.—No one who reached the third floor could help but investigate the Stimpson exhibit, so alluring was the whirr of the new, electrically vibrated Mitchell screen. This new type promises to revolutionize mill screening in the finer sizes. That the vibration was there, many were willing to get greasy hands to find out.

Corning Glass Works—This company is one of the leading exponents of the manufacture of American laboratory glass ware. An unusually complete line of standard and intricate forms was exhibited. It was a happy thought to include a demonstration of glass bending, blowing, and sealing. When the operator faced his roaring blowpipe flame, a crowd of fascinated boys and men soon gathered there.

The Dorr Co.—Working models of the Dorr thickener, Dorrco pump, and Dorr agitator were of sufficient size to attract considerable attention. Other exhibits showed that this company does not confine its activities to mining, a working model of a system of sewage purification being a feature.

Foote Mineral Co.—The rare minerals are always interesting. Both crude and refined products were shown in an attractive display.

United Filters Corporation—The disk type of filter is still of sufficiently recent introduction to be critically inspected by mining men. The working models shown plainly exhibited how simply the filter segments could be changed and the large capacity considering the size of the machine.

American Metric Association—At an exposition of chemical industries, a booth devoted to the advantages of the metric system of weights and measures, seems a superfluity, as the pure and the applied science underlying the whole exposition uses that system almost exclusively. A representative was on hand, however, and presided over a display of familiar canned food containers whose weights were given in ounces and in grams on their labels. Two sheets of the International Map, scale 1:1,000,000, published by the United States, also displayed the advantages of the metric scale.

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
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Volume 110 New York, October 16, 1920 *Number* 16

The Bureau of Mines Directorship

THE novel idea of having someone who is familiar with mining from actual experience, contact, and practice as head of the Bureau of Mines, when in the future the time comes for a new selection to be made, has been taken up with great favor by the mining industry. The Bureau needs such a man, for only such a one can understand and classify in the proper order of priority the different demands which the industry will make upon the Bureau which represents it. It needs such a man, with the business experience of having handled mining enterprises with a view toward economy and efficiency, to expend the large sums which are annually allotted to the Bureau, and secure the maximum results per dollar of the public's money expended.

It matters little who the practical engineer is who will be called upon or who will consent to take charge of the Bureau's affairs and devote his thoughts to perfecting plans for organization. We have already mentioned Pope Yeatman, whose record of experience and ability leaves little to be desired. Other excellent suggestions have included Arthur Thacher, Robert M. Raymond, and Allen H. Rogers. All these gentlemen are familiar with organization, efficient administration, and the whole range of mining problems; all are expert captains of men, with histories which guarantee success to anything they undertake.

The Function of Government

THERE is a rumor in Washington, which has been reported in our columns by our Washington correspondent, to the effect that a party from the Interior Department is in Alaska investigating smelter charges and that the plan to install in that region a Government mill or smelter is receiving consideration.

We may question whether such an investigation is within the function of the Bureau of Mines or the Geological Survey. At first glance it would seem to fall under the redoubtable Federal Trade Commission, if anywhere. If the Interior Department has the right to investigate supposed industrial monopolies and prescribe a remedy therefor, the idea is novel. If not, is it proper to spend Government money even in the investigation? Granted the propriety, however, of the investigation, is it permissible to consider the solution of a Government-owned smelter or mill?

In a spineless commonwealth, as we conceive of it, the people lean on the government; in an ideal democracy, the government would lean on the people. In our Government today we see both tendencies. A large class of people are yearning to become Government paupers, demanding from the Government that they be babied from birth till old age. "The world owes us a living," was the old remark of the loafer. "The Government owes us a living," is the present-day theory. But for every bone that is thrown to a man by the Government on such a system, a substantial bit of his freedom and liberty is taken away. Suppose the Government is to smelt the miner's ore, or mill his ore. If this is to be done in Alaska, by all means let it be done in Colorado, Arizona, and Montana. Any Government official who imagines that the Government can do it for a substantially less cost than the present average charges is unfamiliar both with custom smelting and milling and with Government administration. It would be done, then, below cost, in order to help out the miner; and the deficit, as in the case of the Government administration of railroads, would be saddled on the taxpayer.

But the Government, if it smelts the miner's ore, must grind the farmer's wheat and refrigerate his beef, must operate all public utilities to rescue the citizen from the "grinding corporations," must by all means dig and transport his coal for him. In short, it must take charge of and direct all big business. This is what is commonly called socialism. We are not here arguing for or against this system, except to point out again that, apart from the question of practicability of business being conducted honestly and efficiently by an ever-increasing swarm of bureaucrats, every coddling function of the Government carries with it a corresponding loss of individual liberty.

As for us, we believe in the maximum of individual liberty consonant with the general welfare. Therefore, we should like to scrutinize carefully each project which makes toward socialism and attacks individualism. If, however, the opposite theory is to hold, we should like to get on the band wagon while the going is still good. We should like to see a bill for the pensioning of editors of mining journals, and will agitate also for a 2-cent subway fare in New York, a Government housage program whereby each citizen can get eight rooms and bath at a nominal rental, and Government remission of all taxes to fathers of families of more than two children.

The Provincialism of Engineers

IT IS A CURIOUS fact that mining engineers to a great extent carry out in practice a theory which is diametrically opposed to certain fundamentals which they absorbed in their early technical training. The study of elementary geology revealed the fact that there are certain fixed laws with regard to the formation of rock strata. We learned, among other things, that there are movements of the earth's crust which cause various phenomena; the actions of ascending and descending solutions produce metals and ores, and certain effects are produced by contact. Contact, as we understand it, and as later studies and investigations showed, was highly important. What is true in a geological sense also has its application in a general way, namely that the law of "contacts" is a most important factor in the existence of the mining engineer—but how many consider it so, or, at any rate, put it into practice?

The engineer, by reason of the fact that much of his work deals with certain concrete facts and with fixed natural laws, is provincial. He takes things as he finds them, applies his acquired knowledge to further his ends, and seeks to obtain a result which is satisfactory to himself and his employers. He takes a pride in his work, and to him one of the greatest pleasures obtained from any accomplishment is the satisfaction of originality. All of which is laudable, justifiable, and eminently proper in one sense, but not at all times advisable.

The story is told—it is ancient history to some perhaps, but we only read of it recently ourselves—of a smelterman who did not know that copper matte could be safely turned into granulated material if a spray of water were properly directed upon it as it flowed from the furnace. He thought that it would cause an explosion, just as it does when the matte is allowed to flow into water. At a neighboring plant, less than twenty miles away, matte had been successfully granulated for some years in the manner described. In the former case, coarse crushing was used, followed by treatment in a ball mill, and a result obtained which was satisfactory to the operator, but at a comparatively high cost. The idea was, to a considerable extent, original, but in comparison with the simpler method which was pursued at the neighboring plant it was an unjustifiable waste.

There exists today a greater realization among engineers of the value of "contacts" and the need of getting the "other fellow's" viewpoint and way of doing things; but there is still room for improvement. Perhaps the best evidence that mining men appreciate the need for this co-operation is shown by the fact that there is a greater tendency toward publicity of mining, milling, and metallurgical methods. More encouragement is offered to engineers to visit other plants, to attend technical meetings wherever operative details are discussed, and to present their views to the technical press. But, as we have before stated, the engineer is by nature inclined to provincialism, and it needs not only the urging of his "boss" but of his fellow engineer as well to pry him from his shell.

On Taking Losses

THERE is no doubt that the consumer will come into his own; a recession in prices has occurred, and in some commodities so rapidly that the rubber balloon called inflation has almost collapsed, as if by a puncture. From a producer's market, conversion has taken place to a buyer's market, and the smooth and exhilarating passage from the valley to the mountain peak of high prices has given way to a rather bumpy and uncomfortable journey to lower levels. The journey up was easy and entailed no worry—the journey down is a different story, and already many business houses have found themselves in a bankrupt condition due to the abrupt turn of affairs.

To ascertain just how metal prices are being affected by deflation, the following table has been prepared, listing a few representative basic agricultural and mineral commodities which reflect the general commodity price level. The table is primarily intended to show how certain of the metallic commodities, such as copper and zinc, are bearing and have borne the brunt of the economic movement downward.

The outstanding feature of the table is the small margin of present copper and zinc prices over 1914 prices. Lead is notably higher, and pig iron is far above its 1914 level. This great trade barometer has shown little inclination to drop, but that other extraordinary price barometer, silver, pointed the way last spring for the general downward movement. The fluctuations in the price of silver have been unusually accurate gages of the general commodity trends, but the peculiar situation in the white metal at the present, whereby the entire United States production is removed from the market, precludes using it as a reliable index.

COMPARATIVE TABLE OF COMMODITY PRICES

	Average 1914	Sept. 1920	Inflation Per Cent
Cotton—Middling, spot, New Orleans, per lb	$0 11¼	$0 28¼	+ 148
Hides—Calfskins, No. 1 Chicago, per lb.	0 21	0 28	+ 33⅓
Wheat—No. 1 Northern Spring, Chicago, per bu	0 97	2 46	+ 154
Wool—Ohio fine delaine, per lb	0 61	1 50	+ 146
Rubber—Plantation, per lb	0 58	0 25	— 57
Hogs—Good merchantable, Chicago, per 100 lb	8 50	16 20	+ 90¾
Petroleum—Kansas-Oklahoma, per bbl.	1 03	3 50	+ 240
Coal—Anthracite stove, f.o.b. mines, per ton.	3 80	8 00	+ 137
Pig Iron—Basic, Pittsburgh, per ton	12 87	50 46	+ 292
Copper—N Y (1910-1914 Av., 0 141 per lb.)	0 136	0 181	+ 33
Lead—N Y (1910-1914 Av., 0 0429 per lb).	0 038	0 082	+ 110
Zinc—St. L. (1910-1914 Av., 0 0567 per lb.)	0 055	0 077	+ 40

Rubber is the only commodity listed which has been deflated below its 1914 level. Although practically all items have exhibited in the last few months a tendency to the normal level, their prices are still markedly high. From hogs to cotton the story is the same—prices have dropped, but are still in the clouds.

For the copper and zinc industry, deflation has meant much financial hardship. Many producers of these metals are taking losses and have been doing so for some time, and there are certain ones whose activities were encouraged by the high price of the metals during the war that are in too weak a position to continue operations. Even the larger corporations are living on the surpluses they were able to accumulate during the war and are undergoing a test of their financial strength. They are progressively becoming leaner—should the process continue ribs will begin to show—and all are receiving a severe lesson in how to take losses. However, as the vice-president of one of our large banks recently pointed out to an editorial conference, the ability to take losses is foreign to the constitution of many organizations, despite the fact that it is part of every-day commercial life to take losses as well as gains.

The business man well schooled in the matter of taking losses and able to judge the market is in an infinitely better position to emerge from this period of deflation with a whole skin than a person so constituted as to be unable to weather a loss. When sugar took its recent tumble we noticed many retailers holding at 20c. when the market was 18c. and less. How much better it would have been to sell at 18c. with a relatively small loss than to have held the product in the face of daily decline, only to unload subsequently with a much greater loss at 16 and 15c.

The same proposition holds true for other business lines, and the shrewdest business acumen will be necessary to weather this period of contraction of prices.

The Artificial Preservation Of Mine Timber

A RECENT inquiry by us in several places indicated that little attention has been paid to the preservation of mine timbers by chemical treatment before placing in the mines. There is field for investigation of this problem, especially in districts where timber is costly. We do not emphasize the additional argument covering the preservation of our forests, for the demands of the

mining industry on the timber supply are relatively not large.

The mine manager, in considering this problem, finds that in many instances the function of mine timber is to withstand an increasing strain, which in the end proves irresistible and crushes the timber long before material decay sets in. Artificial treatment against rot would not increase efficiency in such cases. In the square-set-and-fill type of mining the functions of the timbers are to support the crushing strain of the walls during that period before the fill is complete, and thereafter it is of no importance whether the timber rots or not. In many other stoping operations only a relatively temporary support is economically desirable. Stulls or other forms of timbering are needed only until the ore is extracted, and rot does not progress during that period. Indeed, in many instances it may be said that where timbers last long enough under crushing strain to rot, no timbering is required. Falsely judged timbering is familiar to all of us, as evidenced where the props or stulls have finally rotted away while the walls or roof stands immovable.

Exceptions to this, where the long life of a timber is desirable, are in gangways or travel channels of all kinds, whether shafts, adit tunnels, drifts, permanent crosscuts, manways, or chutes. These may require timbering, often including lagging, when the strain is slight. In such cases the life of the timber under slight strain may be prolonged by guarding against rot.

The careful student of economy will doubtless again discriminate as to the exact conditions. Water acts as a preservative of timber in mines, whereas moist air passing over the wood brings on the growth of fungi which produce the so-called dry rot. It is, finally, in the last condition that the problem of timber preservation may be studied. Probably the timbering of shafts will be the most common example. In instances of this sort the preservative may be creosote or other chemical means, the timber being treated before being placed. A spray of magnesium chloride has been tried and found to be efficacious after the timber is set if it is available for the spray from all sides. Under similar conditions, the thin layer of cement spread by the "Cement Gun" may also be efficient in sealing the wood from the air, which is the rotting agent.

Will the Zinc Industry Respond?

THE American Zinc Institute has taken a practical and commendable step. In the October issue of the *American Zinc Institute Bulletin* appears an article entitled the "Future of the United States Zinc Industry" (reprinted in our issue of Oct. 2), which is a frank discussion of the precarious position of the domestic zinc producers, the underlying causes, the exceptional opportunities facing the industry, and the remedy for existing conditions. The necessity of readjusting the zinc business to meet the changed world economic condition, and the urgent need of meeting lower foreign smelting costs and more efficient working, if the United States is to enter the export market, is properly emphasized, and the suggestion is made—the crux of the article—that "the Institute stands ready to co-operate, through its Developments of Industry Committee, with the zinc manufacturers of the United States in studying, analyzing, charting, diagraming, and putting each and every operation in their plants to a test in the light of world practice, with a view of reducing their zinc costs below those of other nations." Splendid! But does the industry realize fully that this plan, if followed, means abandoning the secretive and narrow-minded policy of some of the zinc producers—a policy well known to the trade—and which at times has led to attempts on the part of competitors to resort to unscrupuleus means in obtaining each other's trade secrets?

It appears that the seed sown by the speech of Charles M. Schwab at the annual 1920 banquet of the A. Z. I., in which this exponent of team work expressed surprise at the attitude of the zinc producers in failing to compare production costs, to their mutual benefit, has taken firm root. Will it grow? Will each member of the institute, by doing his share, help nourish it? For their own good they will do so. Few people besides themselves will benefit by a new tendency on the part of the producers. Should the idea perish, and the wheels of the industry slip back into the old rut, one of the greatest opportunities faced by the United States zinc industry will be lost—foreign trade will be relegated to foreign producers, who will supply that trade, hands down, by lower production costs, if for no other reason.

One of the important and as yet intangible fruits of the war that has come to this country of ours, is the prospect of a highly enlarged foreign trade—an expansion undreamed of a few years ago, but which an increased merchant marine, the havoc and destruction of the war, and enlarged domestic production facilities have brought within our reach. The nation does not know what to make of this international aspect of its markets, and many difficulties must be overcome before a place in export favor and trade can be won. The problem peculiar to the zinc industry can be duplicated in many other lines—not only metallic.

If the zinc producers avail themselves heartily of the timely effort of their representative organization to make co-operation replace isolated endeavor, the announcement of the American Zinc Institute noted will herald a new era, for then no longer will there be, as in pre-war days, a balance of domestic production and consumption, because a new factor, that of foreign trade, will have been introduced. But to compete in the world's zinc markets means a concerted co-operative spirit, which can readily be achieved only by the action proposed. "If they (the producers) will not do so," so the statement goes, "they will simply continue to supply for a time what will eventually prove to have been an incidental European market."

Will the zinc industry change its behavior?

Engineering and Mining Journal Quotations in South America

MR. V. L. HAVENS, editor of *Ingenieria Internacional*, who has just been on an extensive tour of South America, relates that while he was in Buenos Aires a judge requested him to procure a file of *Engineering and Mining Journal* to assist him in making a decision. A dealer in Buenos Aires had purchased tungsten ore from Bolivia, which was shipped from time to time, and there was a legal dispute as to the price. The judge ruled that settlement was to be made according to the *Engineering and Mining Journal* quotations at the time of each shipment. We have, before this, chronicled rulings in the United States courts where our quotations were accepted as standard and a basis for legal decisions, and it is gratifying to note that South American courts have followed the precedent.

WHAT OTHERS THINK

Engineers on the Witness Stand

If a young man may comment critically on the professional and public actions of his elders, I should like to register an impression that I have received from reading the testimony of several prominent engineers when testifying before important governmental bodies. During the spring of 1918, W. R. Ingalls, editor at that time of the *Engineering and Mining Journal*, was requested to come to Washington and express his opinion about the War-Minerals bill before the Committee of Mines of the House of Representatives. The conservative Mr. Ingalls was strongly opposed to any interference by the Government with the sacred law of supply and demand, and spoke at every opportunity against the bill. But the point that I wish to emphasize was the uncoöperative and sarcastic attitude which he assumed toward the poor Congressmen, who scarcely knew enough about mining to ask intelligent questions. The following is a sample of Mr. Ingalls' replies[1]:

Mr. Hamlin was trying to understand the position which arsenic plays as a byproduct of the copper industry. He compared it with the production of oleomargarine in its relation with the cattle business. Mr. Ingalls said: "I wish you would cite some analogy which is more in my line." Mr. Hamlin asked: "It (oleomargarine) is a byproduct of the steer, is it not? Is that not a fact?" Mr. Ingalls: "I do not know about that." Again, the chairman remarked: "The emergency is here. What are we going to do about it?" Mr. Ingalls replied: "What is anybody going to do?"

My impression from reading the testimony was that Mr. Ingalls made things difficult for the committee. Many of his replies were curt, and he apparently showed little tact or willingness to help matters. Now, much has been said recently about the need for engineers mingling in more friendly fashion with people in general, and establishing a respect for their profession among public men. Such an attitude as Mr. Ingalls' seemingly would antagonize more than it would conciliate, and would even arouse resentment about engineers in the minds of Congressmen who were present.

During the past several weeks the editor of the *Mining and Scientific Press*, T. A. Rickard, was called before the Federal Trade Commission in San Francisco to testify about the Minerals Separation companies and the flotation patents. His attitude, as is evident from reading the testimony,[2] was flippant at times, as when he suggested that a man could be born in a stable and yet not be a horse, or as when he remarked that it would be well for the questioning lawyer if he had had as much literary experience as had Mr. Rickard.

The attitude of both Mr. Ingalls and Mr. Rickard contrasts with that of another prominent engineer, the late Hennen Jennings, who testified in 1918 before the Committee on Ways and Means of the House of Representatives in regard to the menace to gold mining. At that time Jennings held a position with the Bureau of Mines, but the service was largely from patriotic motives, as was shown recently by the large fortune left on his death. In reading his testimony[3] one cannot but be impressed by his extraordinary patience in striving to have the Congressmen understand what they were talking about. Mr. Rainey, for instance, appeared to think that the German control of iridium would affect the use of gold as a standard of exchange, because iridium is more precious than gold. Jennings explained tactfully why this was not so, although such a foolish question is difficult to answer tactfully. Another questioner, Mr. Sloan, said of platinum: "It don't burnish like gold, it is not as desirable for the vision as gold, and it yields to certain acids (anything that has lead in it), so that it may be lost in a very short time?" Now, what engineer could reply seriously to that? Yet Jennings said: "It is really more valuable in the arts now for electrical purposes, and chemical purposes, and in laboratories—and it is very useful."

The question is, is it not better for engineers, when called to testify before governmental bodies, to take a tactful and coöperative course than to be sarcastic or flippant?

P. B. MCDONALD.

New York University.

[1] *Mining and Scientific Press*, July 6, 1918.
[2] *Mining and Scientific Press*, Aug. 21, 1920.

Engineering in the Tropics

Under "News From Washington" in your issue of Oct. 2 was published a half column of complaint from someone of the "greatest of hardships" in tropical areas, and for that reason "it is becoming difficult to persuade the more experienced [Government?] engineers to undertake such expeditions." This seems to me to be hardly an authoritative statement, and as an impression might be made on some younger engineer contemplating such a trip which would cause him to miss a very interesting and valuable experience, I protest against such rot, for I have had many years of experience and enjoyment of examinations in the tropics.

The animals and insect pests may be avoided, and with them most of the exposure to disease. Any man who does not sleep under a net where there are mosquitoes is exposing himself to malaria, and the net should be the close woven net of the tropics, not the one for use against our larger mosquitos. Proper boots and clothing guard against many other pests and, in bad cases, putting the legs of cots and chairs in cans full of water or kerosene keeps away prowling insects. To drink unboiled and unfiltered water or to eat fresh salads and vegetables in cholera time without thoroughly washing them first is to invite disaster.

Work in the tropics is somewhat of a special character and should not be undertaken by engineers without experience—"tenderfeet," in other words—except under some experienced man, but there is no reason whatever that any engineer in good health, with some regard to sanitation and the well-being of his body, cannot undertake such a trip without misgivings. I speak from an experience embracing paddling through rainy seasons in the Philippines, Venezuela and Nicaragua, and various wanderings all over South America and the rest of the globe.

A. J. EVELAND.

Boston, Mass.

[3] *Mining and Scientific Press*, July 27, 1918.

PACKING WATER BY BURRO TRAIN TO CARNOTITE MINE LOWER SAN MIGUEL RIVER DISTRICT

Carnotite Mining in Southwestern Colorado

Estimated Ore Resources Larger Than at One Time Anticipated—Extensive Use of Diamond Drill for Discovery and Outlining Ore Deposits—High Mining Costs and Difficult Transportation—Experimentation With Milling Methods

BY BLAIR BURWELL
Written for *Engineering and Mining Journal*

PRODUCING radium, vanadium, and uranium during the year 1919 valued in excess of five and one-half millions, and with a total production, including the year 1919, of approximately 29,000 tons of carnotite ore averaging 1.90 per cent U_3O_8 and 5.80 per cent V_2O_5, the carnotite field of southwestern Colorado is at present producing the bulk of the world's radium ore. With little of the publicity that usually attends the initial success of a Western mining camp, the region promises, in the course of a few years, to exceed the gold production of the State of Colorado in the value of its output[1].

Carnotite has been found over a wide area in western Colorado, eastern Utah, and even in northern New Mexico; but at present the bulk of the mining is carried on in the semi-arid basin country in Colorado, along the course of the Dolores River in the west ends of Dolores, San Miguel and Montrose counties, and in the southwest corner of Mesa County. This belt of country is roughly divided into districts whose degree of development is dependent upon transportation facilities, operations at present being centered in the Paradox Valley, Long Park, and Lower San Miguel River districts tributary to Placerville, Col. To the south the Bull Cañon and McIntyre regions and to the north the Mesa Creek, Grubstake, and Gateway districts constitute a vast mineralized area that awaits transportation facilities.

The eight producing camps in the region are operated by the Standard Chemical Co., the Radium Co. of Colorado, and the Radium Luminous Materials Corporation. The Standard Chemical Co. is by far the largest operator, mining approximately 75 per cent of the region's output. The Radium Co. of Colorado produces 10 per cent and the Radium Luminous Materials Corporation 8 per cent of the total production.

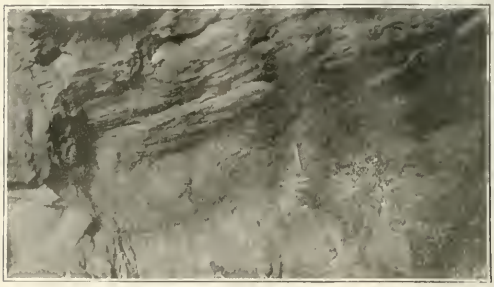
Horizontal and slightly dipping Mesozoic sediments overlie the region. The present drainage has exposed the cliff forming Cutler and Dolores red beds (Permo-Triassic) in the cañons that deeply dissect the region. Above the red beds occurs the prominent La Plata sandstone (Jurassic), with a distinctive white top. Above the La Plata sandstone occurs the carnotite-bearing McElmo series (Jurassic) of sandstones and clays, in which erosion has created a series of rims and flats, capped by the bold cliffs of the so-called "Dakota series of conglomerates" and sandstone. The McElmo formation varies considerably in thickness, but averages about 700 ft.

GEOLOGICAL CHARACTERISTICS

The ore deposits are exceedingly irregular as to size, shape, distribution, and grade of ore. It is believed that the thick series of clays and impure sandstones at the top of the McElmo formation, containing uranium and vanadium minerals widely disseminated, were the source, as traces of these elements are found throughout this member and not in any overlying formation. A downward migration of uranium and vanadium took place in ground waters containing sulphates, with a formation of crystalline gypsum and the precipitation of vanadium and uranium under the influence of carbonaceous matter. In many cases the vanadium was precipitated first, and the uranium subsequently partially replaced the vanadium, thus forming carnotite. In some parts of the district the ready solubility of uranium and vanadium, when exposed by erosion to

[1] In Bulletin 103, U. S. Bureau of Mines, may be found a detailed résumé of mining and other conditions in this area.

ground waters containing carbon dioxide, has resulted in four successive migrations and the formation of four ore levels in favorable precipitating horizons. However, the bulk of the deposits are found in a fairly definite sandstone and clay member of the McElmo formation, about 200 ft. from its base. This member is predominantly æolian in origin and probably represents a sand-dune region where local patches of vegetation and occasional overwhelmed trees, now replaced by ore, followed the pitches and undulations of the dune surface.



CARNOTITE OREBODY, DOLORES CAMP, STANDARD CHEMICAL CO.

CARNOTITE. STOPE IN YELLOW JACKET MINE AT CLUB CAMP, STANDARD CHEMICAL CO.

The orebodies are found throughout this member without any special relation to present cañons, faults or minor dislocations, their distribution being governed by the presence of carbonaceous matter and the lenticular nature of closely associated clay formations.

Two ores are recognized: One, which is the most widely distributed, a black oxide ore of vanadium, carrying a small amount of uranium; and carnotite, which contains a variable proportion of uranium to vanadium, ranging from 1 to 1 for an ore containing 8 to 18 per cent U_3O_8 to 1 to 3 for an average ore containing $1\frac{1}{2}$ per cent U_3O_8. Carnotite frequently carries large amounts of calcium vanadate as well as other variable constituents. This is especially true of deposits found under heavy cover, where in some cases carnotite forms the outer shell of masses of calcium vanadate. In this connection it is interesting to note that calcium vanadate is usually formed from interaction of vanadium solutions and gypsum, and often occurs as a pseudomorph after the latter mineral.

In size the orebodies vary from pockets containing a few hundred pounds to deposits yielding as much as 1,800 tons in exceptional instances. As there are often no indications leading to an orebody, prospecting by jackhammers or by diamond drills is resorted to in advance of mining operations. When the overburden is less than twenty-five feet, the jackhammer is the cheapest method of prospecting, and for this purpose portable gasoline-driven compressors are used. However, as most of the mining operations are being carried on under increasing cover, the diamond drill, with its superior core information, is taking the place of the jackhammer. The practice in prospecting with a diamond drill is to run a line of holes thirty to sixty feet deep and from fifteen to fifty feet apart across the area to be prospected. Upon striking ore or mineralization, drilling is concentrated until the body is roughly defined.

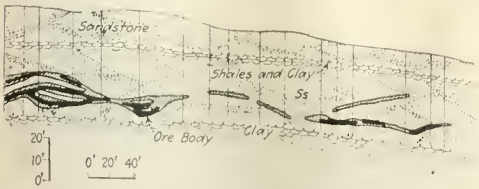
At the Club Camp of the Standard Chemical Co., situated on the west rim of the San Miguel Cañon, four miles above its junction with the Dolores, 45 per cent of the region's total production is being mined from ore located by diamond drills. Three drills are in operation continuously during the drilling season, and 1,000 holes have been completed in an area of approximately 200 acres. The ore is mined from four inclines and four adits, and a total of 10,000 ft. of drifts and crosscuts have been driven.

MILL OF THE STANDARD CHEMICAL CO. ON THE LOWER SAN MIGUEL RIVER

ORE-SORTING CHUTE, CLUB CAMP, STANDARD CHEMICAL CO.

The irregular nature of the orebodies makes it difficult to follow a definite plan of mining, but the usual procedure is to drive haulage drifts below the lowest ore horizon shown by the drills. Raises are then made into the ore, and the waste and ore from stoping are wheeled or shoveled into chutes, from which the cars on the haulage level are loaded. In stoping, what might be termed a room-and-pillar method is followed, the poorer portions of the deposit being left as supports. The waste is stripped from below, and the ore care-

fully shot down on canvas or on a swept floor. In the usual mining operations, from five to ten tons of waste are moved for each ton of ore mined. The roof is usually good, and as a rule little timbering is required, which is fortunate, as the local piñon and cedar are of poor quality. For purposes of mining, the ore is divided into three grades: Low grade, covering up to 0.7 per cent U_3O_8 and usually 2.5 per cent V_2O_5, which is left in the mine or dumped separately for possible future



TYPICAL CROSS-SECTION OF CARNOTITE OREBODY

use; milling ore, assaying from 0.7 to 2 per cent U_3O_8; and high grade, which is carefully mined from the richer portions of the deposit and carries up to 35 per cent U_3O_8.

Hand sorting on the dumps from specially designed sorting chutes is taking the place of the early methods of spreading the ore on a flat rock and picking out the waste. The ore from the mine is dumped into chutes, which discharge upon a breaking platform, where the waste is rejected. The ore then drops into chutes beneath the platform, from which it is sacked and loaded upon wagons for haulage to the company's mill on the San Miguel River, a mile and a half distant and eight hundred feet lower than the mines.

The equipment of the camp consists of a 50-hp. Ingersoll-Rand two-stage compressor, driven by an electric motor with a Foos gas engine in reserve, and a 25-hp. compressor, also motor driven. Power is supplied from the company's hydro-electric plant on the San Miguel River, in which supplementary units consisting of two 200-hp. Fairbanks & Morse "Y" engines have recently been added. A motor-driven triplex pump and pipe line to the camp from the river are installed.

Typical of the smaller camps is the Dolores, also operated by the Standard Chemical Co., and situated on the east rim at the junction of the Dolores and San Miguel rivers. The camp is reached by a trail that climbs five hundred feet above the road, over which water, supplies, and ore are packed by burro trains. Prospecting by drills has not been as intensive as at the Club Camp, but a number of orebodies have been located, and a steady production of about three tons of carnotite ore per day is maintained. Six adits have been driven from the rim, and orebodies located under seventy feet of cover. A Sullivan Compressor with a 25-hp. Foos gas engine has been installed.

From the San Miguel River southward the formations rise with a two-and-a-half-degree slope to the north rim of the Paradox Valley. Here is found a park-like area known as Long Park, in which are the camps of the Radium Co. of Colorado and the Radium Luminous Materials Corporation. Two roads give access, one from the San Miguel River and the other from the Paradox Valley. Long Park has to its credit a total shipping production of about 4,200 tons of carnotite ore averaging 2 per cent U_3O_8, and at present is producing at the rate of about five tons per day when all the camps are in operation. Mining is carried on in open cuts, tunnels and inclines, and jackhammers and diamond drills have been used in prospecting. A number of camps—Saucer Basin, Jack Rabbit, Julian, Outlaw, and the Hieroglyphic—have been established on the sloping country between Long Park and the San Miguel River, but the general scarcity of water in the region has hindered prospecting by drills, and, as a consequence, the majority of the camps lie idle after having exhausted the exposed orebodies.

On the south side of the Paradox Valley a number of claims are located on a faulted segment of the carnotite strata. The most important camps are the Jo Dandy and Monogram, which are owned and operated by the Standard Chemical Co. At the Monogram Camp, reached by trail from the Paradox Valley, mining operations are carried on by hand, due to the difficulties of packing machinery. However, a road to the camp from the Paradox Valley is now under construction.

THE MOTOR TRUCK HAS NOT ENTIRELY REPLACED THE FREIGHTERS' "SIX" HAULING ORE OUT OF THE PARADOX VALLEY

Three adits are worked and several extensive orebodies have been found.

The Jo Dandy claim, early mined by the General Vanadium Co. and declared exhausted, is now a steady producer. Due to broken ground and lack of water, diamond-drill prospecting has not been attempted, but three development adits with connecting crosscuts have opened up a number of orebodies, which are being worked in some cases under 140 ft. of cover. From the operations here, evidence is strong that the carnotite orebodies will be found under the heavier cover of the overlying formations as well as under the shallow overburden of the flats and benches on which operations in the district have so far been confined.

Utilization of low-grade ores is one of the problems in the district. Considerable experimentation is being done with various methods of concentration. The Standard Chemical Co. operates a 50-ton mill on the lower San Miguel River, and at present is the only company concentrating its ores. A simple method of crushing the ore and recovering the mineral in the slimes by a classifier is used. The carnotite and vanadium is friable, slimes readily, and the sand is rejected as tailings. Extensive tests are being made by this company to improve the mechanical details of its process.

Cost

Cost, of course, varies widely with the camp and its condition. The average mining cost per ton is as follows:

Labor—Mining and mucking	$24.35	
Sorting and sacking	2.60	
		$26.95
Powder, fuse and caps		2.25
Other supplies		6.66
Laboratory expense, boarding house loss and general overhead		19.24
Depreciation and replacement on mining equipment		5.22

To which prospecting and transportation charges should be added as follows:

Diamond-drilling prospecting	5.78
Wagoning to Placerville	30.00
Total	$96.10

Where packing is necessary, the cost per ton varies from $3 to $5. Freighting is usually done at the rate of 50c. per ton-mile.

Diamond-drill costs, with the light type of rig used, vary from 80c. to $2 per ft., an average cost being as follows:

Wages	$0.56
Gas and oil	0.05
Repairs	0.10
Depreciation, machine and diamonds	0.07
Overhead and interest	0.16
Total	$0.94

To this must be added the cost of supplying water, which varies from 7c. to 50c. per ft.

The labor supply is scanty and of poor quality, due to the distance of the region from the railroad and the attractions of a town. Miners and muckers are paid $4.50, ore sorters $5.50, and drill runners $7 per shift, with board at $1 per day.

Market

Practically all the operators treat their ore in plants in Denver, or in the East, under secret processes, and market their products as ferrovanadium, ferrouranium, and radium. Owing to the costs involved, little mining is done by the small prospector.

A uranium assay is one on which very few laboratories can check, and the difficulty of reconciling the assays of the miner's inaccurate sample against the pessimistic assay of the buyer causes constant trouble. Ore has changed hands on a basis of $2.75 per lb. of U_3O_8 contained, with a minimum of 2 per cent ore, and some deals are made with a flat rate of 75c. per lb. for vanadium oxide and a sliding scale for the uranium oxide, based on grade.

Excessive transportation costs over roads that are impassable three months of the year comprise one of the limiting factors in the development of the region. Plans are being made to build a road from Naturita to Placerville, the principal shipping point, a distance of forty miles, by the co-operative efforts of the mining interests with state and county aid. This proposed road will follow the course and grade of the San Miguel River, and will greatly stimulate the opening up of the district.

Taking the average tonnage per acre on ground systematically prospected by diamond drills as a basis, and multiplying this into the number of acres in located claims, exclusive of territory mined out, which show equal surface promise of production, and for safety dividing this by five, gives an estimate of 100,000 tons of carnotite ore containing 1.5 per cent UO_3 and 4.5 per cent V_2O_5, which may possibly be termed as the ore resource of the region. The located claims cover only a small fraction of the mineral-bearing territory, and include none of the vast areas where the carnotite sandstone is covered by heavy overburden. Consequently, it is evident that the carnotite region of southwestern Colorado possesses great potentialities for future production.

Chromium Ore in Russia

The most important producers of chromium ore are South Africa (Rhodesia), New Caledonia, Asiatic Turkey, and Russia. Generally speaking, chromium is rarely found in commercial quantities; therefore it has a good market, especially at the present time, when the production of various kinds of steel is increasing. Most of the consuming centers are a great distance from the centers of production. The United States is the most important consuming country, using over 50 per cent of the world's production.

The most important beds of chromium ore in Russia, according to *Commerce Reports*, are found in the Urals (from south to the extreme north), mainly on its eastern slope. All these beds have been only superficially explored; therefore, their supplies cannot be estimated. But the great number of these deposits and their nearness to metallurgical centers give them much importance. It can be expected that a considerable amount of chromium ore will be exported when conditions are again normal and proper methods of exploitation are adopted. Prior to the war the mining of this ore was considered of minor importance in the Urals, but the increasing demand for it may aid in the development of its mines. Chromium ore has been obtained from twenty to thirty small mines, but mostly by primitive methods. In addition to the Urals, chromium ore is also found on the northeastern banks of Lake Goktcha, Government of Erivan, Transcaucasia, where the supply is considered rather large, and also along the Gazimur River, near the Kultuminsk silver-lead mines, Transbaikal region. These beds are all undeveloped.

The Shattuck-Arizona Mill for Concentrating Silver Lead-Carbonate Ores

How a Low-Grade, Truly Oxidized Ore Is Concentrated at a Profit—Exceedingly Fine Crushing Necessary—Table Treatment and Sulphidizing Followed by Flotation Gives Satisfactory Lead Recovery

By Glenn L. Allen
Mill Superintendent, Shattuck Arizona Copper Co.

Written for the *Engineering and Mining Journal*

THE Shattuck-Arizona Copper Co., of Bisbee, Ariz., has probably the most unique and successful plant in operation today for the concentration of silver lead-carbonate ores. The plant and process represent a new departure in the art of dressing low-grade oxidized ores of lead and constitute a real advance in a new and rapidly developing form of metallurgy. This mill is designed for treating a class and grade of ore heretofore considered impossible of profitable treatment.

GLENN L. ALLEN

The most abundant economic mineral in the Shattuck ore is cerussite, or the carbonate of lead. The ore contains in addition silver chloride or cerargyrite, and gold. Sulphate of lead is present but in very small quantities. The major gangue constituents are silica, specular iron, and limonite. Lime, alumina and manganese together represent less than 1 per cent by weight of the ore. The sulphur content is about 0.1 per cent, so the ore is truly oxidized. A typical analysis of the mill feed is Au, 0.06 oz.; Ag, 5 oz.; Pb, 5.3 per cent; Fe, 13 per cent; "insoluble," 71 per cent.

The mill has a nominal capacity of 400 tons in 24 hours and employs both gravity concentration and flotation, as shown on the flow sheet. Flotation of the carbonate mineral depends upon a sulphidizing process wherein the silver chloride and lead carbonate are lightly coated with a film of sulphide and thus made amenable to oil flotation such as is commonly practiced with the natural sulphide minerals. The reagents and chemistry of sulphidizing have been described in detail elsewhere.[1]

Gyratories and Rolls Used for Crushing

Ore from the mine, 800 ft. deep, is delivered to the mill in 50-ton side-dump cars and dumped directly into the coarse-ore bins (1) having 1,000 tons' capacity. Eight Jeffrey stationary steel apron feeders (2) deliver the run-of-mine ore into one movable hopper car which feeds a 20-in. conveyor belt (3). This belt delivers to a 20-in. inclined conveyor belt (4) provided with a magnetic head pulley. The grizzly (5) on which this belt discharges is spaced 1.5-in. between bars and delivers the oversize to a No. 5 Telsmith gyratory crusher (6) set at 1.5-in. opening. The undersize of the grizzly joins the gyratory product at the boot of a Jeffrey continuous bucket-and-chain elevator (7) which discharges over a Hummer electrically vibrated screen (8). This screen is equipped with a heavy wire cloth having a rectangular opening $\frac{5}{8}$ in. wide. The oversize, after passing through the 42 x 16-in. Traylor rolls (9), is returned to the boot of the elevator (7). The undersize of the screen is sent to the fine-ore bins by a Jeffrey 16-in. conveyor belt (10) inclined at 21½ deg. Another conveyor belt (11) drives a self-reversing automatic tripper (11) which beds the crushed ore in either of two 400-ton bins (12). These bins feed the ore by means of six Challenge feeders to 16-in. belts (13 and 14). The next belt (15) passes over automatic weighing scales (16) and delivers the crushed ore into the mill. About 20 per cent of the crusher product will remain on a 3-mesh screen, 75 per cent is coarser than 48 mesh, and 14 per cent will pass a 200-mesh sieve.

About half of the ore is too coarse to concentrate, so it is sent to a Whip-Tap vibrating screen (17) screening dry through a 4-mm. opening. Water is added to the undersize to carry it to primary Butchart tables (18), two operating. These tables produce a finished concentrate. Their tailings are deslimed and dewatered in a 12-in. drag classifier (19) operating at 75 ft. per min., and ground in a 4 x 10-ft. Allis-Chalmers ball tube mill (20) in closed circuit with the drag classifier.

The oversize of the screen (17) is a coarse, hard, siliceous material and is laundered nearly dry directly

[1] "Flotation of Oxidized Ores of Lead," Glenn L. Allen, *Chem. and Met. Engg.*, Vol. 20, No. 4, Feb. 15, 1919, and "Innovations in the Metallurgy of Lead," Lyon and Ralston, 1919, 157, U. S. Bureau of Mines.

THE SHATTUCK ARIZONA MILL, BISBEE, ARIZ.

to the scoops of two 6 x 4½-ft. Marcy mills (21) in closed circuit with 5-ft. Dorr duplex classifiers (22). The overflow of these classifiers joins the overflow of the drag classifier (19) and is laundered to 6-ft. Allen sand cones (23) for sand and slime separation.

Sizing the mill feed through a 4-mm. screen has distinct advantages. It gives the primary tables an enriched feed of finer material, on which they do good work; it eliminates much wear of linoleum and riffles on the tables; and it provides a minus 4-mm. feed for the 4-ft. tube mill. For the 6-ft. Marcy ball mills the screen oversize provides a dry feed of minus ⅝-in. and plus 4-mm. material and allows a high percentage of solids in the mills. Sizing the mill head thus virtually gives a modified two-stage grinding wherein the larger sizes are ground in large diameter mills with larger steel balls and heavy ball charges. The smaller sizes are ground in a smaller diameter mill using small cast balls and cheaper cast liners. This permits of finer grinding, easier and closer control of the size of the material in the overflow of the classifiers, and a higher percentage of solids in the mills. Economy in balls and liners is probably secured and power per ton milled is materially less.

The ball charges in the Marcy mills are replenished with 85 per cent 4-in. and 15 per cent 3-in. forged steel balls. When the occasion offers, the balls smaller than two inches are sorted from Marcy mill charges and fed into the 4-ft. tube mill. This mill is regularly charged with 2-in. and 1.5-in. cast balls, although a small percentage of 3-in. balls appears to give the mill more grinding capacity. The tube mill makes 31 r.p.m. and the ball mills make 25 and 23.5 r.p.m. All are belt driven from a line shaft which is driven by a 220-hp. synchronous motor.

Referring again to the flow sheet, the products of the mills are finely ground and ready for desliming. The tube mill furnishes a product 68 per cent of which is plus 200 mesh and the ball mills grind to 55 per cent through 200 mesh. Both products are combined and deslimed in two 6-ft. Allen cone classifiers (23). The

DISTRIBUTING ORE IN FINE-ORE BINS

overflow of the cones is about 90 per cent through 200 mesh and is laundered to a 34 x 12-ft. Dorr thickener (24) to thicken it for flotation. The underflow of the cones contains about 15 per cent through 200 mesh. This 200-mesh material contains a large percentage of lead carbonate which, though very finely ground, is still granular and is recovered in the subsequent tabling operation.

The two secondary Butchart tables (25) treating the underflow of the Allen cones are similar to the primary tables except that they use shallower riffles and higher speed. The same highly developed system of riffling found most effective with lead carbonate ores is used on both primary and secondary tables. These secondary machines produce a finished concentrate about 30 per cent of which is minus 200 mesh. The tailings are again classified in an Allen cone (23-*A*), and re-treated on Butchart tables mostly for gold and silver because virtually all the lead has been removed in the previous tabling operation. The last two tables (26) produce finished tailings and a middling product that is returned to the tube-mill circuit for regrinding.

Pulp Treated With Sodium Sulphide Previous to Flotation

Virtually all of the slime portion of the minus 200-mesh material, whether primary or resulting from the action of the mills, collects in the thickener (24). The underflow of this thickener is sulphidized with a weak solution of commercial sodium sulphide, then pumped to an agitator (27), where primary oiling takes place. From the agitator the pulp, which is now well sulphidized and oiled, is distrubuted to six K. & K. and two Rork flotation cells (28) arranged in four series of two 10-ft. cells each. The froth concentrate from the first cell in each series is run to the concentrates dewatering plant and the low-grade concentrate from the second cell in each series is returned to the agitator (27). The tailings from the second machine go to waste. The low-grade concentrate from the secondary cells was formerly re-treated in a separate cleaner machine, but this practice was abandoned in favor of returning to the head of the system.

The sodium sulphide used for sulphidizing is the ordinary commercial 60 per cent Na_2S fused in iron drums for convenience in shipping. For convenience the sulphide is dissolved and held in steel storage tanks. The dilute solution is drawn from the tanks and added to the flotation circuit at the rate of about 3 lb. per ton of ore treated by flotation.

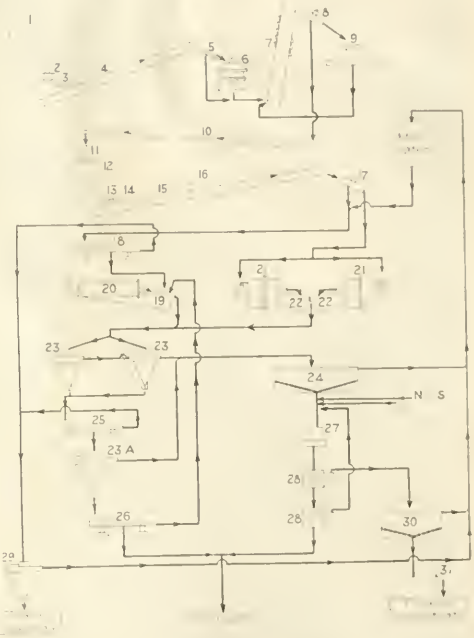
The primary flotation oil consists of a mixture of coal-tar creosote and hardwood creosote. The secondary oil usually consists of a mixture of oil tar, coal creosote, wood creosote and sometimes a little pine or eucalyptus oil.

The usual percentage of solids in the flotation pulp at the head of the primary machines is 30 and at the foot of the secondary machine about 28. Fine grinding seems essential to good flotation work. The usual grinding is all through 100 mesh, 2 per cent on 150 and 90 per cent through 200 mesh.

Flotation Machines Are Particularly Sensitive

The flotation operator controls the work of the flotation machines by varying the amount and kind of oil used, pulp density, pulp-level adjustments, and by varying the amount of sulphide solution used. The work of the machines is very sensitive to changes in the amount of sulphide, so that every precaution is taken to have the flow of the sulphidizing solution under ready and positive control by the operator. Although flotation requires close attention of expert operators, the results obtained are good and remarkably consistent; especially so when it is remembered that the ore treated is entirely oxidized and contains no natural sulphides of the minerals recovered.

All gravity concentrates are combined and laundered to Allen cone classifiers (29) for dewatering. These machines are automatic and entirely satisfactory. The spigot discharge of the cones, containing 21 per cent moisture, is caught in concrete bins having a sand-



THE MILL FLOW SHEET

filter bottom which further reduces the moisture to about 10 per cent. The clear water overflow of the cones is combined with the overflow of the flotation concentrate Dorr thickener and returned to the mill for reuse. The concentrate is shoveled from the bins onto shuttle-type conveyors which load the cars for shipment to the smelter.

Ratio of Concentration Almost 6 to 1

The flotation concentrate is thickened in a 20 x 12-ft. Dorr thickener (30). A 3-in. diaphragm pump ele-

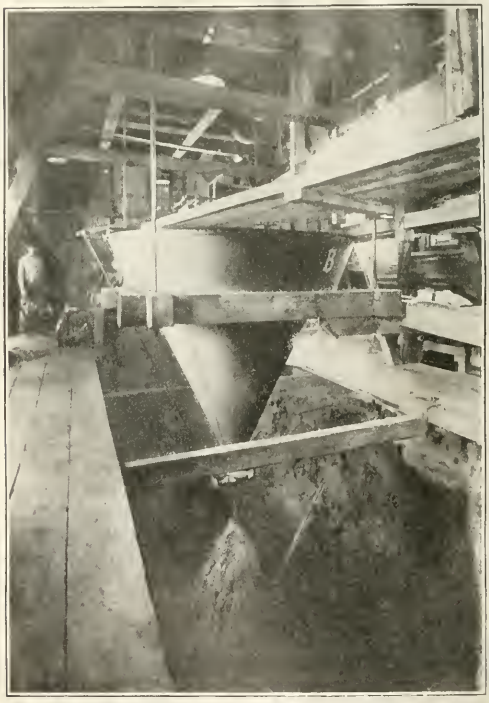
AVERAGE ANALYSES

	Au, Oz.	Ag, Oz.	Pb, per Cent	Fe, per Cent	Insoluble, per Cent
Mill head	0.059	7.22	6.27	13.73	63.99
Concentrate	0.227	28.53	32.92	20.6	22.3
Mill tailings	0.022	2.52	0.43		
Recovery, per cent	69.4	71.3	94.4		

vates the thick pulp underflow of the thickener to the hopper of an 8-ft. diam. x 6-ft. face Oliver filter (31) which discharges its cake into a concrete bin ready for loading.

The metallurgical efficiency of the process is well shown by the average analytical results of a recent period. During this time the ratio of concentration was 5.56 to 1 and the grade of ore was good. The recoveries were calculated from the average assays as noted.

The mill was designed for 400 tons' capacity, but has handled up to 500 tons with but little loss in efficiency. The buildings are all frame structures with corrugated galvanized iron sides and asbestos roofing. The floors and all foundations are of concrete. The mill was built during the World War at war prices at a cost of $275,000. All of the metallurgical work incident to the Shattuck milling enterprise, including the development of the sulphidizing flotation process, was done by Glenn L. Allen, who also designed the mill and supervised its construction.



DEWATERING GRAVITY CONCENTRATES
SHATTUCK ARIZONA MILL

Each shift in the mill consists of two millmen and two helpers, the ball-mill operator having charge of the shift. In addition to the operators the mill organization consists of a superintendent, foreman, clerk, samplers, millwright and mechanics. The crushing, loading of concentrates, unloading of ore, and general surface work requiring unskilled labor is done by Mexicans under the direction of an American surface foreman.

For permission to publish this account I am greatly indebted to L. C. Shattuck, general manager of the Shattuck Arizona Copper Co., to whom acknowledgment is duly accorded.

Difficulties of South African Mines

In spite of the premium on gold, the low-grade gold mines of the Rand (Witwatersrand) are finding it difficult to continue operation, in view of the mounting cost of production, according to Trade Commissioner R. A. Lundquist. For the year 1914 the average working cost for the mines of the Rand district was 17s. 1d. ($4.16) per ton milled. For the first three months of 1920 the costs averaged 25s. 9d. ($6.30 at normal exchange).

The increase in working costs has been due partly to higher wages and partly to the increased cost of all materials, and, in addition, the burden of the mines has been increased through the heavy exchange charges imposed by the banks. At present (May, 1920) the banks charge 8 per cent on London sight drafts.

The closing down of many of the low-grade mines seemed imminent last year, in view of the rising working cost, but the premium on gold temporarily eased the situation. However, the prices of all commodities soon began to rise in even greater proportion than the premium on gold, and, furthermore, while the premium on gold has receded to about 26 per cent, as against a maximum of 44 per cent of a few months ago, the cost of labor and commodities has not been reduced.

Many of the mines, therefore, are now operating at a loss and are faced with the proposition of taking out ore only from the richer sections of the property in order to continue. However, some of the mines are unable to carry on this selective mining, and the Princess, the Jupiter, and the Simmer Deep have already announced that they will close down, and Roodepoort United is considering doing so. At several other mines, the Durban Roodepoort, Deep, the Aurora, the New Goch, and the Luidpaardsvlei Estate, the managements have arranged to cut down the number of white miners to a minimum, and are endeavoring to increase the production per man.

Joint meetings of mine officials and of mine labor leaders are being held to consider the situation, which is regarded locally as serious. Nothing has been announced as to the results of the meetings, but it is reported that the labor leaders and the miners themselves appreciate the gravity of the situation, and that the mine workers' union will take steps toward an increased production per man.

The closing down of these low-grade mines will to a considerable extent affect the mining machinery and materials market, but the effect will be lessened by the increased activity on the East Rand, where new mines are being developed. However, the idle equipment of the mines being shut down will be available for the mines coming into development, and this will reduce the demand for any equipment on the East Rand to no small extent. The general economic unsettlement due to the closing down of mines will also, no doubt, react seriously upon the importation of American goods generally.

State Aid for Australian Lead Producers

A relatively large proportion of the Australian production of lead, zinc, and silver is produced by the various mines at Broken Hill, New South Wales, all of which is handled through the State of South Australia, the lead and zinc being treated at Port Pirie by a producers' association which owns the reduction plant there.

FIG. 1. VIEW OF THE COLQUECHACA MINING DISTRICT

Note rims of old houses surrounding the now inhabited part of the city. The high peak at the head of the valley on the left is Hermoso peak. The rims near the head of the valley on the right mark the site of the ancient settlement of Aullagac.

Revival of the Colquechaca Silver-Tin District, In Bolivia

Ancient Mines in the Andes Mountains Which Have Yielded High-Grade Silver and Tin Ore From Narrow Fissure Veins in Igneous Rocks Are Being Reworked —Present Operations Contemplate Using Flotation To Recover Both Metals

BY JOSEPH T. SINGEWALD, JR.*

Written for *Engineering and Mining Journal*

DESPITE the well-known productivity and importance of the Colquechaca district in years gone by, geological and mining literature on the region is particularly meager. The only readily accessible account is a résumé by R. Peele, Jr., published in the *Engineering and Mining Journal* in 1894, of a private report made by him in 1892. This deals primarily with the operating conditions and treatment of the ores at that period, and was written at a time when only the silver ores were known. Since its publication, the district has passed through a long period of desuetude in silver mining, toward the close of which there was a brief boom in tin mining. It is now in the early stages of what promises to be an important revival in both silver and tin mining. The time seems opportune, therefore, to give an account of the main features of the ore deposits as they are known today and of the new operations that are being initiated.

The close association of silver and tin ores in many of the Bolivian veins has attracted much interest for a number of years. At the beginning of tin mining in Bolivia, there was considerable discussion as to the conformity or non-conformity of the Bolivian tin veins to the normal tin-vein type of Europe. Only in recent years has the completion of the Bolivian railroads made the Bolivian mining districts reasonably accessible, so that the participants in this early discussion were usually familiar with a restricted area only, and were prone to generalize on the basis of what they saw in that area. Thus, some observed no essential difference between the Bolivian tin ores and the European; others could discover no essential points of similarity. Attempts were made also by some investigators to differentiate two distinct types of deposits with different areal distribution.

It has been my privilege in the course of several trips to South America in the last five years to visit almost all of the important mining districts of the Bolivian Andes. My observations indicate with increasing certainty that the mineralization of that range is a genetic unit, and that its exceedingly diverse expressions at different points are only local facies of one general mineralization. At some points, or even over certain large areas, a typical tin mineralization has taken place. As those deposits have been more closely observed, telltale traces of the silver or bismuth minerals often have been noted. At other points, the silver and tin minerals or the bismuth and tin minerals are essential constituents of the ores and are so intimately intermingled as to leave no doubt of their genetic unity. On the other hand, in the light of present scant knowledge concerning them, there are other places where the silver mineralization does not seem to have been accompanied by the deposition of tin or bismuth ores, and where, consequently, a distinct and unrelated mineralization may have occurred.

When consideration is accorded the fact that many of the old silver districts of Bolivia are today producers of silver and tin, with the latter in many instances of predominating importance, and that most of the apparently tin-free silver districts are those that have been quite dormant since the inception of tin mining in Bolivia, suspicions are aroused, and the investigator wonders whether a reopening of those old mines would not disclose tin ores, just as has happened in such districts as Oruro and Potosi. If such were not the case, why should not a tin-free silver mineralization repre-

*George Huntington Williams Memorial Publication No. 4.

sent one extreme, just as the silver-free tin mineralization of such a region as the Quimsa Cruz range represents the other, of a single metallogenic province?

Colquechaca has seemed to stand out as a representative of the tin-free silver type, noted particularly for its great accumulations of the ruby silver ores. It is true that a tin production has been reported from the Colquechaca district for some years, but nothing was known concerning the relation of the tin veins to the old silver veins, and it is probable that the tin ores may have come from other veins in the vicinity, as it is known that such tin districts as Ocuri and Maragua were not far distant. A visit of several days at Colquechaca proved, however, that the Colquechaca veins are both silver-bearing and tin-bearing, and that beyond question they belong to the mixed type of silver-tin ores so abundantly represented in Bolivia.

Colquechaca lies at an elevation of 14,000 ft. at the fork of a deep valley cut into the southern flanks of a group of peaks which rise to an elevation of 2,800 ft. above the city. It is most conveniently reached from Chalapata, a station on the Antofagasta & Bolivia Ry., between Uyuni and Oruro, with which it is connected by a road eighty miles long, which is now traversable by

FIG. 2. SKETCH MAP OF COLQUECHACA MINING DISTRICT, SHOWING THE LOCATION OF THE PRINCIPAL MINES

automobile. Colquechaca lies a little north of east of Challapata. Sucre is situated about sixty miles to the southeast, and Potosi about one hundred miles in a direction east of south.

The great antiquity of the Colquechaca mines is attested by the fact that the San Bartolomé tunnel, the longest in the district, was begun before 1700. The city of Colquechaca is the third mining town that has sprung up on the flanks of this group of mineralized mountains. In the canyon between Santa Barbara and Flamenca peaks are the ruins of the completely abandoned town of Anconaza, about which are evidences of ancient workings of considerable extent. South of the Cerro Gata, in the canyon between Animas and San Matias peaks, are extensive ruins of the town of Aullagas, which, except for the presence of a few Indian families, is likewise abandoned. About thirty years ago, Colquechaca had a population of 8,000. A period of decline to almost extinction of the mining industry then set in, so that by 1900 the population of the town had dwindled to a few hundreds, and in 1915 it was mainly a town of roofless walls.

With the increasing activity in the Bolivian mining industry incident to the rising prices of silver and tin during the war, a revival set in at Colquechaca, and the district recently has been the scene of more active operations. The former population is returning in constantly increasing numbers and the bare dobe and rock walls along street after street are again being roofed and converted into habitable houses. The town now presents the curious spectacle of a central inhabited part with newly whitewashed houses surrounded by outlying sections of abandoned walls.

General Features of the District

The prevailing rocks for miles around Colquechaca are a great series of red sandstones, quartzites, and shales, which Steinmann has called the Puca sandstone, from the Quecha word for red. The series is generally made up of three fairly distinct divisions—a lower consisting of red sandstones; a middle, made up of red clays, with which are often associated salt and gypsum; and an upper, which, like the lower, is prevailingly sandy. These beds are for the most part unfossiliferous. Near the base of the shaly division, however, are often fossiliferous limestones, which near Miraflores and between Miraflores and Potosi have yielded Cretaceous forms.

Colquechaca is on the contact between these red sediments and a mass of igneous rock which constitutes the group of peaks in the vicinity of the town on the north, and which has been intruded into and through the Cretaceous strata. The igneous rock is a rhyolite which ranges in texture from a distinctly porphyritic rock, in which there are large phenocrysts up to an inch in diameter, to a rock with very small phenocrysts. The phenocrysts are quartz, feldspar, and hornblende. The quartz crystals are generally less than $\frac{1}{8}$ in. in diameter and quite abundant. The feldspar is usually a glassy orthoclase, and frequently shows zonal structure. Many individuals are over $\frac{1}{4}$ in. in diameter and some are as much as an inch, but most of them are smaller. In some places the rock contains patches of radiating acicular crystals of tourmaline, many of which have pyrite in the center. Often the tourmaline in part replaces the feldspar phenocrysts. Small fractures are also filled with veinlets of tourmaline, but the mineral was not seen in the ores. Locally there is an abundance of inclusions of fragments of sedimentary rocks, chiefly sandstones and quartzites, in the form of rounded pebbles.

All of the workable veins of the Colquechaca district lie within the igneous rock. The most famous and productive has been the vein which to the southeast is called the Embudo and to the northwest the Gallofa. It has been worked through the San Bartolomé, Amigos, Huainacucho, Progreso, Begoña, and other tunnels, almost continuously along the strike for a distance of two miles, and over a vertical range of 2,000 ft. The outcrop of the vein runs in the direction N. 35 deg. to 60 deg. W. near the crest of the mountain on the south side, from the pass between Flamenca and San Matias

FIG. 3. LOOKING DOWN THE COLQUECHACA VALLEY OVER THE LOWER PART OF THE CITY
The rocks are strata of the Puca sandstone series

peaks. Its dip is usually steep to the north, but equally steep reverse dips are found. It has yielded only silver ores, and has been especially noteworthy for phenomenally high-grade oreshoots.

The vein is generally a well-defined but narrow fissure filling, rarely over four to eight inches wide. Over most of its extent it consists of low-grade or barren filling, frequently gouge and sphalerite. Irregularly distributed are the small shoots of rich silver ores. The most important ore mineral has been ruby silver. Associated with it, particularly in druses, is wire silver. Argentite and tetrahedrite are also of common occurrence. The most abundant sulphide is sphalerite. Galena is found only locally, and iron sulphides are not abundant. The principal gangue mineral is quartz.

Descubridora Vein Now Worked for Tin

About 300 ft. northwest and parallel to the Embudo vein is the Descubridora, which has also produced large quantities of silver but is now worked primarily for tin. The southeast end of the vein lies on the north side of the crest of the mountain, but toward the northwest it crosses to the south side. It was not encountered in the San Bartolomé tunnel, but was an important vein in the mines west of it as far as the Manjon tunnel. The average width of the vein is eight to sixteen inches, but it attains to widths of three feet or more. On the other hand, it frequently splits up into small stringers to such an extent as to be unworkable. Most of the ore has a massive and compact texture, but locally it is drusy and crustified, and has a banded structure. The gangue minerals are quartz and a little siderite. Sphalerite is the most abundant ore mineral, with cassiterite second.

Much more pyrite occurs than in the Embudo-Gallofa vein, and also a little chalcopyrite and pyrrhotite.

Galena is found in sufficient abundance locally as to necessitate sorting it out of the tin ores to be concentrated. The average grade of the hand-sorted ores is about 15 oz. of silver and 9 to 18 per cent tin. Small pockets and shoots of rich silver ore are frequently encountered that yield a half ton to a ton of ore, with several ounces in silver. The principal silver mineral is the ruby silver. There is considerable similarity, therefore, between the Embudo-Gallofa and the Descubridora veins. The differences are that the Descubridora sliver shoots are not as abundant or large as those of the other vein, and there has been sufficient deposition of tin in the Descubridora to bridge over the gaps between the silver shoots with workable ore and thus make the vein important as a producer of tin ore.

Another Producing Vein

In the Begoña and Progreso tunnels a vein is encountered parallel to the Gallofa but at a distance of 1,000 ft. to the northeast, which is called the San Carlos. In the absence of a vein in the expected position of the Descubridora, the San Carlos is believed by some to be the northwestward continuation of the Descubridora. The filling of the vein is mineralogically the same as

FIG. 4. ONE OF THE REHABILITATED STREETS OF COLQUECHACA. ANIMAS PEAK AT THE HEAD OF THE STREET. HERMOSO PEAK IN THE BACKGROUND

that of the latter vein, but sphalerite and quartz are more abundant, cassiterite is less abundant, and the silver shoots are lacking. Only a small part of the vein is rich enough in cassiterite to yield workable ore under existing conditions.

The Embudo-Gallofa, Descubridora, and San Carlos are the only veins producing at present, but a number of other veins have been worked, some for silver, others for tin, and some for both metals, several of which have yielded large productions. Prospecting is being carried on, and doubtless other productive veins will be developed. By far the most important part of the district has been the side of the mountains facing Colquechaca. On the east side much work has also been done, and considerable production has come from the mines on that side. The north side of the mountains has been but little worked, and the west side still less.

Aliada Mine Formerly Prolific

In Gato and San Matias peaks, on the east side, is the Aliada mine, now idle, but which about 1910 was producing at the rate of 100 tons of 60 per cent concentrates annually from hand-sorted ore carrying 25 per cent tin. The value of the tin production of this mine is said to have aggregated over two million dollars, a figure that is doubtless exaggerated. Lower down in the same canyon in which the Aliada mine is situated, is the Gran Poder mine, which is not now being worked, on account of the complexity of the ore. The Lora is the principal vein in this mine. The tin tenor is said to be high, but the vein is only four inches wide, and carries so much galena that the production of clean tin concentrates is difficult. The Rosario vein, at right angles to the Lora, carries less galena but more sphalerite. The Porfyr vein, northeast of the Gran Poder mine, is being developed by Simon I. Patiño. As thus far opened up and developed it is a narrow vein with highly pyritic ore.

The wall rock of the Colquechaca veins has undergone considerable alteration. For some distance from the vein, it is soft and kaolinic in appearance and impregnated with pyrite. At the vein walls, it is often typical gouge, and shows evidence of mashing, which may warrantably be assumed to be due to slipping along the fractures.

Tin Ore Concentrated Locally in Present Operations

The production of the district comes from the Huainacucho, Santa Teresa, Manjon, and the Gallofa mines. The position of the Huainacucho mine is shown on the sketch map. It is the property of the German commercial firm of Moerch, Bauer y Compañia. Rafael C. Campos and Luis Calvo have operated the mine under lease since early in 1919. Up to August of that year only ten tons of high-grade tin ore had been shipped, the rest of the production being stored at the mine awaiting facilities for milling. At that time they leased La Cruzada mill, situated in the valley a short distance below Colquechaca. The production last year was at the rate of 400 tons of crude ore per month, all from the Descubridora vein.

The Santa Teresa mine is owned and operated by the Gumucio Brothers, and has been worked about three years. The workings are likewise on the Descubridora vein, and lie to the east of and above those of the Huainacucho mine. During the latter part of 1919, the daily production had been brought up to 1½ tons of high-grade ore and 4½ tons of concentrates. The company has rented a small mill at the lower end of the city, to which the ore is brought down on llamas. After a preliminary hand-sorting at the mine, the tin content of the ore sent to the mill is 18 per cent. Concentration with hand jigs makes a preliminary product of 35 per cent tin. This is ground in a Krupp ball mill and classified into three sizes, 2-4 mm., 1-2 mm., and less than 1 mm. The two coarser sizes are concentrated on jigs. The smallest goes to a spitzkasten, the settlings of which are treated on a Wilfley table and the overflow in buddles. The jigs and table make a pyritic middling, which is roasted and reground in a buhr mill, and then reconcentrated. The final concentrate contains 62 to 65 per cent tin. The silver content is such that the concentrates carry 12 oz., the middling 60 oz. and the tailings 20 to 24 oz.

The Gallofa Consolidada is a Bolivian stock company, with headquarters at Sucre. It is operating the Manjon mine and the Gallofa mine, which includes the Progreso and Begoña tunnels. In the Manjon mine only the

Descubridora vein is being worked, and operations are on a small scale. The San Carlos vein is being worked in the Begoña tunnel, and the ore is treated in a small mill equipped with hand jigs and buddles at the Progreso tunnel. The output is 30 to 40 tons of concentrates monthly. In the Progreso tunnel the high-grade silver shoots of the Gallofa vein are being worked. The company is erecting a new mill of 40 tons' capacity a quarter mile below the tunnel to treat the lower-grade silver-tin ores. The ore will pass from a crusher to ten stamps with ⅜-in. screen. The stamp pulp will go to a hindered settling hydraulic classifier. The overflow from this will continue to a Dorr thickener, and the settlings to trommel, which will make a more than 20-mesh product and a less than 20-mesh product. The greater than 20-mesh size will be concentrated in a four-compartment jig, the first two compartments making tin concentrates, the last two middlings, and the tailings being discarded. The less than 20-mesh size will be concentrated on a Deister table. The jig and table middlings will be reground in a Hardinge mill. This mill pulp and the settlings of the Dorr thickener will be concentrated in a Kraut and Kolberg flotation machine. The flotation tailings will be concentrated on Deister and Overstrom tables, roasted, and reconcentrated on slime tables. The ore to be concentrated in this mill is estimated to contain 45 oz. of silver and 5 per cent tin. Flotation experiments with it yielded a 360-oz. concentrate.

The most productive part of the Colquechaca district in the past was that of the Compañía Colquechaca Aullagas de Bolivia, which last year was acquired by Simon I. Patiño, the owner of the Uncia, Huanuni, and other mines in Bolivia. This property is also known as La Unificada, because it represents the consolidation of the workings of the Flamenca, San Bartolomé, Amigos, and other tunnels in their vicinity. It is the purpose of Patiño to reopen these old mines and push their development.

The possibilities of this plan for the rehabilitation of the mining industry of Colquechaca can be grasped by a consideration of a few production figures given in Peele's report. In the twenty-seven years subsequent to 1865, the San Bartolomé tunnel produced $21,000,000 in silver, and from 1884 to 1892 the Amigos tunnel produced $5,700,000. During the first ten months after the consolidation of the properties in 1892, the combined output was 809,000 oz. of silver.

Colquechaca District Has a Bright Future

From the foregoing description, it is evident that the veins of the Colquechaca district are persistent laterally and vertically, but are very narrow. Mineralization is not uniform, but, on the contrary, is very irregular. The veins are characterized by the occurrence of rich oreshoots, between which the grade of the ore in low. This is particularly true of the silver veins with little or no tin content, in which the mineralization is practically devoid of values between the oreshoots. It is true to a less extent in the veins in which the value of the tin exceeds that of the silver

In the days when only the silver ores were worked, the existence of the mines was precarious. A company was prosperous for a period; then followed a long barren spell, against which resources had not been sufficiently conserved, and a collapse followed. Now that the tin ores are also being utilized, and provision can be made for the recovery of both tin and silver values of the mixed ores, that state of affairs has been considerably ameliorated. Nevertheless, the nature of the Colquechaca veins is such that their successful exploitation can be accomplished only by companies with a far-sighted policy and adequate resources, working on a program that carries them over the lean periods as well as through seasons of prosperity. The performance of these veins in the past, and the developments of the present, make reasonably sure a successful outcome with such a program. The Patiño management, especially, is capable of and has the resources for operating on such a basis, so that Colquechaca should soon again take high rank among Bolivia's mining districts.

U. S. Quicksilver Production Declined in the Second Quarter of 1920

From April 1 to June 30, 1920, inclusive, 3,685 flasks of quicksilver of 75 lb. net was produced in the United States, according to F. L. Ransome, of the U. S. Geological Survey, who obtained the figures from the producers. This is 1,214 flasks less than was produced in the first quarter of 1920 and 255 flasks less than was produced in the second quarter of 1919. Only thirteen mines were reported as productive—eight in California, one in Nevada, one in Oregon, and three in Texas. California produced 2,704 flasks, Texas 952 flasks, and Nevada and Oregon together 29 flasks.

The chief cause of the decrease in production during the second quarter was the destruction by fire on June 20 of the reduction plant of the New Idria mine, in California, and the consequent loss of quicksilver already reduced during the earlier part of that month. Because of this misfortune the production for the third quarter of 1920 will probably be still smaller than that for the second quarter. Reconstruction is in progress, and it was thought that the plant would be in partial operation in August or September of this year. Other causes that contributed to the decrease in production were a shortage of efficient labor and a reduction in the average grade of the ore.

At a time when initiative in the quicksilver-mining industry is at a low ebb and the tendency is rather to abandon enterprises already begun than to embark on new ones, it is of interest to note that the former productive Klau mine, in San Luis Obispo County, Cal., has been reopened under capable management as the Carson mine, and that its 50-ton furnace has been put in repair, so that the mine is likely to become a considerable producer.

The Styrian Iron Industry

A few weeks ago, according to *The Ironmonger*, the last blast furnace of the Alpine Montan Co., in Styria, was blown out. Styrian ore, the chief product of the country, can no longer be smelted locally, because not enough coke is coming from Czecho-Slovakia. The Styrian iron and metal industry is now entirely dependent upon foreign iron, and Czecho-Slovakia, taking advantage of the situation, recently raised its prices of iron for delivery in Austria by 16,000 Austrian kronen per ton, and a further increase is under consideration. The Austrian government has been asked to take speedy measures to obtain supplies of fuel, to avert the complete ruin of the Styrian iron industry.

The Declining Quicksilver Production

Drop in United States Output of Mercury Especially Marked During the Summer—World Production Also Has Been Declining, but Present Prices Make It Difficult To Operate Domestic Properties Profitably

By Murray Innes
Written for *Engineering and Mining Journal*

THE Geological Survey has estimated the United States quicksilver production for the first quarter of 1920 at 4,900 flasks. The estimate for the second quarter has not yet been published, but cannot fully reflect the decline in production during June, July, and August, which has been so rapid as to indicate a collapse of the industry. Two-thirds of the mines that were producing in the first quarter are no longer operating. The extensive works of the New Idria mine were destroyed by fire in June, and the California output has declined to 300 flasks monthly. The total United States monthly production is now less than 700 flasks, and though the New Idria Co. will gradually rebuild, it is doubtful if the United States output for the second half of the year will average 1,000 flasks monthly, which compares with 3,000 flasks per month during 1917 and 1918.

A Comparison of Cost of Production and Prices

The cost of mining and reduction has steadily increased. As a rule twelve to fifteen tons of ore are mined and roasted to produce a flask of quicksilver, and thus any increased cost per ton is multiplied in like ratio.

The present New York price (about $75) compares with $105 to $125 per flask during 1917 and 1918, and therefore, though the average cost of production has doubtless increased at least $25 per flask, the market price has declined even more, and as a result there is now no incentive to operate even a well-developed and well-equipped property.

During 1919 the average selling price was somewhat higher, and the average costs of labor, fuel, and other items, considerably lower than at present, but even under the conditions then prevailing the profit of the largest producer on a production of 7,400 flasks amounted to only $1,051.81, or about 15c. per flask.

The New York market has lately been depressed by the dumping of Italian metal, made possible because of exchange conditions, and also from the dumping of re-sale metal from Japan, where a financial crisis has prevailed, and even from the dumping of the small stock held by our Navy Department, amounting to about 1,400 flasks. It would seem (at least to the quicksilver miner) that there was no urgent need of sacrificing this metal at $25 per flask below what it cost the Government.

Prior to the war the average quicksilver consumption in this country was about 2,500 flasks monthly, and at present the country is producing about a quarter of this amount, with small likelihood of permanent increase.

The Attitude of Interested Parties

The position of the miner is simple. He can no longer operate. The Western metal miner is an optimist, but there is usually a limit to the period in which he can operate his mine as a charitable institution.

The position of the quicksilver importer is also simple. The smaller the domestic production, the larger the imports and the larger his business and profits. In other words, he profits by the death of the domestic industry.

The position of the manufacturers of explosives and mercurials and the other larger consumers, who have always the lion's share of profits from quicksilver, has been, I think, rather shortsighted and for the following reasons:

Notwithstanding war demand, the quicksilver production of Europe has also shown a considerable decline during the last few years. For example, the annual production of Spain, including the great Almaden mine, was 23,300 flasks in 1916, 24,300 flasks in 1917, and 16,600 flasks in 1918, or an average of 21,000 flasks for this three-year period. This compares with an average of over 40,000 flasks prior to 1912. As far as figures are available, the production of Italy and Austria also shows a decline, with mine operation becoming increasingly difficult, owing to strikes and Bolshevist activities.

As compared with the United States production of 1917 and 1918, our output at the present rate will show an annual decrease greater than the entire output of Spain, and the United States consumption on a pre-war basis would absorb not only our present output but also the entire output of Spain.

The Question of the Tariff

With declining world production, it might therefore profit our large consumers, now that the domestic production is in collapse, to look about and insure their future requirements. Domestic stocks are negligible, and as most of the European supply is in strong hands, there is a possibility that those who control it may some day decide to do much manufacturing in Europe. If this should happen, the ultimate consumer will doubtless pay through the nose.

The production of quicksilver is not a large business, and the few engaged in it have no influence; but it is a fairly useful metal to have in the country, and when war comes it is an essential. Possibly in a year or two years some old-fashioned protectionist may suggest that it might do no harm to keep the industry alive. Right then we will doubtless hear from the importers and also from the assorted blatherskites who will raise a howl about taxation for the benefit of a few wealthy mine owners. It is to be hoped that the consumers will, if only for their own benefit, take a broader view and show more of the spirit of live and let live than they have shown in the past.

[Since this article was written the quicksilver production estimate of the U. S. Geological Survey for the second quarter of 1920 has been received and will be found on page 767 of this issue of *Engineering and Mining Journal*. It confirms the decline in United States quicksilver production mentioned in Mr. Innes' paper.—Editor.]

Mining Engineers of Note

Pope Yeatman

POPE YEATMAN told a story on himself at a dinner given by the Mining and Metallurgical Society of America, on March 21, 1918, at which time he was presented with the Gold Medal of the society for Distinguished Service in the Administration of Mines. The story was to the effect that he had admitted to his young son that he had never killed a bear, an elk, or a man. His son thoughtfully replied, "Too bad; you're not much of a hero." From this we gather that we may be judged by different standards. Although Mr. Yeatman may receive the same opinion from his fellow engineers with regard to his heroic qualities in the use of firearms, there is little doubt as to how he stands professionally and in the esteem of his colleagues. Mr. Yeatman was born in St. Louis on Aug. 3, 1861. After receiving his degree from Washington University in 1883, he was first employed at the plant of the St. Genevive Copper Co., near St. Louis. From there he went to New Mexico, Mexico, and then Colorado, where he engaged in mining. Later he accepted the position of superintendent of the mine, mill and smelter of the Doe River Mines, in Missouri, and in 1891 took charge of the properties of the Empire Zinc. Co., at Joplin, Mo. In 1895 he went to South Africa, where he remained until 1904. During this time he was successively assistant consulting engineer for the Consolidated Gold Fields, general manager of the Robinson Deep mine and later of the Simmer and Jack mine, and finally consulting engineer and general manager of the Ranfontein Estates Gold Mining Co., Ltd. The nine years spent in the Transvaal by Mr. Yeatman were eventful ones in the history of the gold-mining industry of that country, and his part of the development during that time was most notable.

POPE YEATMAN

Returning to this country, Mr. Yeatman entered consulting work. This was at a time when the copper industry was undergoing a change and methods of mining and treating low-grade ores were receiving attention. In his administration of the Nevada Consolidated Copper Co. he demonstrated that excellent ability for organization which also characterized his work at the Braden and Chuquicamata mines, in Chile.

When the Great War arrived, Yeatman was one of the first engineers to offer his services to his country, for he comes of a military family; and he took steps to enter the Engineering Corps of the Army. At about that time Bernard Baruch was organizing and developing the War Industry Board into a great system which eventually kept track of and controlled the industries of the whole country. He got J. Leonard Replogle, head of the Replogle Steel Co., to come to Washington and take charge of iron and steel problems, and then he cast around for a suitable head for his division to take charge of the other metals — copper, lead, zinc, and such trifles. Yeatman was the man who seemed best fitted, and Baruch asked him to contribute his services. Mr. Yeatman explained to Baruch that he wanted to enter the army, but would go where duty called him, although a desk at wartime did not at first impression arouse in him much enthusiasm. Baruch thereupon had Yeatman appointed a Lieutenant-Colonel of Engineers in order to try to please his new division chief, but when Yeatman heard of it he refused the commission and said he had least of all the ambition to be a swivel-chair officer. So it is *not* Colonel Yeatman, but we love him the better for it. His war record, as it was, left nothing to be desired in the way of being the right man on a big war job.

It is such a record in a Government position, combined with his signal achievements as an engineer, organizer, and operator, that has led many of the mining fraternity throughout the country to hope for a man of his type to head the Bureau of Mines. Those who have worked with him testify to the breadth of his knowledge of details as well as principles, whether it was the detail of sampling procedure or the geology of such a complicated problem as Chuquicamata.

Among the societies in which Mr. Yeatman is a member are the A. I. M. E., the A. S. C. E., the Institute of Mining and Metallurgy, and the Mining and Metallurgical Society of America.

By The Way

Too Much Variety

"These days, m'son," said Cap'n Dick, "a man mus' naw jus' w'ot 'e's doin', an' it does'nt 'ardly do to confuse 'is work so that 'e becomes one o' these 'ere jack-o'-h'all-trades. This is tha h'age o' specialization, they do say, an' tha business o' tryin' to do too many things at once does'nt work h'out some'ow. Sometimes a chap gets h'all h'upset h'over tryin' to suit h'everybody. Take tha case o' Jan Williams, tha blacksmith. W'y, 'e were a good blacksmith too, but they bloody near spoiled 'e w'en they tried to give 'im somethin' to do besides blacksmithin'. 'Ere's 'ow it 'appened. The super, one day, h'asks Jan to keep track o' tha time 'e puts on h'each job in tha shop so that they could make tha right h'appropriations in tha h'office. So Jan said 'e would, but, dam-me, tha more 'e tries tha worse 'e gets tha charges mixed h'up. Tha chief clerk kep' after 'im to get tha h'accounts straight, but Jan wuz poor at figgers, so 'e could 'ardly make 'ead or tail out o' they. Finally one day Jan gets mad, an' after swearin' aroun' 'e sez to tha chief clerk, ''Ere, you, be I a blacksmith or be I a bloody book-keeper?'—an', dos't thee know, m'son, they let 'im alone h'after that for 'e come mighty near quittin'."

Reviews of 1920

Those who hold that engineers should take a more active interest in what is going on about them, aside from their own particular work, will be glad to learn that the U. S. Bureau of Standards has recently issued a paper on the subject of "Adjustment of Parabolic and Linear Curves to Observations Taken at Equal Intervals of the Independent Variable." It is high time that our scientists turned their attention to the national game, the ins and outs of which are readily seen to be susceptible of much investigation. Such manifestation of interest will also serve to awaken in the esoteric a keener appreciation of its finer points and, on the other hand, will perhaps imbue those of the exoteric class with a desire to become esoteric, thus tending to raise standards throughout the country. This is where the Bureau comes in. Lack of space unfortunately prevents quotations at length from this admirable paper. Let it suffice that it starts out with "$Y = A + BX$," to which we echo "Y indeed," and after a reference or so to the "Theory of Errors," that umpire's handbook, arrives at the expression $Y = 0.0285 + 0.009141\ X$. Here is the answer, then, and the reason why only a few become proficient in curves is readily apparent. We have but one criticism to offer, and that is that the author spends too much time on "least squares." Some authorities hold that this should be "diamonds" rather than squares, and there are some who go even further and sweepingly declare that there is nothing square about the thing at all. The pamphlet costs but five cents and may be obtained from the Superintendent of Documents at Washington.

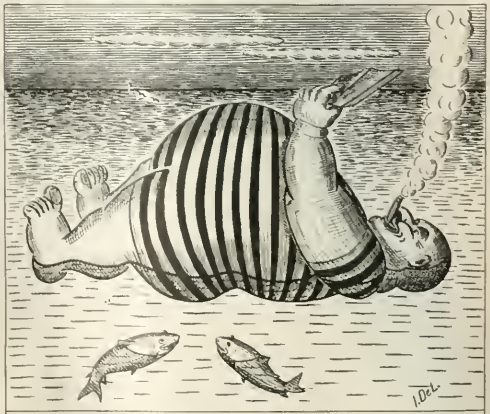
Another paper that is worthy of more than passing comment is Professional Paper 128-A of the U. S. Geological Survey, entitled "The Fauna of the Cannonball Marine Member of the Lance Formation." It is one of the shorter contributions to general geology, being only sixty-six two-column pages in length. The title has a post-bellum sound, but this is merely an accident, the article being a discussion of all the known animal fossils from the Cannonball member. The fauna is strictly marine. Among the good things which all will be glad to hear about are the Solemya bilix White, the Fasciolaria (Mesorhytis) dakotaensis Stanton, and the Otodus obliquus Agassiz and their numerous faunal relations. Those interested should apply to the Director for a copy of this pamphlet.

A Consulting Food Expert

"Dr. Beef, the well-known lady authority on food values, has accepted an invitation from the Rand Mines, Ltd., to visit the mines and report on the question of mine natives' food," says the *South African Mining and Engineering Journal*. Thus opens a vista of jobs for the jobless, not to say beef for the beefless.

Equality

"Next to the tendency of life in the mining regions to remove all restraints and bring into prominence all the vices that were lurking, perhaps unknown to themselves, in the breasts of many of the first comers," says Hittel's "History of California," "one of the most noticeable features of the times was the extraordinary leveling tendency of that life—a tendency upon the effects of which have been based to a great extent the readjustments and developments on new lines that have constituted the peculiarities of California civilization. Every man, finding every other man compelled to labor, found himself the equal of every other man; and, as the labor required was physical instead of mental, the usual superiorities of head-workers over hand-workers disappeared entirely. This condition of things lasted several years. Men who had been governors and legislators and judges in the old states worked by the side of outlaws and convicts; scholars and students by the side of men who could not read or write; those who had been masters by the side of those who had been slaves; old social distinctions were obliterated; everybody did business on his own account, and not one man in ten was the employee, and much less the servant of another."



"Metallurgical Term: "Easy to Float."

CONSULTATION

Method of Marketing South African Gold

"It is not quite clear to me exactly how the South African gold producers market their gold so as to obtain the benefit of the 'gold premium' in London. I can readily understand that it is due to the depreciated currency of Great Britain and the relatively high gold price in the United States that a premium exists, but the exact manner in which the result is brought about is unknown to me. Can you enlighten me upon the subject?"

Without entering into a discussion of the history of the gold premium, a subject which has frequently appeared in the columns of the *Engineering and Mining Journal*, suffice it to say that the South African gold producers are enabled to realize a premium over the normal local currency value of their gold by being allowed to sell their product in the general world market and receiving in exchange the equivalent of $20.67 per troy ounce in their own depreciated *paper* currency.

In marketing their gold, the South African gold mines rely on an agreement made on July 24, 1919, between the Imperial Government, the Union Government, and themselves, whereby they agree to ship all gold refined and unrefined which has been produced by them, to England, consigned to the Bank of England, with, naturally, the exception of such amounts of metal as are necessary to meet local currency requirements. The unrefined exported gold is refined upon arrival at the Bank of England by the gold producers' refiners. The sale of all the refined gold is negotiated by the producers' agents at the best market price obtainable. The fluctuations in the London price of gold reflect the discount on foreign exchange; when exchange is low the price of gold is correspondingly higher, and vice versa.

The Bank of England has authority from the Treasury to issue licenses for the re-exportation of the gold at any time within the period of five weeks from the date of its arrival at the bank. Under ordinary conditions, a period of five weeks is assumed to be amply sufficient to allow the gold to be disposed of to the best advantage. Furthermore, as the amount of each shipment is cabled to London, additional time is afforded in which to market the gold, a total of possibly eight to nine weeks. The assurance is given the producers that in the event of interruption in export facilities due to unforeseen circumstances, an extension of time will be granted. Should sovereigns be required for export, the Bank of England will make payment in sovereigns for gold sold to it at 77s. 9d. ($18.89 at par of exchange) for the standard ounce of gold, .916⅔ fine. All charges for freight, insurance, refining, assaying, and marketing are borne by the gold producers. Another provision whereby the Bank of England undertakes to advance an amount equal to 76s. ($18.46) per standard ounce, subject to interest, is included in the agreement.

This arrangement is of great benefit to the producers. In contrast to the 77s. 9d. received before and during the war, about 117s. is now being received for the standard ounce.

Abnormal Relation Between the New York And St. Louis Lead Markets

"For six days the price of pig lead is quoted at less in the New York market than f.o.b. St. Louis, and this we cannot understand, because all the lead comes from the West, and the price generally is higher in New York than out here [Missouri]. Is it due to the fact that imported lead has weakened the New York market to this extent?"

The abnormal disparity between New York and St. Louis lead markets was due solely to the fact that heavy importations of foreign lead were laid down in New York alone, which was offered at lower prices than lead transported from the Middle West to the Atlantic seaboard. It is estimated that about 11,000 tons of foreign pig lead were received in the port of New York during the month of September, and more is still arriving. Under such a state of affairs the New York and St. Louis markets are influenced by another market element, one that does not ordinarily assume such importance—importations of lead. In fact, these importations are still influencing the trade and neutralizing the normal differential between the two markets. Attention was directed to this situation in the market report for the week in question. The disparity will gradually adjust itself as the domestic price of lead meets the London quotations and makes the cost of importing lead unprofitable.

In 1916 a similar condition arose, with this exception: exportation of lead from the Pacific Coast to Asiatic points was taking place, so that the New York lead market necessarily had to lower its level in order to meet the competition of the Middle West, where producers took advantage of the shorter haul westward.

Uses and Production of Calcareous Marl

"I have been unable to get much information regarding calcareous marl. What it is used for, prices and production? Any information you can give me will be appreciated."

The calcareous marl industry is relatively small. An idea of the production for the past four years can be obtained from the figures of sales given by the U. S. Geological Survey, with average prices:

CALCAREOUS MARL SOLD IN THE UNITED STATES

Year	Quantity (Short Tons)	Value	Average Price per Ton
1916	58,088	$144,768	$2 49
1917	73,900	165,223	2 24
1918	98,894	261,082	2 65
1919	91,437	327,294	3 58

Calcareous marl is of both marine and fresh-water origin. In 1916 and 1917 the entire output was used in agricultural work. In 1918 and 1919 a part of the production, about 15 per cent, was used in the neutralization of acid waters and the preparation of patent fertilizers. Production jumped during the war.

The method of preparation for marketing is usually simple screening and drying, but rotary kiln drying, crushing, screening, and pulverizing may also be used.

California, North and South Carolina, Pennsylvania, Virginia, West Virginia, and Arkansas are the chief producing states.

THE PETROLEUM INDUSTRY

The Prospects for Petroleum Production In Peru and Bolivia

The High Cost of Development, Difficulties of Transportation, High Royalties Asked, and an Objection to Long-Term Concessions Are Drawbacks to the Exploitation Of Oil Possibilities in These Countries

BY CHARLES S. HALEY
Written for *Engineering and Mining Journal*

SINCE the close of the war, the opportunities in the South American field for mining and oil investment have been attracting the attention of American and English capital. Considerable money has been invested there in the last two years, and it seems that more interest is being taken with regard to future development possibilities than has ever been evinced before.

The importance of this field should not be underestimated, nor should its disadvantages be overlooked. It is with the intention of giving a brief survey of the good and bad points of the situation, more especially with regard to the two most prominent republics from a mineral standpoint, Peru and Bolivia, that this article is written. Both of these countries have been famous for centuries for their mineral production, and justly so. Potosi Hill, in Bolivia, has a recorded production valued at more than seven billion dollars, and has been in continuous operation for more than three centuries. Other and less known districts in Bolivia have been adding their steady contribution to the wealth of the world for many decades and even centuries.

PERU IMPORTANT MINERAL PRODUCER

Peru, from a mineral standpoint, is one of the most attractive countries in the world today. The greater portion of the country is occupied by the high Andes and the river valleys between their slopes. Much of it is inaccessible to ordinary methods of travel, and a large portion of it has never been traveled by anyone save the natives. In the colonial days of Spanish rule, many mines were worked at a tremendous profit by means of slave labor, amid difficulties of transportation and operating conditions which would stagger attempts at production even now. And still the heart of the country is as yet unknown and practically unprospected, from a mining standpoint. All over the country one encounters tales of old colonial mines which were abandoned at the time of the revolution, when the colony of Peru threw off the yoke of Spanish dominion. In many places the natives are making an easy living from the crudest forms of placer mining; and what work has been done by the Peruvian government engineers has shown that there exist in that country deposits of almost every known economic mineral within the range of civilization's present horizon.

The petroleum possibilities of Peru have long been known, as have those of Bolivia. Denouncements and concessions have been made in both countries for many years, but as yet the only field of economic value that has been developed has been a very limited one on the northern portion of the Pacific coast of Peru. This field at present produces around one-half of 1 per cent of the world's total production of petroleum.

PROSPECTIVE PETROLEUM FIELDS INACCESSIBLE

The reason for this apparently small development of what appears a great prospective field is obvious. The principal prospective petroleum fields of both Peru and Bolivia lie in the most remote and inaccessible portions of both countries. This does not impress the governments of either of these countries as it should, and still less is it taken into consideration by the average owner and holder of concessions. The main thing that appeals to this individual is that—according to everything he reads—the world's visible supply of petroleum is steadily growing less. He has petroleum, or at least he thinks he has, under the surface of his ground. Therefore the world must come to him and tamely submit to being his oyster. And the petroleum—if it is there—still lies under the ground, and lies, and lies, and lies.

One of the most attractive prospective fields is that extending in eastern Bolivia southerly from the Santa Cruz region through the Azero into the Argentine. Seepages can be found over the entire distance from Embarcacion, in the Argentine, to the north of Santa Cruz, and the structure seems favorable. Until a careful examination can be made, and a few holes put down, that is all that can be said. To date, the presence of slightly productive oil sands has been proven by two shallow wells. The cost of a careful examination of the country is greatly enhanced by the fact that most of it is several hundred miles from the nearest railroad, and the expense of getting material in for development is bound to run from three to five hundred dollars per ton up—as there is absolutely nothing but muleback transportation into the country. Supplies are correspondingly high, and the native labor is notoriously uncertain and inefficient. The result is that in beginning operations in the country, without considering the enormous cost of getting the oil out to a world market, a tremendous overhead is thrown upon the work from the start, in the way of interest and amortization.

DRAWBACKS OF TRANSPORTATION

The most feasible route for the transportation of the oil to a market is by way of the Rio de la Plata. To avoid rehandling and towing of barges—a condition which

makes costs prohibitive when the back haul is considered—a pipe line of from three to four hundred miles in length would have to be built from the most accessible part of this field—this, through a country absolutely without roads or other feasible means of transportation. Such represents the overhead with which the pipe-line company would have to contend. A prohibitive charge for the transportation of the product of the development company would have to be made to amortize the pipe line within a reasonable time.

Product Would Compete With Mexican Oil

After the oil has been safely delivered to tankers of sufficient draft to navigate the Atlantic, geographic troubles enter in. The world's principal petroleum market is the United States, and will be for some time to come. And from the mouth of the Rio de la Plata it is three thousand miles to the east of the market, and eight thousand miles to the south of it. How much of this oil—which by this time represents an investment that approaches in cost the perfumes of Araby—will one have to expend in pushing the rest of it on a back track to the market, and how is the operator going to compete with Mexican petroleum produced at the very front door of the United States?

Considering taxes and royalties, the standard royalty in the United States has for years been 12½ per cent of the gross production. This condition exists in a country where railroad facilities are excellent, where a constant supply of skilled labor is to be had, and where the principal materials for development are produced within easy distance of the property. The Bolivian government is demanding a 15 per cent royalty on gross production, applied universally over the country on all government lands, and private owners are naturally following its lead. So petroleum still lies under the promising prospective territory.

Value of Field Purely Prospective

The entire value of this ground, as has been stated before, is purely prospective. The extent of the territory is so enormous, and its geological history is so favorable, that it seems likely that some day in the future very productive fields may be developed. But this is all indeterminate at present. No corporation which has not been deprived of its financial reasoning powers is going to the expense of making a careful and detailed geological examination of the country, and to the further enormous expense of sinking the first few wildcat wells, until it is assured of at least having a chance for fair return on the investment. In negotiating with private owners, a very definite trend is noticeable toward hard and immediate cash in hand—and the more immediate the better. This tends to disillusion the confiding purchaser as to the owner's faith in the future production of the property.

The attitude of the government is largely influenced, of course, by the political situation. As soon as a large concession is granted, some patriotic individual will come out with a passionate appeal in the papers to the people at large not to permit their political masters to sell their inheritance and birthright for a mess of pottage—and such emotions, properly fanned, may mean revolution. In other words, it is better to have a stable government in an undeveloped and povery-stricken country, than a revolution in an effort to better conditions.

The metal-mining situation in Bolivia is much better. For some reason, the government does not have to contend with the same popular attitude that it does in regard to oil, and the taxation scheme introduced in 1920 seems rather fair and liberal, although a bit too hastily devised. It is perfectly possible to secure a good title to mining property in Bolivia, although the recent revolution has undoubtedly stirred things up to some extent, and to work a small high-grade property, or a large low-grade, on conditions which compare favorably with those in the United States. The attitude of the government which existed until July of this year was both friendly and liberal, with regard to mining.

The same applies to mining conditions in Peru. Peru probably has the most liberal mining laws of all countries in the world. The government is stable—in spite of some revolutions it always recognizes the foreign obligations of former governments—and the general policy of the present administration is to encourage foreign capital by every means possible to come into the country. The continued existence and strength of the powerful and prosperous Cerro de Pasco company through various changes of government demonstrates clearly the possibility of absolutely stable conditions.

Personnel of Peruvian Government Excellent

The present president of Peru, Sr. Augusto B. Leguia, is probably the most capable and able leader that Peru has had in a generation, and the people as a whole seem to be solidly back of him. He has been fortunate in being able to surround himself with a body of ministers whose efforts show that they have the best interests of their country sincerely at heart. In Peru, also, a system of propaganda, instituted by Sr. Oscar Salomon, is being given aid and support by the government, with the idea of educating the people up to the necessity and desirability of getting foreign capital into the country. This propaganda is bearing fruit; and my impression is that the attitude of the Peruvian nation in general toward the United States is the most friendly of all the Latin American republics.

Peru Objects to Long-Term Concessions

The petroleum situation in Peru is not so difficult from either a geographic or a governmental standpoint as it is in Bolivia, but a tinge of the same attitude—that the world must come to them—is visible in certain circles. This tendency, fortunately, is held in check by the wiser and more far-seeing heads of the government. The inaccessibility of the best prospective field—on the drainage of the Amazon—is fully recognized, and excessive royalties are not expected. The government will not charge duty on machinery brought in for development, and will grant all facilities in its power as to right of egress and appropriation of natural resources of power and timber. The chief drawback seems to be a hesitancy to grant long-term concessions—an absolute necessity, in view of the enormous first cost involved—and an unwillingness to give a sufficient time for preliminary prospecting, with a cautious expenditure of money until the ground is sure. This reluctance can be readily understood in the case of fly-by-night companies and irresponsible individuals, who should of course be discouraged from the pre-emption and holding of large territory at all times. But in the case of a well-known production company, of undoubted financial strength and responsibility, it hardly seems necessary or advisable to take these precautions.

The geographical situation of the most promising prospective petroleum territory of Peru—that of the *montaña*—though more favorable in many respects than that of Bolivia, is still far from being ideal. In fact, it is in its own way more or less prohibitive. Practically all the territory of this field is tributary to the Amazon and its headwaters. These are navigable to a far greater extent than those of the Plata, and barges of five- to seven-foot draft can come directly to the region of some of the best seepage indications. This, of course, merely affects the handling of machinery, for barge transportation is out of the question in handling oil, on account of back haulage.

This field is much closer to the west coast of South America than are the Bolivian fields, and as the west coast of Peru is almost due south of New York, the transportation problem is much simpler from there on. But the question which causes the greatest difficulty, and which seems on first consideration to be an insurmountable obstacle to the development of these fields, is the problem of getting this oil to the west coast.

Inaccessibility of Peruvian Oil Fields

The main *cordillera* of the Andes forms a barrier from 14,000 to 17,000 ft. high between this oil and the coast, under the most favorable conditions that can possibly be selected. The distance is only 300 or 400 miles—compared to 4,000 miles by the other door (the Amazon)—but the enormous cost of installing a pipe line with successive pumping stations to overcome this lift is appalling. The country through which the pipe line would have to pass is absolutely without transportation facilities. It takes from one to two months of steady muleback travel to even reach it from the coast. A railroad could not be developed into a financially paying venture, owing to the thin population of the district and the primitive character of the major portion of the inhabitants. Wagon roads and truck roads would have the same drawback. How, then, is the heavy material required in a pipe line of this character to be brought into the country? Discarding Zeppelins and other ultra-modern ideas, there remains transportation by main strength and awkwardness—in other words, by trail. The cost of four hundred miles of such an installation is so extremely high that it could be justified only by the discovery and careful development of a field which would be rich enough and extensive enough to surpass any at present known to the world.

There is, of course, a possibility that on the eastern slopes of the lower Andes such a field may exist. That, however, is highly problematical, and would require many years of careful prospecting and the drilling of many wildcat wells to be susceptible of proof. Again, the spectre of overhead comes in even before the pipe line can be considered. Transportation of complete blacksmith and machine shop equipment 4,000 miles up the Amazon, and transshipment on barges, will make the first oil produced—if it is produced—worth much more than its weight in gold.

It would then appear that it is absolutely imperative that time should be given to prospect carefully and feel the way before money be wasted needlessly. All necessary guarantees should be exacted, but the mere tying up of a corporation's money in prospecting, not to speak of development work, should be the greatest guarantee of all. The more money that is spent in successive years, the more the company will be loath to leave it. A long-term concession is absolutely necessary to give the development company a chance to get its money back. This does not take into account the still longer time which would be necessary before the pipe-line portion of the work could begin to exhibit a profit.

These conditions I believe the Peruvian government will realize, as it appears to have the best vision of all of the Latin-American republics of South America. But the Bolivian attitude appears hopeless for some time, unless the new government which has recently come in adopts an attitude far different from that of its predecessor.

Latin America Should Utilize Foreign Capital

In brief, the situation is this: Now is the accepted time for the Latin-American republics to use our capital—as well as that of England, the only European nation which has it to spare—in the development of their own natural resources and the transformation of themselves into prosperous industrial communities, such as their immense natural resources seem undoubtedly to warrant. Mexico is beginning to realize this fact, and under the new and progressive government has already made great strides toward regaining the confidence of American capital. In the next few decades she will begin to reap the reward of this enlightened and progressive policy.

It is entirely up to Latin America. For years she has neglected to take advantage of her opportunity, partly because of a distrust of the United States, which seems to have been partly justified by some of the acts of our Government in the past, but mostly on account of lack of vision among the statesmen of the Latin republics.

Supplementing the vision of her public men, she must educate her people up to the standpoint where they do not take the vision for the reality. Otherwise the petroleum resources will still continue to lie where they are. To convert any vision into reality, the effective presence and co-operation of hard cash is needed and absolutely essential. To invite this co-operation, and the confidence of pioneer capital, liberal facilities must be offered, and exaggerated ideas of undeveloped riches must not be too strongly held; or, rather, the fact that they are undeveloped, and will continue to be unless such facilities are offered, must be impressed on the minds of the people. Latin America, and more especially Peru and Bolivia, have a brilliant future just around the corner, if they will but recognize their opportunities and give the United States a chance to work with them for our mutual benefit.

A Record Well

In a recent issue of the Standard Oil *Bulletin*, information is made public of the Packard No. 1 Well in California, which is the deepest well in the state, having reached a depth of 6,240 ft. The well turned out to be a "dry hole." Drilling was begun in July, 1919, and completed in March, 1920. The "deepest well in the world," the Lake No. 1, drilled by the Hope Natural Gas Co. on the Lake farm, twelve miles east of Fairmont, West Virginia, was sunk for gas and was abandoned at 7,579 ft. when gas was not found. Europe's deepest well at Czuchow, Silesia, is 7,345 ft. in depth.

NEWS FROM THE OIL FIELDS

Oil Company Sued for Violation of R.R. Commission Rules

State Gas Survey To Be Made in Texas —Recent Completions in Breckenridge, West Columbia, and Hull Fields

From Our Special Correspondent

Suit has been filed in the fifty-third district court of Travis County, Texas, by County Attorney John W. Hornsby, for the State of Texas, against the Montour Oil Co., a corporation of Delaware, with Texas headquarters at Fort Worth, for $870,000. This sum represents penalties for alleged violations of several of the rules of the Railroad Commission, these violations having taken place after March of this year. This is the second suit of this nature filed against the same company. The first, filed in March, asked for penalties amounting to $1,000,000.

A survey of the gas industry of the state will be made by R. D. Parker, newly appointed chief engineer of the gas utilities division of the Railroad Commission. An attempt will be made to fix a fair price for gas sold by the eighteen gas companies placed under the supervision of the commission by the Cox gas law.

The new 18-in. gas main, twenty miles long, from Joshua Junction to the Dallas-Fort Worth trunk line, has been completed, and an additional supply of 50,000,000 cu.ft. of gas will be furnished by the West Texas fields to these cities. It is believed that this increase in supply will prevent any shortage of gas in Dallas this winter.

Recent completions in the townsite pool at Breckenridge, Stephens County, have been made. The W. G. Harding well, a joint well of the Cooper Henderson Co. and employees of that company, located just north of town, came in making 4,000 bbl. It caught fire, but was quickly extinguished. The Cooper Henderson Co. well No. 1 Walker Caldwell, on the east edge of town, has 2,000 ft. of oil standing in it. The Stoker No. 4 well of the Gulf company was shot, and its flow increased from 350 bbl. to 1,500 bbl. daily.

West Columbia holds the attention of all the operating companies on the Gulf Coast. Recently the Humble Oil & Refining Co.'s. No. 28 Japhet well came in making about 15,000 bbl. of oil. The Monarch Oil & Refining-Stribling No. 1 Smith well came in at 3,287 ft., making over 1,000 bbl. of oil. This well is about 1,300 ft. north of the Texas Co.'s Abrams No. 1 well.

At Hull several producing wells were recently completed, including the No. 4 Thomas well of the Gulf Production Co. flowing initially over 2,500 bbl. The total production of this field has been steadily increasing the last few months and is now nearly 15,000 bbl. daily.

Damaged Valve Causes Losses in Mexican Oil Field

From Our Special Correspondent

Well No. 4 of the Transcontinental Petroleum Co. on Lot 134, Chinampa, is running wild, making about 40,000 bbl. a day. The well was flowing under heads at regular intervals, when just before it was brought in one of the gate valves was damaged by the drilling tools; and the other was blown out by the well pressure while the operatives were trying to close in. Temporary pumps and boilers have been set up in an effort to save as much of the oil as possible. About two thousand barrels a day are being saved.

Special apparatus will be necessary gain control of the well, and it is probable that the well will continue wild for a week or ten days at least. The task of getting a new valve on the well is a very difficult one, as the material used is necessarily heavy and has to withstand great pressure. The workmen also have to contend with the gas given off by the well. This gas suffocates, and in some cases proves fatal. This accident will not help the Amatlan-Chinampa pool; as this great daily draught will aid the encroachment of the salt water.

It is reported that one of the International Petroleum Co.'s tests in Zacamixtle has brought in salt water, and that the Aztec hole is drilling in brown limestone at 2,806 ft.

British Interest in Roumanian Oil Development

A new British oil company has been organized to complete, with French and Roumanian groups, a syndicate to acquire a controlling interest in the Steaua Romana Oil Co, according to *Commerce Reports*. The British group will be called the British Steaua Romana Co. and will be floated jointly by the Anglo-Persian Oil Co., Stern Bros., and James Dunning & Co. The French members of the syndicate will be La Banque de Paris et des Pays-Bas, Mirabaud et Cie., La Société d'Etudes et d'Entreprises, Mallet Frères et Cie., and an industrial group represented by M. Mercier. The Roumanian group will include La Banque Marmorosch Blank, La Banque Romanesca, La Banque Générale, and La Banque du Crédit Roumain.

The Technical Sub-Committee of the Committee on Standardization of Petroleum Specifications, appointed some time ago by President Wilson, will hold a meeting at the offices of the Bureau of Mines, Washington, D. C., on Oct. 18, to give further consideration to Government specifications on gasoline, kerosene, fuel, and lubricating oils.

Shallow Well Completed in Poison Spider, Wyo., Field

From Our Special Correspondent

Gas has been turned into the mains of the New York Oil Co. from the Poison Spider field, in Wyoming, for delivery to the oil refineries at Casper. Mains in Casper are also being laid. The completion of the New York Oil Co.'s No. 9 South Casper Creek well at shallow depth on its 2,000-acre lease, making 75 to 100 bbl. of oil, is considered an important development.

The Consolidated Royalty Oil Co., at its annual meeting held in Casper recently, declared the regular quarterly dividend of 2½ per cent payable Oct. 20 to stockholders of record Oct 15. New officers elected were: B. B. Brooks, president; T. A. Dines, vice-president; C. B. Richardson, vice-president; R. N. Matson, secretary and treasurer; R. S. Ellison, H. D. Schoonmaker and S. A. Lane, directors.

The Sage Creek Petroleum Co. has spudded in for a second well on the Winkler Dome, Fremont County. This well will be drilled on the side of the formation. The first well, on the apex, came in as a large gas well. The same company will also resume drilling at 2,420 ft. in its Buffalo Basin well, Fremont County. It is stated that some oil and gas showings have been obtained here.

The Producers' & Refiners' Corporation has struck a third gas sand in its well at the Wertz camp, between the Ferris and Lost Soldier fields. The first sand was at 3,200 ft., the second at about 3,400 ft., making 2,000,000 cu.ft., and the third at 3,440 ft. with a flow between 7,000,000 and 9,000,000 cu.ft. This same company has completed its No. 2 well in the Osage field at 1,525 ft. making 150 bbl. by pumping. No. 1 well is making good progress and will be completed soon.

The Western States Oil & Land Co. has completed its No. 31 well on Sec. 5-39-78 of the Salt Creek field at a little over 2,300 ft., making an initial production of about 500 bbl. The oil-bearing sand is said to be over 60 ft. thick.

Oil in Alberta Sands

That oil in sufficient quantities to supply the world for 600 years will be released when the problem of separation of oil from oil sands lying to the North of Edmonton has been solved is the opinion expressed by Dr. H. M. Tory, principal of the University of Alberta. Dr. Tory stated that a member of the faculty of the university has been working on the problem of separation for ten days, and that if he continues to make progress as rapidly as he has done hitherto, the problem will be solved in six weeks.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Principles for Determining the Legality of Unsigned Contracts

West Virginia Court Propounds Conditions Under Which Reduction to Writing of Verbal Agreements Is Necessary.

In these days of innumerable leases on oil, gas, and mineral properties, their proper execution may well be considered. The Supreme Court of Appeals of West Virginia determined the legal aspects of such issues in deciding the case of Herndon et al vs. Meadows, affirming judgment of the land owner.

The facts appear that after some negotiations a conclusion was reached to the effect that Meadows would lease his land to his grandson, Tolley, and Herndon upon certain terms. A writing was prepared purporting to be between Meadows as one party and Herndon and Tolley as second parties, with provision for the signatures of all parties to the contract. Meadows signed and acknowledged it before a notary. It was subsequently signed by Herndon, but Tolley never did execute the instrument. Herndon had a lease prepared according to the terms of the contract, but Meadows refused to sign this, and sold the land to others. Thereupon Herndon brought this action for breach.

In its opinion the Supreme Court says that where the parties to a contract reduce their agreements to writing, with the purpose and expectation that the same shall be signed by all the parties before the agreement is completed, the failure or refusal of one party thereto to execute will excuse all of the parties from performance. Where, however, the agreement of the parties is complete, and the writing is simply treated as a memorial of the contract already entered into between them, and its execution not necessary to the completion of the contract, the parties will be bound.

The court found the writing in this case to be in a form which contemplated execution by all of the parties, and further, one as is required to be in writing to be enforceable under the statute of frauds. It was said that where a contract in writing is executed by only one of the parties, and the other party waives the execution by accepting performance, or by doing something under the contract which shows that the parties did not contemplate its complete execution as a prerequisite to a valid contract, it will be binding; but where a contract is reduced to writing, and the subject matter is such that people do not ordinarily contract in regard to it without expressing their agreements in writing, and the paper on its face indicates that it is the intention that all the parties shall execute it, and nothing is done under the contract to indicate that the parties intend their agreements to be binding, whether the writing is signed or not, it will be held that there is no completed contract, unless all the parties thereto execute the same.

Therefore judgment for the land owner was upheld, for the reason that there had never been a completed contract between the parties.

Upper Locator Liable for Damages to Lower

Judgment in Favor of Allison's Mines Co. Reversed by California District Court of Appeals

The District Court of Appeals of California has reversed the judgment rendered against J. W. Dripps in his action to recover damages for injury to his placer mining claim, situated in Laurel Gulch, Los Angeles County, by the Allison's Mines Co. The Allison company located its mining claim to the north of Dripps' claim and further up the gulch. Plaintiff's evidence was that tailings from defendant's mill accumulated on plaintiff's land along the stream the entire length of his claim, and from six inches to two feet in depth; that large rocks and boulders, aggregating many tons, rolled down the steep sides of the gulch; that this was caused by the trail built and used by defendants; that it would cost $25,000 to remove the rocks, and several thousand dollars to remove the tailings, necessary to work the claim; that the water in the stream is made "muddy and riley" by the tailings from defendant's mill; and that this "gums up the riffles," so that this placer mining claim cannot be worked profitably.

In reversing the judgment the court said it was now settled that the first locator on mining ground has no right, by custom or otherwise, to allow tailings to run free in the gulch and render valueless the mining claims of subsequent locators below him. And where the land of the lower locator is actually invaded by "tailings," "slickens" or other material from the claim of the upper locator, it makes no difference how carefully the latter may have worked his mine. If his work in fact injures the property of another, he is none the less liable.

As for the water, the prior locator cannot insist that the stream above him shall not be used by subsequent locators for mining purposes; neither may the subsequent locator so conduct his operations as unreasonably to interfere with the fair enjoyment of the stream by the prior locator. The reasonableness of the use is a question of fact in each particular case. The spirit of the law is "live and let live."

Dey Loses Action To Recover Laurel Canyon Mines

Failure to Appeal from Former Judgment in Favor of Arizona Mining Company Renders Later Action Void

In the action brought by Richard V. Dey against the Laurel Canyon Mining Co., in Graham County, Ariz., to recover possession of certain mines and improvements, the grounds alleged were that the mining company had forfeited its lease of the premises by breaching certain covenants of the lease. But shortly after this was begun, Day instituted another action under the Landlord and Tenant Act of Arizona, to recover possession of the mines. This case was tried and resulted in a judgment in favor of the Laurel company, which was never appealed, and therefore became final.

The lease was a working lease with option of sale. It contained covenants to pay lessor certain royalties and to keep mill in continuous operation, and to keep same and other improvements in repair; to work the mines in a miner-like manner, and to timber, where necessary; to pay promptly all debts incurred; and to keep property free from liens, and similar charges. The violations of these covenants were alleged as the grounds for suit. The court found the violations cover the period in both suits, that the object of both suits was the same, both being possessory actions to dispossess the Laurel company. In the last case brought, the court said Dey was unable to establish the breaches claimed, and a final judgment in that case, therefore, has forever settled his contentions.

American Metals Co. Denied Removal of Suit to Federal Court

Federal Judge Smith of the District Court at El Paso, Tex., has remanded the suit instituted by the Compania Minera y Compradora de Metales Mexicano, S. A., against the American Metal Co. and the Compania de Minerales y Metales, S. A., to the Texas state court from which the American Metal Co. sought to remove it.

The plaintiff in this case seeks to recover of the defendant, Compania de Minerales y Metales, S. A., damages for an alleged breach of contract between them, and alleges that this company, in making and breaking said contract, was acting as the authorized agent of the American Metal Co.

Grounds for removal of a cause from a state to a Federal court are purely statutory, and Judge Smith ruled that no proper showing was made bringing the suit within the statute.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Safety Devices on Winding Engines*

Nearly all accidents in hoisting are due to two general causes: Failure of the hoist machine to function, and failure of the hoist operator or engineer to act correctly.

Failure of the hoisting machine to function is caused by faults in design, defective material, poor workmanship, overloading and neglect. No safety devices can prevent the failure of a hoist under any of these conditions, but they can prevent to a large extent injury to life and property due to hoist failure from such causes. But in some cases the finest of safety apparatus will be powerless to prevent accident unless backed up by sufficient strength, proper design, and care of the hoisting machine. With respect to strength, however, a factor of safety of not less than five should be used. Most hoist drums should be provided with an indicator positively driven by chain or gearing from the drum or other hoist part having motion coincident thereto.

Of the utmost importance are adequate brakes, and every hoist should have at least one efficient brake applied to the drum. For long hauls or for deep shafts where heavy loads are lowered by gravity, two brakes are advisable, to be used alternately in order to prevent overheating and probable breakage due thereto.

The hoist operator should be protected as much as possible, and the operating levers should be so placed as to keep him out of the way of a possible flying rope. Safety devices or other mechanism that cause operators' levers to move are dangerous and should be avoided.

The hoist should be designed for the maximum load it will be called upon to handle, and this load should be known to operator and cage tenders. Before men are handled on any hoist, trial trips should be made to test the equipment for possible flaws in materials and workmanship.

The most common dangers incident to hoisting may be enumerated as follows: Cage or trip passing prescribed or safe limits, traveling beyond a prescribed or safe speed, starting the hoist in the wrong direction, improper application of brakes, failure of brake to hold, accidental release of clutched drum, backing away of hoist due to power failure, and inability to stop hoist in emergency.

Protection from these dangers cannot be had without some form of power-operated brake engine, which automatically applies the brake and brings the hoist to rest through actuation of the safety devices. Such brake engines may be of steam, compressed air, or oil type, according to the power available or preference of the hoist owner. Usually they are of the weighted type, the engine being provided with two cylinders, each having a movable piston, the piston being fitted to a common rod to which, by suitable means, a set of weights is attached, and which also acts to move the brake bell crank. In one cylinder the motive field acts to keep the weights in a suspended position ready to be released for application of the brake. The other cylinder contains oil, which is by-passed through an adjustable valve from one end of cylinder to the other, effecting a smooth motion of the piston rod. There is a valve provided at the power end of the brake engine to release the pressure against the piston, allowing the weights to apply the brake. When weighted brakes are not used, the brake is both held in the released position and applied by direct fluid pressure on the engine cylinder. Either type of brake is normally controlled by the operator by means of hand lever or valve which governs the admission of motive fluid to the brake engine cylinder and its release therefrom. But when the operator fails to act properly, the safety devices take control of the brake from him and use it according to their functions.

*Abstract of a paper by L. F. Milten delivered at the Ninth Annual Safety Congress, Milwaukee, Wis., Sept. 27-Oct. 1, 1920.

Requirements of Rescue Training for Metal Miners*

It is of vast importance that the men to be selected for places on the rescue crews should be given careful consideration. It is just as essential to have physical fitness in rescue or recovery work as it is to have mechanical fitness in the type of apparatus which is used. Each of these factors is dependent on the other, and each without the other is dangerous, not only to the one man but to the entire crew. Therefore, each candidate should be subjected to a thorough physical examination prior to any instruction. Inasmuch as a considerable part of actual emergency work with apparatus is dependent upon the absolute understanding and execution of instructions, men who are to be selected for the training should be mentally as well as physically efficient.

All candidates should be thoroughly familiar with the mine workings, and should know the conditions existing in each level and ladder-way. It is also important that they should be able to do any of the various kinds of work underground as might be necessary, such as timbering, constructing brattices, drilling, mucking, etc.

With apparatus and men selected, the next thing to be considered is the place of training. The preliminary instructions should be given on the surface, so that any room large enough to accommodate the number of men in training will serve this purpose. Also, the first couple of days can be spent in the open air until the men become familiar with the apparatus and "get the feel" of it while wearing it in the preliminary work.

Following this period many instructors take the crew into the mine for further practice. The course of training is for the purpose of teaching the men something entirely new, a phase of mining work that requires courage, and one that is not without hazards. Therefore, the work must be done in a manner and under conditions that will instill in the men absolute confidence in their machines and in their ability to use them. It is important that they should be able to carry on their work under similar conditions as exist underground. To this end the training chamber, or smoke room, should be constucted to meet these conditions, and most metal mine conditions can be represented here.

An arrangement of apparatus which offers practically all of the mine conditions, eliminates the generation of smoke and fumes in the mine, and, further, establishes confidence in the men during the training period, has been designed and built in the First Aid building of the New Jersey Zinc Co. at Franklin, N. J..

Five half days, at least, should be allotted for the preliminary training. Six half days are not too many. This preliminary course endeavors to carry the candidate gradually from an understanding of the fundamental principles of rescue work to as thorough a knowledge of the details as is possible in the time allotted. It is natural that, in the training period, many unforeseen things will occur that the men will not understand. Reducing valves will require adjustment, by-pass valves will accidentally become opened, men will overexert themselves, etc. It is the duty of the instructor to explain carefully the reasons for all such occurrences and instruct the men how they may be corrected or prevented.

It is advisable that a half-day each month be allotted to each crew for practice. In these periods the apparatus should be worn for at least one and one-half hours and the work should be varied so as not to become monotonous.

*Abstract of a paper by R. H. Selp delivered at the Ninth Annual Safety Congress, Milwaukee, Wis., Sept. 27-Oct. 1, 1920.

Special Committee of National Tax Association Reports on Mines Taxation*

The Committee on a Model System of State and Local Taxation recommends for general adoption by the states three principal taxes, viz, a personal income tax, an ad valorem tax on tangible property, and a tax on business. Concerning the taxation of mines it said "We are agreed that mines should pay, under whatever method may be adopted, a tax commensurate with that paid by other real estate in the same taxing jurisdiction."

How should the tax on mines be imposed and collected? Our answer is in precisely the same manner that taxes are imposed and collected on other real estate. The Committee on Model System would retain the ad valorem tax on other forms of real estate with modernized administration. In our opinion the equalization of the taxes on mines with those on other real estate requires that no exception be made in the case of mines.[1]

The populations of the typical mining communities of the United States are almost entirely dependent on the mines. So long as the mines exist other real estate has value, but when they are exhausted it has no value or only nominal value. The mines must pay most of the taxes, it matters not under what system they are levied.

If the ad valorem tax on mines is abandoned in favor of a tax on income or product, the local community will lose control of its main source of revenue, and in lieu of the ad valorem tax it will receive such portion of the tax on income or product as may be prorated to it by the state, and this portion will be an annually fluctuating sum. In periods of low income the main burden of the taxes would fall on other property. The effect would be that the tax rate on other property would fluctuate inversely with the productivity of these taxes.

The interests of the local taxing jurisdictions are paramount in any system of taxation devised for the American state. The bulk of the public expenditures is made by the cities, villages, townships, school districts, and other local jurisdictions. The tax on property has been the mainstay of the local community. It would be under the proposed Model System. Taxes based on the production or on the income of mines are ill adapted to the requirements of the local communities. The necessary control of the rates of such taxes by the state deprives the local mining jurisdiction of control over its own finances to an embarrassing degree, and imposes on it a tax system which would starve the treasury in some periods and flush it in others.

The property tax, the elastic element in the Model System, will practically disappear if mines are excluded from its provisions in the typical mining jurisdictions where the value of the mines comprehends from 50 to 95 per cent of the value of all property.

We believe that mines should be taxed for revenue only and condemn the super-taxation of mines on the one hand, and exemption or under-taxation on the other. A classification of real estate for taxation opens the door to exploitation of the numerically weaker elements in the population by the dominant elements. We find no reason why city property and mines should pay more taxes in proportion to *value* than rural property.

It is the outstanding merit of the Model System that all able-to-pay elements of the population will be reached and fairly taxed.

There are no insurmountable obstacles in the way of taxing mines as other real estate is taxed, and the rule of uniformity should govern. Subsidies on the one hand and penalties on the other, administered to industry through the device of taxing, are a dangerous perversion of the taxing power of the state. It is opposed to inter-state comity in taxation, fostered in the provisions of the Model System, and introduces an unnatural disturbing element in the economics of the internal commerce and development of the country.

It is assumed that mines and other real estate will be subject to both state and local taxation. It is not conceivable that the local jurisdiction can dispense with the tax on mines, but if the state abandon the property tax, the principle of equalization of the tax on mines would require that it also abandon the tax on mines.

We believe that ad valorem taxation of mines by state and local jurisdictions under direct administration by a state tax commission or tax commissioner is a thoroughly practical method of taxing mineral wealth. If the assessments are made by township, city, and village assessors, it cannot be operated satisfactorily. But the Model System contemplates a state tax commission or tax commissioner in every state, with power of original assessment of certain property and presumably with power to maintain such expert assistance as may be necessary. Such a centralized administration is indispensable for a satisfactory administration of the ad valorem tax on mines. It has proved its worth in several states.

Approved methods of determining mining values for taxation should not differ in principle from those used in ordinary commercial transactions, for whatever a property is worth commercially, it should also be worth for taxation. The value sought should be the amount which the mine should command in the event of sale at the time of assessment. In this connection we may add that prescription by state legislatures of formulae for the valuation of mines is a usurpation of an important function of the Tax Commission or Tax Commissioner.

In our opinion idle mines ought to be taxed if they are valuable. There is no more reason why idle mines should be relieved of taxes than non-productive property generally should be. Neither are we impressed with the often voiced opinion that ad valorem taxation for revenue only, at the same level as other real estate, restrains, too seriously, the development of ore reserves and discourages development of new mines. The tax is merely an element of cost and will be reckoned with precisely as other costs are. Of course, there is no pyramiding of the taxes on unmined mineral as an actual fact of accounting and financing. Obviously, all charges in excess of or advance of income are capitalized, and taxes are no exception.

Summary

Summarizing the recommendations, your committee approves the principle of equalization of taxation of mines and other real estate, opposes the classification of real estate (including mines) for taxation at different levels, or by different methods, and advises the inclusion of the ad valorem system of mines taxation, under centralized state authority and control in the Model System of State and Local Taxation.

*An abstract of the report by a committee of the National Tax Association, presented at its thirteenth annual conference on taxation, held in Salt Lake City, Sept. 6-11, 1920, to appear (in full) in vol. 13 of the annual proceedings of the Association.

[1]This report should be read in connection with the "Preliminary Report of the Committee on a Model System of State and Local Taxation." Proceedings Eleventh National Conference, 1918.

New York Section of A. I. M. E. Hears Discussion of Ancient and Modern Mines

The first of the fall meetings of the New York Section of the American Institute of Mining and Metallurgical Engineers was held at the Machinery Club the evening of Oct. 6. Following the regular dinner, E. P. Matheson, chairman of the section, introduced Courtenay De Kalb, who spoke on the subject "A Visit to Some of King Solomon's Mines." Mr. De Kalb, as a special commissioner in the Bureau of Foreign and Domestic Commerce, spent some time in Spain, and while there visited the different mining sections of that country. The first part of his talk was given over to that period of early Biblical history pertaining to the mines of the ancients, and he quite definitely established the fact that many of the mines in Solomon's time which were of great value are the same properties that are worked today in parts of Spain. Following this introduction a number of stereopticon views were shown of the Rio Tinto and Almaden mines and also of some of the iron-ore mines and plants near Segundo. During the showing of the pictures, Mr. De Kalb gave a most interesting talk on the geology, history, and development of the mines. Further views of the Rio Tinto mine were shown by Col. A. S. Dwight, who related his experiences on a visit to the property in 1903. Both of the speakers were well received, and the attendance and interest indicate a most successful series of monthly gatherings to be held this season.

Technical Papers

Mineral Statistics—Recent separates of the *Mineral Resources* series issued by the U. S. Geological Survey, Washington, D. C., and which may be obtained on request, include: "Thorium, Zirconium and Rare-Earth Minerals in 1919," pp. 32; "Magnesium in 1919," pp. 4; "Bauxite and Aluminum in 1919," pp. 7; "Gold, Silver, Copper, Lead, and Zinc in Colorado in 1918," pp. 56; and the "Preliminary Summary of Mineral Resources in 1919," pp. 128.

Tennessee Oil—The oil and gas resources of the northeastern part of Sumner County, Tenn., form the subject of a thirty-nine page booklet recently issued by the Tennessee Geological Survey, Nashville, Tenn. To the date of writing, no oil had actually been discovered in Sumner County, but several wells were producing in Allen County, Ky., adjoining. This report deals principally with geological conditions.

Manganese Ore—Two pamphlets have been issued by the U. S. Geological Survey on this subject. Bulletin 715-C (pp. 3) describes a small deposit in the Laramie Mountains of Wyoming, and Bulletin 715-D (pp. 12) discusses several occurrences in Colorado. They may be obtained on request. *The Mining Magazine* for September (Salisbury House, London Wall, London, E. C. 2.; price 1s. 6d.) contains an illustrated six-page article on the manganese deposits of Tchiaturi, Caucasus. The deposit there is probably the largest producing property in the world. Methods of mining and milling and economic conditions are described.

Air Lift Pumping—The continuous air lift requires a depth of submergence which often does not make it feasible. The lift may, however, be made in sections and operated with low-pressure air, a device of this kind having possibilities for unwatering or regular pumping work, which could only be reached with mechanical plants at greater cost both of installation and maintenance. The advantages and methods of installation and operation of the low-pressure air lift are discussed in a three-page article in the August number of the *Mining and Oil Bulletin* (Los Angeles, Cal., 25c.).

Flotation—*The Boletin de Minas* for June 30, 1920, contains a fifty-eight-page article in Spanish describing the general principles of the flotation process and the machines used therein. Some space is also given to the Murex process whereby oil is mixed with pulverized magnetite before being brought in contact with the sulphide minerals, the latter then being separated from the gangue by a magnetic process. A copy of the *Boletin* may be obtained on request from the Escuela de Ingenieros, calle Calleo 5a. (Espiritu Santo) Apartado de correo: 1301, Peru.

How To Get Government Publications

United States—Each of the various departments of the U. S. Government issues its own publications, which are printed at the Government Printing Office. These departments include, among others, the Bureau of Standards, the Geological Survey, and the Bureau of Mines. A part of each issue is ordinarily reserved to the branch which publishes it, for free distribution in the United States. Requests addressed to the individual bureau at Washington, D. C., within a reasonable time after publication, will usually secure a free copy, or one may be obtained from a congressman. The remainder of the issue is customarily kept in stock by the Superintendent of Documents, and sold by him at a price to cover the cost of printing—ordinarily 10 or 15c. Remittances should be made in advance to the Superintendent of Documents, Government Printing Office, Washington, D. C., by coupons, postal money order, express order, or New York draft. Foreign orders should be accompanied by international money order or New York draft. Postage stamps, coins defaced or worn smooth, foreign money, and uncertified checks will not be accepted. Coupons that are good until used in exchange for Government publications sold by the Superintendent of Documents may be purchased from that office in sets of twenty for $1. No charge is made for postage on documents forwarded to points in the United States, Alaska, Guam, Hawaii, Philippine Islands, Porto Rico and Samoa, or to Canada, Cuba, Mexico, or Shanghai. To other countries the regular rate of postage is charged.

The only publications furnished free by the Superintendent of Documents are the lists of the various department publications, with their prices. Separate price lists are devoted to such topics as Mines, Engineering and Surveying, Chemistry, Labor, Maps, Finance, Transportation, Health, Agriculture and Geography and Geology. These lists are revised once or twice a year.

Those who wish to be advised of all new publications issued by any department should write to the department in question and ask to have their name put on its free mailing list for announcements. Those who wish to be advised of all new Government publications should subscribe to the Monthly Catalogue of U. S. Public Documents, the subscription price of which is 50c. domestic and 75c. foreign, from the Superintendent of Documents.

State Publications—In addition to the above, each state bureau publishes numerous books and pamphlets, e.g. the State Mining Bureau, San Francisco, Cal.; the Kansas Geological Survey, Lawrence, Kan., or the Oregon Bureau of Mines and Geology, Portland, Ore. These bureaus may be situated at the state capital, at the leading city, or at a state-endowed university. In general, the publications issued may be obtained free on request, or a list will be supplied by addressing the bureau in question. Those who wish to be advised of all state publications as issued should subscribe to the Monthly List of State Publications, price 50c. per year domestic or 75c. foreign, from the Government Printing Office, Washington, D. C.

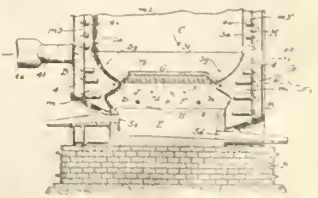
Canada—As in the case of the United States, both the central government and the individual provinces issue books and pamphlets. There is, however, no general catalogue issued, and no central office from which publications may be obtained. Requests for publications should be sent to the individual bureaus, as the Canada Department of Mines, Mines Branch, Ottawa; the Geological Survey, Ottawa; the Ontario Bureau of Mines, Toronto, and the British Columbia Department of Mines, Victoria, B. C. Ordinarily, Canadian government publications are supplied free of charge. Regular monthly lists of new publications are mailed on request by some of the departments.

Great Britain—Most British publications are sold through His Majesty's Stationery Office, Imperial House, Kingsway, London, W.C. 2. That office issues frequent free lists as well as annual lists of all government publications. The publications of the Geological Survey can be purchased from the Director General of the Ordnance Survey, Southampton.

Recent Patents

1,351,451. Smelting Furnace. Randolph G. Ward, New York, N. Y., and William R. Ward, Bethlehem, Pa., assignors to Independent Mines Smelting Co., Inc., New York, N. Y. Filed Oct. 4, 1916.

The combination of a horizontally elongated charge chamber having the lower part of its walls downwardly and inwardly curved to form a furnace hearth provided with a central elongated hearth opening having a width greater than its vertical depth; and oppositely disposed upwardly and inwardly pointing coacting burners arranged under said hearth and disposed in opposed pairs and adapted to combine their flames at a point just beneath said opening and to project the concentrated flames up through said hearth opening to points considerably above the opening.



MEN YOU SHOULD KNOW ABOUT

A. H. Brooks has returned to Washington after three months in Alaska.

Arthur Keith is making a study of the structure of the Taconic Belt in Vermont.

Norman Carmichael, general manager of the Arizona Copper Co., is in New York for a short time.

E. C. Pierce, of Los Angeles, is inspecting the mill of the Cora Miller mine, near Tyrone, N. M., which he designed.

W. L. Creden, mining engineer, is now manager for the Cascade Mines & Mills Co. in the Neihart district, Montana.

Edwin J. Collins, mining engineer, has returned to Duluth, Minn., from an inspection trip in New Mexico and California.

K. C. Heald is inspecting the Geological Survey's field parties in the oil fields of the Big Horn Basin and the Lost Soldier region.

William J. Hamilton, of Westmount, Que., general manager of the Cerro de Pasco Copper Corporation, sailed for Peru on Oct. 6.

C. Erb Wuensch has returned to Golden, Cal., after four and one-half months spent in Salvador, C. A., in geological examinations.

L. Salazar Salinas, director of the Geological Survey of Mexico, is in Washington studying the methods and organization of the U. S. Geological Survey.

E. L. Hawes, mining engineer, who has been the copper country representative of the Ingersoll-Rand Co., will leave soon for South America for the same company.

J. C. Martin is engaged in field work for the U. S. Geological Survey in Connecticut, where he is continuing the study of the high-calcium and dolomitic limestone.

H. M. Robinson, formerly a member of the U. S. Geological Survey, is in Washington making a compilation from the files of the section of foreign mineral resources.

E. J. Ruh is now at the U. S. Bureau of Standards as research assistant, appointed by the International Nickel Co. to assist investigations on the properties of nickel alloys.

S. Z. Krumm, formerly assistant professor of metallurgy at Colorado School of Mines, has accepted a similar position with Case School of Applied Science, Cleveland, Ohio.

P. J. Creighton and **John McPhilips** of Syracuse, N. Y., have been in Butte, Mont., on their return home after an inspection of the Brady Development Co. property in Idaho.

A. W. Newberry, mining engineer, has returned to New York City from a recent trip to Canada. He has moved his offices to 2 Rector St., that city (Phone, Rector 1421).

Herbert Hoover has been appointed by Secretary Payne to serve as consulting mining engineer on the advisory board of the Super-Power Survey authorized in April, 1920.

J. T. Pardee, of the U. S. Geological Survey, was a recent visitor in Seattle, Wash. He is now engaged in working out certain glacial problems in Montana and in eastern Washington.

William B. Milliken, graduate of Colorado School of Mines in 1883, is reported dead. Mail addressed to him at Ipoh Perak, Federated Malay States, via China, has been returned so marked.

W. H. Webster, assistant general manager of the Copper Queen branch, Phelps Dodge Corporation, has returned from a visit to the principal mining camps of Grant and Hidalgo counties, N. M.

Alfred W. Stickney, the geologist reported to have been roughly treated by the Bolsheviki in Moscow, has reported from Riga to the Department of State that he is safely out of Soviet territory.

R. D. Idema, of Grand Rapids, Mich., formerly with the Tennessee Coal, Iron & Railway Co., has taken a position with the engineering staff of Pickands, Mather & Co. on the Gogebic Range, Michigan.

W. C. Bridgeman, M. P., has been appointed the first Secretary of Mines under Great Britain's new Mining Industry Act. He has selected **E. A. Gowers** as Permanent Under-Secretary for Mines.

J. W. Russell, manager of Oxford Cobalt Mining Co., and member of the staff of Woodstock College, Woodstock, New Brunswick, Can., has been appointed professor of geology at Western University, London, Ont.

W. Z. Price is the newly appointed assistant professor in mining engineering and **W. A. Copeland** has been appointed instructor in metallurgical and mining engineering at the Carnegie Institute of Technology, Pittsburgh, Pa.

Charles Hoyle, general manager; **W. A. Gardiner**, superintendent; **Joseph Dietrich**, mine foreman, and **Forest Godden**, assayer, of the Esperanza Mining Co. of El Oro, Mexico, captured and held by Pedro Zamora, a bandit, have all been released or escaped from detention.

Harry O. Robinson, mining engineer, is in New York City on a brief visit from Venezuela, where he is engaged in professional work. His address is care of American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York City.

E. Martin Thorniley, mining engineer, of 625 I. W. Hellman Building, Los Angeles, Cal., is sailing for Jamaica, B. W. I., where he will spend several weeks in the examination of a copper property for British interests. Mr. Thorniley will go from Jamaica to London, and expects to return to Los Angeles early in 1921.

W. B. Plank, formerly with the U. S. Bureau of Mines, has been appointed to the Markle professorship of mining engineering and head of the department of mining engineering at Lafayette College, Easton, Pa. Recent reports erroneously stated that Professor Plank was an instructor there.

C. J. Whittlesey has been appointed by the Gypsum Industries Association as a research associate to work at the U. S. Bureau of Standards. He will study particularly the technical data regarding gypsum now available, and assist in further investigations of the properties of this material.

Albert H. Fay, consulting mining engineer, formerly with the U. S. Bureau of Mines, is now a valuation engineer, Oil and Gas Section, Internal Revenue Bureau, Washington, D. C.

Rolland C. Allen, geologist and vice-president of Lake Superior Iron Ore Association, Cleveland, Ohio, is chairman of the special committee on mines taxation appointed by the National Tax Association. The committee includes Ralph Arnold, J. Parke Channing, Celcus P. Link, C. M. Zander, Samuel T. Howe, Ernest L. Bogart, and L. E. Young.

The delegates to the Stewart, B. C., meeting of the Canadian Institute of Mining & Mettallurgy included H. M. Roscoe, secretary of the North Coast Division of the Institute; J. Tuttle, Jr., mine superintendent at Hidden Creek; N. E. Nelson, field engineer; John Dillon, Anyox smelter; W. L. Wetmore, mechanical engineer; William Weir, chemist; A. B. Wing, superintendent at Swamp Point, Granby Co.; Dr. Stuart A. Scofield, Canadian Geological Survey; and G. W. Bain.

OBITUARY

Spencer W. Clawson, who died lately in Los Angeles, was best known in the Southwest as superintendent of mines for the Copper Queen at Bisbee for twenty-three years. He went to Arizona in 1880, then connected with the Contention, at Tombstone. After leaving Bisbee he had an office as consulting engineer in Los Angeles, Cal. For a time he was in charge of a gold mine near Parral, Mexico, before being driven out by revolution.

SOCIETY MEETINGS ANNOUNCED

The California Metal and Mineral Producers Association meets at San Francisco on Oct. 24.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

New Mexico Chapter of American Mining Congress Organized

C. T. Brown, of Socorro, Governor, and Burton Bunch, of Silver City, Elected Secretary

Organization of a New Mexico Chapter of the American Mining Congress was completed Oct. 4 by the naming of fourteen directors, election of officers and adoption of the Arizona Chapter's constitution and by-laws as a temporary guide. The officers elected were: C. T. Brown, Socorro, Socorro County, governor; I. J. Stauber, Lake Valley, Grant County, first vice governor; I. R. Kirchman, Silver City, Grant County, second vice governor; Powell Stackhouse, Jr., San Antonio, Socorro County, third vice governor; Ira. L. Wright, Silver City, treasurer; and Burton Bunch, Silver City, secretary.

A committee on constitution and by-laws was appointed composed of Percy Wilson, Silver City; Frank W. Vellacott, Silver City; and John M. Sully, Hurley. The finance committee is as follows: D. W. Boise, Hurley; Donald G. Miller, Tyrone; and J. B. Gilchrist, Silver City. The personnel of other committees was not announced.

The fourteen directors elected were: C. T. Brown, Socorro; E. M. Sawyer, Tyrone; J. M. Sully, Hurley; Ira L. Wright, Silver City; Powell Stackhouse, Jr., San Antonio; B. B. Hanger, Albuquerque; S. J. Kidder, Mogollon; M. W. Porterfield, Silver City; J. H. McCutcheon, Chloride; L. M. Kniffin, Fierro; Norval J. Welsh, Gage; F. W. Vellacott, Silver City; I. J. Stauber, Lake Valley; and R. I. Kirchman, Silver City.

Dispute Over Engineer Group at Atlin, B. C., To Be Heard

The question of ownership of the Engineer group of mineral claims in the Atlin district, B.C., is expected to be brought before the courts for decision about Oct. 20. Because the property is valued at considerably more than $1,000,000, being rated as one of the most promising of the lode gold mines of the province, the suit will be followed with much interest. The action has some interesting features. In the first place the original stakers will seek to establish their right to title. It is understood that it will be alleged that the late Captain Alexander, the accepted owner during his lifetime and whose heirs will be the defendants, occupied the ground before it had become vacated.

WEEKLY RÉSUMÉ

In Utah an attack on the powers of the State industrial commission under the workmen's compensation act has been begun by the Utah Fuel Co. In the extreme southern part of the state, the McQuatters Corporation, of New York, is reopening the old property of the Silver Reef Consolidated Mines Co., about forty miles from a railroad; this was formerly a producer of high-grade but is probably a milling proposition now. In Nevada, the Bullfrog-Goldfield railroad has been taken over by the Tonopah & Tidewater, and to be continued in operation. In the Coeur d'Alenes of northern Idaho, financing of the U. S. Copper Co. has been provided for; the Kill Buck stockholders have elected a new directorate controlled by the Interstate Callahan; and the development is on the two Flynn groups are being pushed by the Coeur d'Alene Syndicate. In British Columbia the dispute over the ownership of the Engineer group at Atlin is to come up in court soon. In the Southwest, the advisability of licensing engineers is again urged. The docks of the Texas Gulf Sulphur Co. at Galveston, Tex., were recently burned.

At Washington a general economic study of the mineral resources of Alaska has been completed by Alfred H. Brooks and O. C. Ralston.

Silver Reef Being Reopened by McQuatters Corporation

The McQuatters Corporation, of New York, took over the property of the old Silver Reef Consolidated Mines Co. in Washington County, southern Utah, in the last few months and is engaged in putting it in shape for operation. Tests have been made on the ore and diamond drilling is to be undertaken. The property was formerly a producer of high grade but is now probably a milling proposition. It is about 40 miles from Leeds, the nearest railroad point, which is on the Salt Lake route.

Butte Ballaklava Property Sold at Sheriff's Sale

The property of the Butte-Bullaklava Copper Co., at Butte, Mont., including buildings and machinery, has been sold at public auction by the sheriff to satisfy a judgment obtained by John G. Williams and other bondholders residing in Duluth. The sale was made to the bondholders' committee for $225,000, which is approximately $5,000 less than the claims of the judgment and costs. It is the intention of the bondholders to reorganize the company and start operations at the property just as soon as all details can be arranged. The company had defaulted on payment of interest.

Northern Mexico Under Peace Conditions

Good Times Ahead — Crops Can Be Harvested—Banks Again Opening —Labor Scarce

Special Correspondence

Chihuahua, Sept. 18—People are still wondering who surrendered, Villa or the government. At all events everyone is well satisfied and Northern Mexico is in peace for the first time in eleven years. People are coming into the towns in buggies, wagons and on horseback, disclosing vehicles and saddles that have been in hiding for a long time. The roads are now free and one can even take a ride or walk in the outskirts of a town or city and get back without being deprived of his clothes by some underfed and unpaid Carranza soldier. The present federal soldiers are of a better class and are constantly being improved, better clothed and fed and, for a wonder, being drilled. The improvement is very marked. The markets also show an improvement.

Villa reached the main line of the old Mexican Central railroad at Bermajillo on Tuesday, Aug. 31 with six hundred men, about seven hundred horses and mules, a Ford and a U. S. Army wagon. Wednesday he sent two hundred men north under General Aranda and made his people a farewell address. In the afternoon he received a party of Americans and told them that he had no ill feeling toward the Americans in Mexico in that he felt that they were in no way responsible for the acts of their government, that he did not think that he had any enemies in the U. S. except one and having been double crossed by that particular person he could not regard him as anything but an enemy. Friday morning he left for Mapimi where he spent a day as guest of an American mining company. Saturday he left the railroad for his new home with over two hundred men, fifty fully armed and all officers with side arms. It was as good as a county fair to see all the fine horses and mules that he had with him and the men in gala attire and in a happy mood. Villa closed all the saloons wherever he went and was very strict in compelling good order.

He was hard pushed in Chihuahua and made one of his remarkable moves, crossing the worst desert in Mexico, the Bolson de Mapimi, and turned up unexpectedly in an important region that had few federal troops at a time when the Secretary of War was away, thus

enabling him to deal directly with the President. Crossing the desert he traveled forty-five leagues (120 miles) in twenty-nine hours without water, losing 172 horses and no men. At Sabinas he took the town and after enquiring for the names of the richer merchants assessed them twenty thousand pesos. He paid cash to all the smaller dealers for what he required of them He compelled the telegraph operator to put him in direct communication with provisional President de la Huerta and arranged for the surrender that is so satisfactory to everyone in northern Mexico.

There seems to be no doubt that the country is in for an era of rebuilding and improvement. Crops can be harvested and marketed this fall without molestation. It will require some years for the herds to accumulate. There never was such pasture, gramma grass thick enough to be cut with a mowing machine. With no stock on the ranges and the abundant rains of the last three years the grass has re-seeded and is remarkably heavy. Work animals turned out on it now will not even eat their grain, as they like the gramma better.

Ten years ago a prospect was hardly in ore before some "expert" was on the ground. Now even small profitable mines that gave promise are idle and filled with water and rubbish. Some have been robbed of visible ore and others have had shots put in them in such a manner as to make the extraction of ore impossible without some preliminary work. The smelters are nearly all operating but are short of the rich siliceous ores that have been hand sorted from the smaller mines, mines that could not afford a mill.

Labor is scarce, the more energetic of the working men having gone to the United States. Even now the trains are crowded with them going north. The demand for labor is constantly increasing and, of course, wages, particularly of those who have some mechanical experience, are increasing. The day wage for eight hours, except along the border, is from one and one half to two pesos.

Banks are opening in the larger towns but there is no such use of checks as has become the practice in the north. The people have had such an experience with paper money that it will be years before it will circulate again. At one time men were receiving the equivalent of four cents American money per day and five dollars would buy a ticket that entitled one to a ride on the railroad from the City of Mexico to El Paso. There is very little small change—a few coins of one, two, five, ten and twenty cents made of copper, fewer nickels and very little silver. The principal coinage is gold, two, two and one-half, five, ten and twenty pesos coins. In the north, American money is in circulation and it is now reaching well south along lines of communication. American nickels pass for ten centavos and a dollar for two pesos.

The railroads are bady run down both in regard to the track and rolling stock. The shops cannot turn out the repair work fast enough. The military carry no tents and are living in trains. The large smelting companies are operating their own trains largely using rebuilt cars. The merchants are bringing in their goods by express which adds to the H. C. L. The native still gets off light with his tortillas and beans.

Protection Against Outside Competitors Asked for Trail Smelting Industry

The attitude of the management of the Consolidated Mining & Smelting Co. of Canada with respect to protection against metal imports was forcibly presented to the Canadian Tariff Commission which recently toured British Columbia. J. J Warren, president of the company, complained of the removal of the 7½ per cent war tax, asserting that, in the confident belief that this impost would remain in force, the company had made investments of a substantial character. Over $250,000 had been expended in developing fluorspar deposits and commitments of equal amount had been assumed in the construction of a rod mill and other additions to the plant at Trail. He declared that there was no protection against Great Britain or the United States and, although competition from the latter source was not keen at present owing to properties having been overworked and little development having been done during the war, under normal conditions the competition for the Canadian market would be active. The United States duty was $1.50 per ton and he felt that Canada should have at least the same protection.

The company's output in lead was about equal to the Canadian consumption, he said. Until 1919 the Canadian tariff was the normal 15 per cent plus the 7½ war tax as against a United States rate of 25 per cent. Last year the whole was removed and a specific duty of 1 per cent per pound imposed.

It was stated by Mr. Warren that his company had paid $150,000 in taxes in 1919, over 16 per cent of the net income. Half a million of the 10 per cent dividends had been taken from reserve funds.

The increase in railway freight rates, Mr. Warren contended, was a direct contribution to the railways because no corresponding increase in selling price could be made. The Trail Board of Trade submitted to the commission a memorandum emphasizing the importance to the Trail smelting industry of adequate protection.

Texas Gulf Sulphur Co.'s Docks Burned

The sulphur-loading docks of the Texas Gulf Sulphur Co. at Galveston, Tex., were recently destroyed by fire, together with about 50,000 tons of crude sulphur, forty freight cars, and a great deal of surrounding property.

Chinese-American Company Working in Yunnan Province

Engineers of Yunnan Ming Hsing Mining Co. Engaged for Some Time in Northwestern Part

"The government of Yunnan Province, China, and the Orient Mines Co. of New York, have jointly formed a Sino-American company called the Yunnan Ming Hsing Mining Co. for the development of mining property in Northwestern Yunnan," says *Millard's Review of the Far East*. "Thirty-odd American engineers have been working there with J. W. Finch, as engineer-in-chief. Silver and lead in large quantities have been discovered.

"American activities in that province are being favored by both the people and the provincial government. Large sums have already been spent by the American partners during the last three years in investigation and development work. The first group of American engineers sent from America to prospect for silver and lead began work in March of 1918. Finding that the property was worth developing, a company was formed in September, 1919. It was a Sino-American undertaking, but it is a purely Chinese corporation operating under a Chinese charter.

"The Yunnan Ming Hsing Mining Co. is the first attempt really to operate a mining enterprise under a Chinese charter. Its promoters declare that thus far it has been successful, and do not believe they will encounter any difficulty in dealing with the Chinese authorities. In their opinion, all Chinese-American enterprises should be run upon that basis and on no other if genuine co-operation of the Chinese is desired.

"The president of the company is Wu Shih-shun, former chief of the Yunnan Bureau of Finance, a man of considerable modern business experience although he has been in contact with foreigners for only a short time. Its engineer-in-chief is Mr. Finch. One of the best known mining engineers in America, Mr. Finch, has been general manager of some of the largest mining enterprises in the United States All credit for the successful formation of the company belongs to him. Having been in China for a number of years investigating mines, he has come to know the Chinese people thoroughly. This knowledge of the people among whom he is now working has helped him greatly in his negotiations with the Yunnan authorities with regard to the formation of the company. Had it not been for his able handling of the negotiations, they might have ended in failure.

"It is interesting to know that as a result of the growth of American influence in that remote province in recent times, Yu Yun-lung, former Civil Governor of Yunnan, several months ago made a trip to the United States, accompanied by C. Y. Chiu, an American returned student, who has held several important positions in Peking,

one of them being English Secretary to the Senate when C. T. Wang was Vice-Speaker after the death of the late President Yuan Shih-kai. The trip of Mr. Lu to America was undertaken to study conditions in that country. Since the arrival of so many American engineers in Yunnan, the interest of the people in that province in commercial conditions in America has been greatly aroused.

"Besides working the silver-lead mines, a number of American engineers are investigating the tin mines in Cochiu and the Tungchwang copper mines, both of which are famous as they are supposed to contain the largest quantity of tin and copper, in the belief of foreign engineers, who have made a study of them. The Americans plan to eventually develop those mines together with the silver-lead ones. Dr. H. Foster Bain, the famous mineral authority, is in charge of the investigation of both the Cochiu and the Tungchwang mines.

"America is destined to play a part—an important part—in the opening up of Western China, and in the development of her mineral resources. When the development work of the Yunnan Ming Hsin Mining Company is well under way, railway communications will undoubtedly be introduced to facilitate transportation of ores. The need has been already deeply felt, the authorities of the company experiencing difficulty in sending a sufficient number of coolies to the region where their property is located. The mining region is mostly unpopulated, and for this reason the import of labor becomes a necessity. The transportation question is now being tackled. Its solution means that Yunnan will be more accessible to the outside world, and its general development will be accelerated.

"Reports from Yunnan indicate that the Yunnan government is appreciative of the fair spirit manifested by the American partners of the mining company. The Chinese own half of the interest, but they do not have to bear the initial expenses such as expenses for purposes of investigation and for the sending of American engineers into Yunnan. Nearly a million dollars have been spent upon the investigation work, which made possible the formation of the company.

"The capitalization of the company is two million dollars to begin with. The company's by-laws provide that it can be increased to any size the board of directors may decide in the future. It has five directors, three of whom are Americans, and there is one auditor-in-general who checks all the expenditures. Many American returned students are being employed to assist the American engineers, and are getting much practical training in mining gineering.

"There appears to be no surer way of insuring the independence of China and maintaining her sovereignty than by encouraging foreign investment in her land and especially the investment of American money. It is said that if America or Great Britain had invested one hundred million dollars in Shantung, the issue of the Shantung question at the Paris Peace Conference would have been entirely different. General Tang Chi-yno, Military Governor of Yunnan, who is the real ruler and authority in that province, seems to understand this situation, and, understanding it, has gone into full co-operation with one of the largest mining companies in the world, the Orient Mines Co. of New York, in which many big American financiers are interested.

"Following the break-up of the age-long idea of spheres of influence which all the enlightened nations are detesting, Americans, Britons, Frenchmen, or other foreigners can go anywhere in China and help the people to develop natural resources. Americans have apparently thrown in their lot with Yunnan, which province is, however, large enough to accommodate activities of other foreigners. In the meantime, the interior provinces such as Szechwan, Sinkiang, Mongolia, and Tibet are awaiting development. They would welcome more men of Mr. Finch's caliber if the latter would go to them in a spirit of helpfulness and friendliness.

"Yunnan, situated on high table-lands, abounds in minerals. Covering 146,718 sq.mi., it is next to Szechwan in size, but it is the least populous province of China, its inhabitants being about 12,721,500 or 86 to the square mile. The extraction of ores, tanning, the preparation of tea, and the mining of copper, iron and tin, occupy a large number of the Yunnan people. In Yunnan, four cities are open to foreign trade, namely, Mengtze Hsien in Linngan Fu, Hokow in K'aihwa Fu, Szemao Ting in P'ueul Fu and Tengyuch T'ing in Yungchang Fu. The treaties provide also for the opening of Yungchang Fu itself.

"Numerous routes radiate from Yunnanfu, the provincial capital of Yunnan. Starting from the city, the following, according to Richard's Comprehensive Geography, deserve to be mentioned: The road to Kweichow, via K'utsing Fu; the road to Szechwan, via Tungchwan Fu and Chaotung Fu; the road to Burma, via Tali Fu and Yungchang Fu; a road forks off at Tali, and leads to Tibet, via Atentze; the road leading to the Laos country, via P'ueul Fu and Szemao T'ing; the road to Tongking, via Mengtze hsien and Manhao; the road to Kwangsi, via Kwangnan Fu. The new railway line, which will bring Yunnan into direct and rapid communication with Tongking, starts from Laokwi, follows the Namti valley, and has its terminus at Yunnan Fu, via Mengtze hsien, and Ami Chow."

The Tintic district in Utah, lying in Juab and Utah counties, produced over half of the total silver output of Utah in 1919, according to the U. S. Geological Survey, having produced 6,815,008 oz. as compared with 11,649,961 oz., for the entire state. The Chief Consolidated at Eureka was the largest producer in the district and in the state.

Utah Fuel Co. Attacking Powers of Industrial Commission

Claims Body Acting Under Workmen's Compensation Act Is Usurping Judicial Functions

The powers of the Utah industrial commission as conferred by the amended workmen's compensation act of 1919 are being opposed by the Utah Fuel Co. on the ground of unconstitutionality. The case will shortly come before the state supreme court, which alone, according to the amended act, is empowered to review the proceedings of the commission. It is held that review by the district courts as permitted under the Act of 1917 would result in frequent appeals, which would be prejudicial to the proper functioning of the law.

The case in point concerns an award of $12 weekly to be continued throughout the period of disability that was made to a former employee of the Utah Fuel Co., who is now supposed to be suffering from progressive or creeping paralysis. The fuel company holds that there is no evidence to connect the man's present condition with his employment with the company about a year ago before the hearing was held, and that the evidence proves the disease to have attacked the employee in question before the time of his entry into the service of the company. The fuel company challenges the right of the commission to make decisions between litigants as to ultimate liability, holding that the commission, an administrative body, is thus usurping judical functions, and that if the law as amended, does attempt to give it such judicial power, this would make it in legal effect a court, and that the law would therefore be unconstitutional and void. Contention is made also for the right of appeal to district courts.

Tonopah and Tidewater Acquires Bullfrog-Goldfield Road

The Bullfrog-Goldfield railroad, which is 75 miles long and extends from Goldfield to Beatty, in Nevada, will be operated in the future by the Tonopah & Tidewater railroad, the control of the stock having been recently bought from the Althouse-LaGrange syndicate, of New York. The road was built during the boom days of Goldfield and of late years has been far from a paying investment. When the Althouse-La Grange syndiate secured control it was with the intention of scrapping the line and selling the equipment at the high prices then prevailing for such material. This was prevented and the road has now passed into control of those who are interested in having it continue operations, and it is expected that a much improved service will result.

The Bullfrog-Goldfield R.R. Co. has been re-organized with R. C. Baker, president, and C. B. Zabriskie, vice-president and treasurer. The general offices will be in Los Angeles. Mr. Baker, the new president, is also president of the Pacific Coast Borax Co. and the Tonopah & Tidewater R.R. Co.

Chisholm, Minn., Seeks More Taxes from Wellington Mine

Steel Corporation's Property Said to Contain Million Tons of Ore—Drilling Results Concealed from Tax Commission

Alleging under-assessment of mining property a petition was recently filed with the state tax commission of Minnesota asking that the commission make a full examination and re-assessment of the Wellington mine, owned by the United States Steel Corporation on the Mesabi Range. The petition states that this property has paid only nominal taxes during the last thirteen years and that the state is entitled to more than $100,000 in additional taxes from the property.

It is alleged that this property was thoroughly drilled in 1907, but that the results of drilling were not disclosed to the tax commission. From 1907 to 1919 the Wellington mine was assessed on the basis of approximately 140,000 tons of ore reserves and on a valuation not to exceed $14,000 in any one year. The annual taxes never exceeded $610, when it is claimed, they should have reached $10,000.

The petition is filed by George H. Spear, attorney of Duluth, and signed by J. Austin, president of the village council of Chisholm, Minn., and E. Drew, president of the school board. The mine is located in the village limits of Chisholm.

The Oliver Iron Mining Co., the iron mining subsidiary of the U. S. Steel Corporation, is now sinking a shaft on the property preparatory to opening up the mine for operation. It is alleged that the mining company has admitted to the board of equalization of the village of Chisholm that the property contains more than 1,000,000 tons of ore.

Licensing of Engineers Urged in Southwest

Mining and civil engineers of Arizona and New Mexico are to try to pass through their next legislative sessions bills for the licensing of engineers. It is urged that the profession assuredly is as technical as that of the law, the bar and of teaching, all of which have strict license regulation that protects the individual and the state alike. The legislatures will be asked in each state to create a board of engineering examiners.

Would Open All Indian Reservations to Mining

The support of engineering and mining societies and much official aid have been enlisted in support of the movement to throw open for mining all the Indian reservations of the nation. Especial interest attaches to this movement in Arizona, which state has large deposits of coal on the Navajo reserve, asbestos on the Apache reserve and mica on the Pima reserve, while on all are understood to be valuable prospects of copper, gold and silver.

Wage Scale Agreed on Last May Still Effective in Slocan, B. C.

The wage scale effective at present in the mines of the Slocan district, British Columbia, is given as follows:

MINE WORK

Class of Work	New Scale
Miners	5.75
Muckers	5.25
Timbermen	6.25
Timbermen's helpers	5.75
Blacksmiths	6.25
Blacksmith's helpers	5.75
Carpenters	6.75
Compressor men (steam)	6.25
Compressor men (other than steam)	5.75
Tramway operators (head end)	6.25
Mule drivers (underground)	5.75
Brakemen on mule trains	5.25
Teamsters	6.25
Common labor	5.25

MILL WORK

Jig men	6.25
Table men	5.75
Flotation men	5.75
Roll men	5.25
Crusher men	5.25
Common labor	5.25
Carpenters	6.75
Repair men	6.75
Repair men's helpers	5.75

This scale became effective May 12, 1920, following the strike called by the O. B. U. on May 1, at which time the men demanded a wage increase of $1 per day and other concessions as given on page 688 of the *Engineering and Mining Journal* of Oct. 2. On May 12 the operators of the district, excepting the Silversmith Mines at Sandon, made an agreement with the International representatives granting an increase of 75c. per day but also increasing the price of board 25c. per day. They also agreed not to employ any I.W.W. or O.B.U. members but reserved the right to employ non-union men.

"As matters now stand four months since the strike was called," says one of the operators, "nearly all the mines have resumed, but, most of them are still shorthanded, though labor has recently become more plentiful. The strike is meeting the fate of all movements founded on misrepresentation and false promises, and, is dying a natural death. Conditions will probably return to normal by the spring of 1920.

"One of the most deplorable features of this trouble particularly from the standpoint of international good feeling has been the spectacle of the ex-District Attorney of Spokane coming to British Columbia, and, making an arrangement which gives aid and comfort to the avowed enemies of established government, for the sake of putting a few dollars in his pocket."

According to the State Mine Inspector, Arizona now is employing about 20,000 men in its mining industry, compared with 30,000 a year or so ago.

Labor Survey Now in Progress in Northern Ontario

Mines Short of Men—Operators See Importation of Foreign Labor Only Relief

Despite the fact that large numbers of men are being laid off in the various industries in southern Ontario, the mines of northern Ontario are very short of men. Unfortunately, men who have been employed in shops and factories are not generally suited for the mines, and it is doubtful if the operators will be benefited to any great extent by this surp'us. Practically every company operating in northern Ontario reports a shortage and a slowing down in development and exploration, and, in many cases, of production. The labor turnover has been high and in the Cobalt camp will undoubtedly average 25 per cent a month. This is due to the fact that there has been no immigration of foreign labor, and that the Government has been consistently opposed to such immigration. An official of the Labor Department from Ottawa is now making a survey of this northern country in order to get first-hand information, and it is hoped that some definite action may be taken. Unless the operators are allowed to import foreign labor they can see practically no hope of relief for the future.

Recent Production Reports

Calumet & Arizona's September production was 3,038,000 lb. copper compared with 3,650,000 in August.

New Cornelia produced 3,314,000 lb. copper in September against 3,842,040 in August.

North Butte produced 1,434,159 lb. copper in September against 1,286,137 in August.

Shattuck Arizona in September produced 166,513 lb. copper, 921,912 lb. lead, 57,008 oz. silver, and 523 oz. gold compared with 194,003 lb. copper, 563,452 lb. lead, 34,661 oz. silver and 406 oz. gold.

Oriental Consolidated, in Korea, reports its September cleanup as $76,500, compared with $75,500 in August. The entire property has been operated with hydro-electric power since July 13. The Tongkol mine has been unwatered and the Chintui mine is now being pumped out. Labor shortage is holding up prospecting work. Exchange continues unfavorable. Chinese labor continues absent and Koreans are more difficult to handle than formerly.

Greene Cananea produced 3,500,000 lb. copper, 159,600 oz. silver and 910 oz. gold in September. The August output of copper was also 3,500,000 lb.

U. V. Extension produced 3,327,644 lb. copper in September as compared with 5,805,568 lb. in August.

Anaconda produced 11,100,000 lb. copper in September against 11,800,000 in August.

Phelps Dodge produced 7,998,000 lb. copper in September, compared with 8,365,000 in August.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Mining in Alaska Less Affected Than Elsewhere, According to Col. A. H. Brooks

Loss of Experienced Miners Worst Feature of Situation; Scarcity of Common Labor Next

The most careful general economic study ever made of the mineral resource of Alaska just has been completed by Col. A. H. Brooks, in charge of Alaskan mineral resources of the U. S. Geological Survey, and O. C. Ralston, of the U. S. Bureau of Mines. This comprehensive study of the entire Alaskan situation from the mineral standpoint, was made at the instance of the Secretary of the Interior, in connection with the program of stimulating Alaskan activities so that sufficient tonnage may be found to make the Alaskan railroad pay. There is also the general consideration of speeding up the development of this territory which has been so generously endowed by nature.

One of the matters to which particular attention is given is the increasing demand in Alaska for a Government smelter. That phase of the matter will be reported on by Mr. Ralston on his return Nov. 1.

Considering the world-wide depression in gold and copper mining, Colonel Brooks was of the opinion that the mineral industry in Alaska is doing very well indeed. Although both gold and copper mining has been affected very seriously by the depression in those metals, Colonel Brooks believes that Alaska has been less affected than any other mining region depending largely on those metals. The fact that Alaska seems to be better off than other mining regions is regarded as an indication that Alaska possesses a fundamental vitality which is certain to exert itself as the situation improves. The worst feature of the situation, in Colonel Brooks' opinion, is the loss of experienced miners. Many of these men have been working in Alaskan camps for twenty years and are thoroughly familiar with conditions. Now a great many of them have returned to the United States and find that they can do better in this country. A great many of them have been attracted by the petroleum industry since the lure of oil carries with it more chances of reward than does gold mining under present conditions.

Another serious feature in the Alaskan situation is the loss of common labor. These men have returned to the United States in great numbers. It was from their ranks that most of the prospectors in Alaska was drawn. It is going to be very difficult, Colonel Brooks believes, to induce these men to return or to get men of their type to take their place.

Despite the depression in gold mining, Colonel Brooks reports great activity in prospecting for gold lode claims in southeastern Alaska. Promising discoveries have been made in the Sitka district. The success of the Chichagoff mine is also having an important influence. It is interesting to note that the Sitka district was the scene of great prospecting activity nearly half a century ago. After a long period during which it was practically abandoned by prospectors it again is the scene of the greatest activity.

At the special request of Secretary Payne, Colonel Brooks made a general survey of the oil possibilities of the territory. He calls attention to the fact that geologic conditions are particularly good for the occurrence of oil at a number of places in Alaska. In addition there is the direct evidence of oil seepages. Due to the increased price of petroleum and to the enactment of the new mineral leasing law, Colonel Brooks expects active drilling to start at a number of points in Alaska next spring. Colonel Brooks visited the Katalla field where drilling and refining are in progress on a patented claim containing 160 acres. This is a field of small pumping wells, but a superior grade of gasoline and distillate are being produced. The petroleum is coming from sands at depths of 300 and 800 ft. In Colonel Brooks' opinion, these wells will continue to produce for a long time to come. There is a ready market locally for all that this field can produce, especially since the product is superior to the imported gasoline.

War Minerals Awards

Awards aggregating $5,812.25 were recommended during the week ended Oct. 2, by the War Minerals Relief Commission. The awards were as follows (the name of the claimant, the mineral, the amount recommended, and its percentage relationship to the amount claimed, are shown): E. E. Taylor, chrome, $300, 100 per cent; Frank M. Liscom, chrome, $148, 16 per cent; W. S. Tolbard, manganese, $5,364.25, 31 per cent.

With the foregoing awards, 239 war minerals claims have been allowed in full or in part. The total amount claimed in these 239 cases was $5,938,748. The amount recommended for award was $1,912,368.23, or 32.2 per cent. In all the commission has acted on 1,032 claims.

The administrative expenses of the commission, on Oct. 2, totaled $302,248.14, or 2.22 per cent of the total amount of the claims settled.

Geologic Study of Homestake Mine, at Lead, S. D., Completed

Sidney Paige Follows Up Earlier Work for Government by Comprehensive Examination

A thorough geologic study of the Homestake mine at Lead, S. D., has just been completed by Sidney Paige. This is the first comprehensive study ever made of this mine by a Government engineer. Due to the fact that the Homestake deposit is unique in the United States, there has been the greatest interest in its geology. It has been the policy of the company, however, not to permit of studies of its ore deposits by outside agencies. An exception was made in 1913 when Mr. Paige was allowed to make limited observations underground. During the present visit, however, Mr. Paige was given every opportunity to make a careful study.

As a result of his study in 1913, Mr. Paige published a short paper on the origin and structure of the ore deposit. His latest examination supports the ideas which he published at that time.

"The mine is really a replacement deposit of a closely folded pre-Cambrian series of schists and carbonate rocks," says Mr. Paige. "The ore, in the main, is confined to beds which probably comprised magnesium and calcium carbonate layers. An important zone of shearing and faulting determined the locus of the ore in this series of carbonate beds. The folding of the beds in large measure determined the shape and pitch of the orebody."

Rumors to the effect that gold existed in the Black Hills became current early in the 19th Century. Owing to the hostility of the Indians, few efforts were made to prospect the hills. In 1874, however, General Custer made a military reconnaissance of the region in an effort to establish whether rumors of gold had foundation. The Custer expedition was accompanied by N. H. Winchell, a geologist. Gold was found to exist in the stream beds of the Harney Peak region. A further examination was made by Government geologists in 1875, but the party did not reach the region of the Homestake mine.

The facts concerning the discovery of the Homestake deposit are not known but it is said that the Homestake and Old Abe deposits were discovered by two French boys, Moses and Frederick Manuel. The property was mentioned in print as early as 1876. Its real worth was established in 1877. Since that date more than $100,000,000 in gold has been taken from the Homestake orebody.

NEWS BY MINING DISTRICTS

Special London Letter

Mining Companies Finding Difficulty in Obtaining Funds—West Rand Consolidated in Sorry Plight

London, Sept. 28—At least half a dozen mining companies acknowledge that they are in need of funds, and five of them are specifying the amount that should be raised. Four of the companies own tin areas, one is a gold mine, and the last, the Broken Hill Proprietary, which owing to demands made upon it is compelled to extend its iron and steel works. Three tin mining companies, namely, the Killifreth, the Dolcoath and the Grenville United are in Cornwall, where the industry is sadly in need of additional financial resources. While tin was selling at a high price and wolfram and arsenic were in great demand the mines of the Duchy earned fairly substantial profits; but since the war, and owing to the action of the Government in regard to the price of the metal, coupled of course with increased wages, the rise in coal, transport rates and raw materials, matters have become much less rosy. Attempts were made to induce the Government to loan £100,000 for development purposes; the authorities, however, refused, deciding that the mining industry must find its own capital. The famous old Dolcoath wants something like £100,000; Grenville United, which for some months worked from hand to mouth, experiences great difficulty in obtaining funds; while Killifreth, which has acquired two adjacent properties, is compelled to provide £20,000 additional capital, and is creating 50,000 new £1 shares.

Money is by no means plentiful, and can only be procured on onerous terms; in fact large lenders of capital to mining companies in the past are deciding to sit still and do nothing because, where machinery is required, early delivery cannot be guaranteed, and they argue that if money is raised on debentures the interest will be paid out of the money that is provided.

An illustration of the unfavorable effect of increased cost of labor, transport, materials, etc., is acorded in the case of Northern Nigeria (Bauchi) Tin Mines. This company designed a hydro-electric plant at the Kwall Falls, to be erected by Messrs. Vickers. The original estimated cost was £85,000, and it will be exceeded by no less than £65,000. To complete the mine equipment will require another £75,000, making £225,000 in all. The directors have expended £100,000, of which £45,000 is borrowed, and they must now raise £125,000. Ten thousand tons of tin concentrates is proved, having an estimated value at the current price of tin of £1,680,000, on which the profit should be £600,000. The issued capital is approximately £300,000.

The Broken Hill Proprietary proposes to spend £3,500,000. It has rather over £1,000,000 in reesrves; it will issue £1,500,000 in 7 per cent debentures at 97 and 420,000 shares at £2 5s. For the iron and steel works this sum is fairly certain to be found.

The West Rand Consolidated Mines is in a very sorry plight, for it needs money and has decided to postpone for three years payment of interest on its debentures, and also redemption of the debentures. Further, it will suspend the first charge of the debenture holders to enable the company to raise up to £100,000 at 8½ per cent on a floating first mortgage. The General Mining & Finance Corporation will advance the money, but only as and when required. The property is a low-grade area in the western part of the Witwatersrand, about which great things were predicted some years ago. The mine, however, has never come up to expectation.

Peregrina—The Peregrina mill continues operating on a reduced scale pending the conclusion of important development work which it is expected will open up a large tonnage of very good ore. W. T. Kendall is superintendent for the company of both mine and mill.

La Luz District—The Guanajuato Reduction & Mines Co. is building a mill and cyanide plant on its properties at San Pedro in the district of La Luz. The plant is designed to handle 200 metric tons per day and was laid out so as to permit of the tonnage being readily increased. The counter-current system is to be used with Dorr thickeners and agitators. Precipitation will be effected by the Merrill zinc dust system, using the Crowe vacuum process in conjunction with same. The ore from the crusher will be screened, the fines going direct to 5 by 6-ft. Allis-Chalmers driect-driven ball-mill; the coarse being passed through twenty stamps before going to the ball mill. Three 5 by 16-in. tube mills are to be used for the fine grinding, working in closed circuit with Dorr classifiers. Construction work is progressing.

A new three-compartment shaft is being sunk in the south end of the Rosario mine, to be used as the principal hoisting shaft for operations in the Rosario, Purisima and San Pedro mines. The old Rosario shaft is being timbered through caved ground, for use as an auxiliary shaft. An adit is also being driven north in the Pili mine at the north end of the company's La Luz group. This mine will be connected with the others by a surface tram. The company expects to have its mill in operation early in November, unless something unforeseen arises.

GROUP INCLUDES CHARLES HOYLE (1), MANAGER OF ESPERANZA MINING CO.; W. A. GARDINER (2), SUPERINTENDENT, AND THREE OTHER EMPLOYEES OF COMPANY, WHO WERE RECENTLY CAPTURED BY PEDRO ZAMORA, BANDIT, IN JALISCO, MEX., AND HAVE SINCE ESCAPED OR BEEN RELEASED

MEXICO

Guanajuato

San Matias Mill Running After Two-Year Shut Down—Guanajuato R. & M. Co. Erecting 200-Ton Mill

Guanajuato—On Sept. 8, the San Matias mill of the Mexican Milling & Transportation Co. resumed operations after having been closed down for over two years. The mill has been entirely overhauled and some important changes made in the flow sheet and system of treatment, which brings the daily capacity up to over 300 tons. The ore is being supplied from the Esperanza group of mines by an aerial tramway 11,000 ft. long, which has recently been installed. P. R. Hudson is mine superintendent and O. W. Johnson mill superintendent.

Durango

Mining Active in Avino and Panuco Districts

Mining is becoming very active in the Avino and Panuco districts in Durango. They are located near each other and at one time were the most flourishing camps in the state. A large amount of English capital was invested there.

Gabriel Segura, of Durango City, has filed on a number of delinquent claims in that vicinity and is preparing to operate them.

The Avino Mines Co., Ltd., are seeking to obtain from Juan F. Flynn, former manager, the titles to the Maverick group of mines near Avino.

CANADA

British Columbia

Re-definition of Canada-Alaska Boundary Progressed During Summer—Opening Berniere Mines

Victoria—Dr. V. Dolmage, of the Canadian Geological Survey, has returned after a summer's field work which has resulted in the obtaining of the information necessary to complete the geological map of the west coast of Vancouver Island. Dr. C. H Clapp and Dr. G. N. Dawson have already completed the geological survey of the southern and northern sections of the west coast of the island.

Vancouver—The re-definition of the Alaska-Canada boundary line, particularly in the Portland Canal and Salmon and Unuk River regions, make considerable progress during the past summer. J. D. Craig, head of the Canadian party, has returned and states that he worked north and westward from the town of Stewart and that the United States surveyors, led by Jesse Hill, worked south by the Unuk River. The duty of these parties was to indicate the boundary clearly by means of monuments and by the cutting of timber where there is timber. It is stated that some miners and prospectors have made the mistake of staking in American territory and recording the same with Canadian officials and that the error has been as frequently made conversely.

Trail—Ore shipments received at the Consolidated smelter during the week ended Sept. 30 totaled 12,744 tons, coming from the following shippers:

Mine and Location	Gross Tons
Emerald, Salmo	33
Florence, Princess Creek	95
Iron Mask, Kamloops	45
Josie, Rossland	448
Monarch, Field	78
North Star, Kimberley	224
Paradise, Athalmer	57
Providence, Greenwood	47
Queen Bess, Alamo	40
Sally, Beaverdell	37
Twin, Princess Creek	26
Velvet, Velvet	28
Washington, Sandon	37
Company mines	11,549
Total	12,744

Revelstoke—The Berniere Mines, situated near Scott Creek, Camborne, are being opened up and a contract has just been let for the construction of cabins, blacksmith shop and other buildings, it being the intention to continue work this winter. The Beatrice Mines, of the same district, are shipping silver-lead ore to the Trail smelter.

Ontario

Temiskaming Shareholders Ratify Coal Mine Deal—To Continue Sinking at Vipond

Cobalt—F. C. Sutherland & Co., of Toronto, have taken an option on the Penn Canadian mine, which has been closed since the strike last year. There is about 8,000 tons of ore broken in the mine and about 150,000 tons of old tailings, which, it is believed, can be retreated at a profit.

At a general meeting of the shareholders of the Temiskaming mine a deal for the purchase of a half interest in the Blue Diamond coal mines in Alberta was ratified. The coal property is being taken up jointly by the McIntyre and the Temiskaming. Four hundred and fifty thousand dollars has already been paid on the purchase price. It is stated that the mine is already making a profit, which will be largely augmented when the new equipment ordered is on the ground.

According to the terms of the agreement between the Dominion Reduction Company and the Peterson Lake, for the retreatment of old tailings belonging to the Peterson Lake, the Dominion Reduction is to receive 35c. per ton over the cost of treatment, and one-third of any profit remaining after this.

The Casey Cobalt Co., which has produced 2,500,000 oz. of silver, has gone into voluntary liquidation.

Porcupine—Following the decision to reopen the Vipond mine, it has been decided to continue the shaft from the 600 to the 1,100-ft. level. A big program of development work has been outlined.

Elk Lake—The Matachewan Gold Mines in the Elk Lake district has recently concluded 15,000 feet of diamond drilling. The results of this drilling, together with the underground development that has been done, is sufficient to satisfy the management as to the orebodies. It is probable that the property will not be opened up in a large way until hydro-electric power is available.

It has been officially stated that the shareholders of Dome Extension will participate in the dividend of 25c. per share on Dome stock, payable Oct. 20. The deal for the purchase of the Dome Extension property by the Dome on the basis of 30 shares to one was recently ratified

Manitoba

Herb Lake—The Rex is working three shifts per day underground and the mill running 24 hours per day. Ore reserves have been blocked out ensuring steady operation of the mill

ALASKA

Rae Wallace Co. in Willow Creek District Installing Gibson Mill

Allen G. Kennedy, of Wallace, secretary of the Rae-Wallace Gold Mining Co., recently returned from an inspection of the company's property in the Willow Creek district, Alaska. Most of the stock of the company is held in the Cœur d'Alene district and the manager in charge at the mine, Don S. Rae, has been in Alaska twenty years and prior to that time was engaged in mining in the Cœur d'Alenes. The development on the Rae-Wallace at this time consists of a series of tunnels which have proved the vein for a distance of 3,500 ft. and exposed enough ore to keep the 50-ton mill, which is now being erected, running for several years. However, the company plans to drive another tunnel just above the mill site which will open up the vein to a depth of 1,200 ft. and then increase its milling capacity. A Gibson mill in two units of 25 tons each is now being installed, and it is hoped to have one unit running before the mining season closes this fall. The ore is free milling and Mr. Kennedy estimates that from $40 to $50 per ton will be recovered by amalgamation.

CALIFORNIA

Construction of 500-Ft. Tramway Begun at Kelly Gold Mine at Quincy

Quincy—Construction of a 500-ft. tramway to connect the mouth of the tunnel with the stamp mill at the Kelly gold mine on Crescent Hill, near Quincy, began on Oct. 1. The work is under the supervision of H. C. Martin, building contractor, who has just completed several other large construction jobs in this district. Martin will also erect an ore storage bin and other buildings. The Kelly mine embraces 180 acres containing nine claims and now employees a force of nine men. The plant is hard to reach by tractors or trucks as in order to get machinery and supplies to the mine a 27-per cent up grade must be overcome.

Sutter Creek—Morris Brinn, of San Francisco, has completed an examination of the Central Eureka property in which he is heavily interested. Power shortage has curtailed the output, but large reserves are being developed.

Jackson—The water in the Kennedy shaft has been lowered to a point below the 2,800 level, with a corresponding progress in the connected Argonaut workings. Last week some delay was caused by one of the large water skips getting caught in the shaft and tearing out some of the timbers. The pumps are working steadily in both mines in addition to the water skips. The shaft as thus far unwatered is in first-class condition. The greater part of the east shaft of the Kennedy is in hard greenstone and is not affected by the water. James Spiers, superintendent, is looking after the present work, which is being done at the expense of the Argonaut company, the Kennedy not desir-

ing to resume operations on its own account during present abnormal conditions.

San Francisco—Fletcher Hamilton, state mineralogist, has been touring the mining districts of the state and giving addresses on the development of mineral resources. H. A. Jenison, geologist for the United States Geological Survey, is engaged in making a survey of the principal copper mines of the state, starting with the Engels and Walker mines in Plumas County.

Engelmine—R. A. Kinzie, present manager of the Engels Copper Co. states that on the No. 6 level, or 600-ft. level, of the Engels upper mine one new tramway, which is now in operation, according to J. R. Walker, who is interested in the company. These concentrates are said to be worth over $80 per ton at the present price of copper. The Walker company is making the camp and headquarters for operations close to the mill,

NEVADA

Cactus Nevada Silver Makes First Shipment

Cactus Peak—The first shipment of ore by the Cactus Nevada Silver Mines Co. was recently made, going to the Goldfield Development mill at Goldfield. A new vein is reported to have been

necessary equipment the driving of the Arctic tunnel at the Cortez Consolidated mine is progressing steadily. It is now in 1,400 ft. from the portal and within another 600 ft. is expected to cut the downward extension of the main vein at a vertical depth of 600 ft. below where the latter was mined in the No. 1 tunnel. Geo. L. Kaeding is in charge.

Tonopah—The Tonopah Extension report satisfactory progress in sinking their Victor shaft, which is now 100 ft. below the 1,760 level. Present plans are to sink 75 ft. before crosscutting, the last 50 ft. to be used as a sump. The McCane shaft workings have been connected to the No. 2 shaft workings and

MILL AND MACHINE SHOP OF ENGELS COPPER MINING CO., PLUMAS COUNTY, CAL. DEPOT OF INDIAN VALLEY R.R. IN FOREGROUND

orebody is 840 ft. long with on average width of 70 ft. Another to the south is 200 ft. long and 60 ft. wide, while two other known orebodies have both been developed sufficiently to have their limits known. These bodies average between 2.75 and 3 per cent copper as they are broken down, also carrying gold and silver.

The Reinmiller Copper Co. has about completed the road leading to the site for the crosscut tunnel which will tap the main vein so far developed at a depth of 400 ft. below the collar of the shaft. A boiler and compressor are on the ground and will be installed at once, after which the tunnel will be rapidly pushed with two shifts until it reaches its objective.

Portola—Between 8,000 and 9,000 tons of concentrates is at the Walker mine at this time ready to ship over the opened up in the east drift on the 265-ft. level.

Goldfield—The winze from the 900 level of the Spearhead is down over 200 ft. and will be continued to a depth of 500 ft. It is being sunk on an incline of 76 deg. and is going through a series of faults, the formation being alternately quartz and alaskite.

Gold Hill—Crosscutting on the 475 and 575 levels of the Co. Imperial is in progress. When the vein has been crosscut, sinking of the shaft will be resumed. Twenty men are at work at the portal of the haulage tunnel on open cut work and construction of buildings to house machinery and supplies. The United Comstock Mines Co. is employing 78 men altogether.

Cortez—With the completion of the installation of a compressor and other after some delay in repairs this shaft is to be sunk to the level of the 1,540 of the Victor. In development work fair progress is reported and mill tonnage from the mine is given as 1,750 tons.

In the Tonopah Belmont mine drifts have been started on the 729 vein from what has been designated the 550 level. This is an intermediate level from a raise driven from the 700 level. The drift shows two feet of fair ore. Regular development from the 700 to the 1,200 levels has disclosed nothing new of importance, ore showings and tonnage mined being normal.

In the West End mine development on the West End, Footwall and Ohio veins has proceeded with few changes. August profits were $47,466.64 from 4,396 tons of mine ore and 496 tons of Jim Butler lease ore mined from the

West End shaft with a total gross value of $112,775.79.

The Rescue continues regular shipments of ore of good grade and it is said that a substantial treasury is being accumulated.

Divide—In the Tonopah-Divide mine conditions are stated to be very good. On the 165 level a crosscut at a point 350 ft. southeast of the original strike on this level has shown the vein to have a width of 36 ft., 12 ft. of which is shipping grade ore and 24 ft. ore of milling grade. Development workings in the vein on other levels have satisfactory showings and crosscutting on the 800 and 1,000 levels has been started.

Pioche — Shipments from the district for the week ended Sept. 30 show a steady reduction on account of the freight increases and it is only hope and assurances of an adjustment in the rates that is keeping the majority of the properties on the active list. Many shutdowns will result in the near future unless some action is taken. Shipments in the week referred to totaled 2,995 tons from the following shippers: Prince Con., 1,700 tons; Virginia Louise, 650; Combined Metals, 245; Bristol Silver, 200; Black Metals, 100; Campbell-Bristol Lease, 50, and Con. Nev. Utah, 50.

ARIZONA

C. & A.'s New Air Shaft in Operation —Considerable Leasing in Tombstone District

Bisbee—The Irish Mag Leasing Co. has finished its first six months' period of operation. The Irish Mag shaft has been opened and retimbered from 40 ft. below the 450 level to a point 20 ft. below the 750 level. Work of opening the shaft and retimbering will be continued. It is planned to start prospecting on the 950 and 1,050 levels. Approximately $17,000 has been spent in repairing the shaft, which work was started April 1, 1920. Two shifts have been working in the shaft continuously.

The Boras and Night Hawk leasing companies have resumed operations after a week's shutdown due to a lack of electric power. The Bisbee Improvement Co., which furnishes these mines with power, was forced to curtail due to a shortage of fuel oil. This is now being received and no immediate shortage of power is anticipated.

At the Calumet & Arizona the new air shaft near the Briggs mine has been connected with the fire area and is now being used for ventilation.

Tombstone—There is considerable leasing going on in the Tombstone district. The Bunker Hill Mining Co. is at present doing no company work. Small leases have been given both on the surface and underground in several of the mines. It is reported that the Mellgren property, comprising about 60 claims, has been examined by Eastern interests. The property is said to be bonded.

The Winter's property has been sold to Boyd, Hughart & Bloodworth, who have formed a closed corporation to develop it. A new shaft is being sunk as the old one has not been found suitable. The present mill will not be operated.

Altogether there are about thirty different operators including lessees in the Tombstone district.

Swansea—The Swansea is now employing more than 100 men, mainly Mexicans, and producing about 140 tons of ore per day. Most of this is milled, yielding a 24-per cent concentrate which is shipped to Humboldt, as well as a small quantity of high-grade ore that is valuable in the furnaces because of its high iron. The Swansea lease has been taken from the Clark interests by the Consolidated Arizona Smelting Co. of Humboldt, as recently stated.

NEW MEXICO

Bonney Con. Makes Strike of High-Grade Copper Oxide

Lordsburg—Frank M. Manson, who recently made an investigation of the possibilities of southern Arizona, southwestern New Mexico and northern Sonora, with the object of locating ore-buying agencies in this section, has announced the intention of the Western Ore Purchasing Co., of Reno, Nev., to establish a number of agencies in this section, which will buy all kinds of salable ores in any quantities. One or more sampling mills will be erected at points later to be decided upon.

A new strike of very high-grade red oxide of copper has been made at a depth of 35 ft., on the Manilla claim of the Bonney mine. Work has been started to cut this from the 100-ft. level of No. 1 shaft.

Ore shipments from the Lordsburg district in September totaled 89 cars, or 4,072 tons, valued approximately $61,080.

White Signal—At Camp Kithil mining of torbernite ores has ceased. The representative of the Radium Company of Colorado, who has been here for several weeks, has returned to Denver. The Merry Widow shaft has been sunk to a depth of 200 ft. and various other openings made which has demonstrated an ample quantity of ore. It is understood however that considerable difficulty has been experienced in perfecting a process for handling the torbernite which differs from the ores heretofore used by the Radium company in the production of radium.

COLORADO

Silver Mountain Mines Suspends — Guadaloupe Mine Changes Hands

Ouray—Silver Mountain Mines has suspended work and is reported to be offering its equipment for sale. The equipment of this property was good and a fair start was made, but subsequent mine development was neither very effective nor successful.

James A. Lannon, of Ouray, formerly manager of the Atlas M. & M. Co., has taken over the Guadaloupe mine for a group of outside men and is actively engaged in equipping it. The construction of a line to transmit electric power to the mine is under way and mining machinery will be installed soon. The mine has been sporadically worked for years but never well developed; the new operations promise to give the mine a good try-out and the prospects are good for success, the mine having produced ore of very good grade at intervals.

Camp Bird has continued active development ever since the new crosscut tunnel, two miles long, was connected with the old workings above by a 400-ft. raise for ventilation. The intervening ground around this raise was opened up by several levels, then the vein was explored on the main tunnel or crosscut level. Drifting over 2,000 ft. east was first done, and now drifting west along the vein is in progress out under the most productive of the old workings. Ore encountered is stored in a stock pile at the tunnel portal. The intermittent manner of adding to this pile indicates that no large or continuous orebody, as compared with the old mine, has been encountered. Considerable ore has been encountered, however, and undoubtedly the mill will again be operated some time in the future.

UTAH

Utah Sulphur's New Leaching Plant Ready Soon—Seek Injunction Against Tintic Standard

Morissey—The new leaching plant of the Utah Sulphur Co. is expected to be in operation early in November. The new plant will have a daily capacity of 250 tons, and with the retorts and sublimer also working, the total capacity, it is stated, will be 350 tons daily. The latter have been doing satisfactory work, but the leaching plant can produce sulphur at a considerably lessened cost, it is said. The sublimer is used only for making the highest grade of sulphur. It is reported that the company is arranging also to produce fertilizer made of sulphur and phosphate rock combined, and that it is going to construct a plant having a capacity of 150 tons daily for this purpose.

Eureka—Tintic shipments during the week ended Oct. 1 totaled 131 cars as compared with 143 cars the week before.

An injunction is being sought against the Tintic Standard by the East Warm Creek Irrigation & Canal Co. to prevent the former from using water from Warm Springs and Warm Creek near the site of its mill which is in process of erection.

Park City—Shipments for the week ended Oct. 1 amounted to 2,153 tons coming from six mines, the Ontario and Silver King Coalition heading the list, with 704 and 554 tons respectively.

Alta—The South Hecla shipped 35 cars of ore during August and the September output is expected to amount to about 25 cars. Labor is scarce.

IDAHO

Cœur d'Alene District

Cœur d'Alene Syndicate Installs Compressor—Financing of U. S. Copper Arranged — Kill Buck Reorganized

Wallace—The Cœur d'Alene Syndicate, of which Rush J. White, mining engineer, is manager, has completed the installation of a large compressor to be used in developing the two Flynn groups which the syndicate has under option. The development consists of the extension of the Black Bear tunnel into the Flynn ground. This has now been extended about 700 ft. since crossing the common line, making the distance from the portal about 4,500 ft. A crosscut is being run south to the Flynn vein which is expected to be cut at any time. The great depth from the surface, 2,000 ft., and the fact that there are no intermediate workings, make it impossible to estimate accurately the position of the vein.

The United States Copper Co. is to be financed by E. R. Day, of the Grasselli Chemical Co., and J. W. Munroe, both of Cleveland, Ohio. Both these gentlemen inspected the company's holdings about a month ago in company with H. V. Edwards, of Wallace, manager, with the result that a permanent wagon road is now being built to the property which will enable the delivery of a compressor and all necessary equipment and building material early in the spring. A vein from 5 to 40 ft. wide outcrops for a distance of over 3,000 ft. A prospect tunnel has been driven 200 ft. on the vein, showing an average of 3 ft. of ore ranging from 2 to 30 per cent copper and some gold. In the spring a crosscut will be run about 1,200 ft. which will cut the vein 350 ft. below the present tunnel.

The Kill Buck stockholders have elected the following directors: Donald A. Callahan, James F. Callahan and Dr. L. E. Hanson, of Wallace; C. W. Newton, of Interstate, and John Borg, of New York. Control was recently purchased by the Consolidated Interstate-Callahan from Senator W. A. Clark, of Butte. The meeting of stockholders was called for the purpose of effecting re-organization with the representatives of the Interstate-Callahan in control. The directors are also identical with those of the Chicago-Boston Mining Co., also controlled by Interstate-Callahan. The two properties adjoin and will be developed through the same shaft, although operated by independent companies.

MICHIGAN

The Copper District

C. & H. Subsidiaries to Get Power From Lake Linden—Tamarack Reclamation Plant Site Cleared

Houghton—Sinking of the New Baltic shaft of the Arcadian Consolidated has been resumed, and at this writing is about 20 ft. below the 600-ft. level. The corner is in the lode.

The steel for the addition to the Calumet & Hecla flotation plant at Lake Linden is expected to arrive soon. This building is being erected by the American Bridge Co.

The site of the Tamarack reclamation plant is practically cleared of the old Tamarack stamp mill and equipment. Excavation for the flotation and leaching buildings are well under way.

Gogebic Range

"C" Pabst Shaft Lining Being Repaired

Ironwood—"C" shaft of the Pabst mine will be shut down for two or three weeks while repairs are being made to the shaft lining. Three shifts will be put on and the work pushed as rapidly as possible. The shaft is vertical, starts in the hanging and passes into the footwall near the 17th level. The pillar left to support the shaft was not adequate and the ground has caved until the shaft is several feet out of plumb. It is now crushing where it passes through the ore and dyke, and has to be retimbered between the 9th and 13th levels.

Menominee Range

McKinney Steel Electrifying Tobin and Dunn Mines Owing to High Cost of Coal

Crystal Falls—The McKinney Steel Co. is to re-equip the Tobin and Dunn mines and will move all the equipment at the Odgers property, all three of which are in the Crystal Falls field. The present steam plants at the Tobin and Dunn are to be scrapped and replaced with new electric hoisting engines and compressors. The present electric hoist at the Odgers will be moved so as to serve the new shaft which was recently completed. The hoisting engines at all of the properties will be housed in new buildings of brick construction. The high cost of coal was the determining factor in causing the company to discard the steam equipment and substitute electric machinery. The work of moving the Odgers equipment has been under way for several weeks and will soon be completed. In addition to erecting a new engine house at the Dunn, the company will also build a new change house for the men and put up a new steel headframe.

MINNESOTA

Cuyuna Range

Armour No. 2 Begins Stockpiling—Transfer of Hopkins Expected

Ironton—The Armour No. 2 mine, operated by the Inland Steel Co., has completed its season's shipments and has begun stockpiling. This property, one of the largest on the range, had the advantage of an early start, three boatloads of Armour ore having reached the lower lakes in May, and is the first to complete its schedule. Most of the Cuyuna Range properties are somewhat behind schedule at this time owing to the delay in boat and car service during the summer.

Irondale Township—The Hopkins mine, located on the NW¼ of SE¼ of Section 3, is expected to pass into the hands of new operators soon. This property was leased to the E. N. Breitung Ore Co. in 1915 and was opened and developed by them as an underground mine. A 3-compartment shaft was sunk to a depth of 171 ft. and development work proved up about 475,000 tons of available iron ore and manganiferous iron ore. In 1918 the operators shipped 37,257 tons of manganiferous ore and in 1919 loaded their stockpile of 5,849 tons. The mine has been idle since the winter of 1918-19.

ALABAMA

Quest for New Ore in State Continues—Prospecting for Gold in Clay County

Birmingham—Satisfied that there is considerable iron ore in Alabama that has not heretofore been considered, engineers and geologists are at work prospecting, mainly in the Birmingham district. The Sloss-Sheffield Steel & Iron Co. has been core drilling on the southern end of Red Mountain, near Parkwood, on the main line of the Louisville & Nashville. This will be a deep mining project if operation be decided upon. The same company has been prospecting on the upper end of the mountain also, not far from what is known as the Ruffner mines in the vicinity of Trussville. This is another deep mining proposition.

The Gulf States Steel Co., after three or four years of development work at the Shannon mines, expects to be obtaining a good supply of ore by Jan. 1. It has been stated that when the Shannon mines are in full operation the company will not only have a visible supply of ore for its own use for years to come but will be able to go on the open market with some of its ore. Smaller mines now supplying the Gulf States will be given up when the Shannon mines are producing as anticipated.

The Tennessee Coal, Iron & R.R. Co. has done some drilling and private parties are now dickering for acreage, on which boring has shown good ore, near the Parkwood property of the Sloss-Sheffield company. Brown ore mines at Cave Springs, Ga., on the northeastern Alabama-Georgia boundary are being operated and the ore is being hauled by trucks to a point of consumption. Other negotiations are on in the state in further prosecution of ore development.

The Woodward Iron Co. reiterates that the shaft sunk to ore during the last 12 months, some distance from its mines on Red Mountain, will be held in reserve until more ore is needed.

Clay County—Prospecting for gold in Clay County, Ala., is again under way, Louisville people being interested, and there is some talk of erecting a mill. The Kentuckians are asking for no financial assistance and appear to be well equipped in that respect to handle the project, which is being done quietly and effectively. For some years prospecting for gold has been under way in the eastern part of Alabama but the results have been encouraging.

THE MARKET REPORT

Daily Prices of Metals in New York

Oct.	Copper	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L	St. L
7	17.10	40.50	42.25@42.50	7.20@7.25	7.20@7.30	7.35
8	17.10	40.50	42.25@42.50	7.15	7.15	7.25@7.30
9	16.85	40.50	42.00@42.25	7.15	7.15	7.25@7.30
11	16.75	40.25	41.00@42.00	7.10	7.10@7.20	7.25
12	.....	.....	.....	.....	.....	.....
13	16.50	39.25	39.75@40.00	7.00@7.10	7.00@7.20	7.25

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point. All prices are in cents per pound.

Copper is commonly sold on terms "delivered," which means that the seller pays the freight from refinery to buyer's destination. The delivery cost varies, and it would be confusing to figure net prices on individual transactions. Consequently, an average deduction of 0.15c. is made from the "delivered" price to arrive at the New York price. When copper is sold f.o.b. or f.a.s. New York, of course no deduction is made.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electro-						
	Spot	3 M	lytic	Spot	3 M	Spot	3 M	Spot	3 M
7	98½	98	112	267	272½	34⅜	34½	40⅞	41⅞
8	98	97	110	266	270⅛	34⅜	34¼	40⅝	41⅜
9	....	....	...	...	....	....	....	...	...
11	96½	95½	109	263¾	269	34⅜	34½	40½	41⅞
12	95	94	109	259	263½	34⅛	34⅜	40⅛	41⅜
13	96½	94½	108	256	260¾	34⅛	34	40	41⅛

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Oct.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
7	349	99½	87	56⅛	11	349½	99½	83	53⅜
8	350	99½	87½	56⅛	12	....	...	..	54⅛
9	350½	99½	85⅜	54⅞	13	348½	99½	87	56⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

On the authority of the Secretary of the Treasury, we quote 100c. per oz. for silver, 1,000 fine, delivered at the option of the Director of the Mint to the New York Assay Office or to the mints in Philadelphia, Denver, or San Francisco, and proved to the satisfaction of the Treasury Department to have been mined, smelted, and refined in the United States. This quotation is retroactive to May 13.

Metal Markets

New York, Oct. 13, 1920

The metal markets record another week of trade dullness. All the major metals remain comparatively inactive, and the sales reported are relatively small. The importance of general financial and economic conditions is especially pronounced in the metal trade, and the effect of strained credit is forcing many producers to create a market at a loss, and as consumers, for similar reasons, are not overly anxious to participate in the market, the tendency is still downward. The market is evidently seeking a new level from which trading can be resumed with confidence by both producer and consumer. The London market in copper and tin took a decided slump during the week, whereas the market for lead and zinc remained at substantially the same level.

Copper

The downward trend of last week has continued. Large producers are no longer holding aloof and are entering into the market at prices representative of the lower level. Large quantities can be bought today at 17c. or less delivered, and it seems as if the copper-consuming industry is attempting to close the year with as small a copper stock inventory as possible. Price concessions have not reached a level which has induced much business, bearing out the impression prevalent in the trade. The summer and fall seasons for construction work are closing, and the demand for copper products is slackening, which partly accounts for the lack of interest in the market. The low price at which the red metal can be obtained is creating a low level for the year and making it increasingly difficult for some producers to operate. There is little interest in futures.

Lead

The official A. S. & R. price remains at 7.75c., N. Y., which is a wide deviation from the general market. There have been few inquiries in the lead market, and the dullness noted last week still prevails. This respite from the recent pronounced activity in the market is enabling producers to complete their unfilled orders and contract deliveries that have long been delayed. Consumers are buying only small quantities and manifesting little interest in the market. The metal can be obtained at practically the same price in both the New York and St. Louis markets. Quotations in the Western market are nominal, and there is little interest in futures.

Zinc

There has been a further decline in the market in spite of a statistical position that is inherently good. The demoralization of the automobile trade is looked upon as of benefit to the zinc trade, in that it will deflect black sheets used by the automobile factories to the galvanizing trade, which has hitherto felt a shortage in supply. On the other hand, there is the unchanged European situation, the foreign-exchange question, and the determination of European nations such as Germany (which was formerly a large zinc-consuming country) to market all available supplies of the metal in order to realize cash. These tactics on their part have acted and are acting as a depressing influence on the domestic market. Interest in futures is largely nominal.

Tin

The effect of the slump in the London price of tin amounting to about £11 for the week has practically killed all interest in a dull market. Supplies of tin are still being liquidated.

Straits tin for future delivery: Oct. 7th, 43.25@43.50; Oct. 8th, 43.50@43.75; Oct. 9th, 42.75@43.25; Oct. 11th, 42.75@43.00; Oct. 13th, 41@41.25.

Arrivals of tin in long tons: Oct. 5th, Penang, 125; 8th, Hongkong, 5.

Silver

The cessation of the sale of Reverse Council Bills in India previously reported has had a weakening effect on Indian exchange, which in turn has had an influence in the lower price of silver. Exchange rates on China have also continued to fall, so that support from China banks at higher prices has been lacking, although buying from that quarter continued moderately.

The result has been a continued fall in the price of silver to 53⅜d. in London on Oct. 11 and on the same day in New York to 83c., which is the lowest figure since June 16. At these low rates, however, it is reported that speculative buying has developed in London, with a resultant sharp advance to 54¼d. and 56¼d. on the 12th and 13th respectively. The New York market has also risen in sympathy.

Mexican Dollars—Oct. 7th, 66½; 8th, 66⅜; 9th, 65½; 11th, 63½; 13th, 66⅜.

Gold

Gold in London on Oct. 7th, 117s. 3d.; Oct. 8th, 117s.; Oct. 11th, 117s. 3d.; Oct. 12th, 117s. 6d.; Oct. 13th, 117s. 6d.

Foreign Exchange

The European exchange market has generally been steady, but slightly downward for the week, with no pronounced fluctuations. On Monday, Oct. 11th, francs were 6.58c.; lire, 4.01c.; marks, 1.52c.; New York funds in Montreal, 8.4 per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 35c.; 98@99 per cent, 34.8c. Virgin metal still obtainable in open market at about 32.5c. for 98@99 grade.

Antimony—Spot metal, 7c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 7½@7¾c. W. C. C. brand, 8¼@9c. Chinese needle antimony, lump, firm at 7@7½c. per lb. Standard powdered needle antimony (200 mesh), 9¼c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $400@$450 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum** Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$100 per oz.

Platinum—Firm at $105 per oz.

Quicksilver—Market quiet; $72 per 75-lb. flask. San Francisco wires $72.50 @$75. Market weak.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Bauxite—About 52 per cent alumina content, less than 2 per cent iron oxide, up to 20 per cent silica and artificially dried to contain not more than 4 per cent free moisture, $10 per gross ton at mine; 54 per cent alumina and about 15 per cent silica, $11; averaging 57 per cent alumina, 8 to 12 per cent silica, less than 3 per cent iron oxide, $13 on basis of 8 per cent free moisture.

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 75@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore—60@70c. per unit, seaport; [1]chemical ore (MnO_2) $70@$90 per gross ton, lump; $80@$100 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 70@75c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.50@$5, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $70 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 9—Zinc blende, per ton, high, $46.50; basis 60 per cent zinc, premium $41; Prime Western, $40@$37.50; fines and slimes, $37.50@$35; calamine, basis 40 per cent zinc, $32@$30. Average settling prices: Blende, $44.86; calamine, $36; all zinc ores, $44.49.

Lead, high, $97.90; basis 80 per cent lead, $75. Average settling prices, all grades of lead, $93.53 per ton.

Shipments for the week: Blende 10,120; calamine 343; lead 2,205 tons. Value, all ores for the week, $672,760.

The labor situation at the Arkansas smelters is unchanged, with negotiations still pending. Fire at Henryetta consumed the Victor Metal company's roaster, putting that company out of smelting for three weeks. Production at the mines continues strong, with buying declined to around 9,000 tons per week. Several buyers offered only $37.50 basis this week and over 500 tons were purchased on that basis. Aside from 500 tons purchased Monday, reported as last week's purchase on $42.50 basis, the bulk of blende sold on $40 basis.

No further decline was made in offerings on lead ore.

Platteville, Wis., Oct. 9—Blende, basis 60 per cent zinc, $45 base for high grade; lead ore, basis 80 per cent lead, $75 per ton. Shipments for the week: Blende, 1,099; lead, 4,398; sulphur ore, 43 tons. Shipments for the year: Blende, 53,701; calamine, 2,459; lead, 4,398; sulphur ore, 1,284 tons. Shipped during the week to separating plants, 2,052 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $12 per gross ton; ground (white) $23@$25; ground (off color) $16@$19 per net ton, f.o.b. Cartersville, Ga. Crude, 88 to 94 per cent, $23; ground (white) $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, not less than 98 per cent, $11@$11.25 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—Domestic, extra light, 5@6c. per lb.; light, 4½@5½c.; heavy, 4@5c; English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30@$35, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content. In Ceylon, some of the largest producers have closed their mines until prices advance to meet increased production costs, and stocks at Colombo were lowered only 3,000 tons in the first five months of 1920. Surplus stocks on Jan. 1 amounted to 20,000 tons.

Gravel—No analysis guarantee, f.o.b. Roseview, Ill., $25 per ton; gravel suitable for acid, chemical or enameling purposes, $60.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses. Tennessee production sold up months ahead.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines. F.o.b. Wausau, Wis., the price is $16 per ton in car lots, and $22 in less quantities, including bags.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery. $170@$180, freight allowed; last half, $170; English, $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $82.50@$85, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten—70 to 80 per cent W, 90c.@$1.05 per lb. of contained tungsten, f.o.b. works.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8.50 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 29½c. per lb.; wire, 22½@23c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver—Unchanged at 39½c per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 26¾c.; sheathing, 25¾c.; rods, ⅜ to 3 in., 23¾c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Clay—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Oct. 12, 1920

Production of steel ingots in September was at the same rate as obtained in August, about 42,700,000 tons per annum. Physical conditions affecting steel production had improved and the failure of production to increase confirms recent reports of some mills slackening their operation on account of cancellations of orders and suspensions of deliveries. The individual mill prefers to do this rather than cut prices in a search for additional business, since the cutting of prices tends to jeopardize the contract business on books.

Pig Iron—Quotable prices on pig iron decline only as purchases are made, fixing new levels, and purchases are rare. Following the decline shown in Valley foundry by a small sale, from $50 to $47, Valley, a sale of 3,000 tons of Valley basic is reported, at $45, furnace, setting the market quotation at this figure against $48.50 formerly quoted. Bessemer remains nominally quotable at $48.50, Valley. Freight to Pittsburgh is $1.96.

Steel—Steel mills call the market $60 for billets and $65 for sheet bars, but these figures have not been tested lately, and a firm bid at $5 less might result in a sale.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16.50@$17; foundry, $18.

Market for Phosphate Rock

Production Confined to the South, in Florida And Tennessee — Export Trade Particularly Heavy

PHOSPHATE ROCK, used principally by the fertilizer trade, is mined in Florida, Tennessee, and to a limited extent in Idaho and South Carolina. In Florida, which is the chief center of production, there are two kinds of rock—Florida land pebbles and hard rock. The pebbles vary in size from grains up to "fists," are found in a matrix of sand or clay, and are recovered by placer mining. After being washed down, they are picked up by pumps and sent direct to a washer, which removes all extraneous matter except 6 or 7 per cent—insolubles. The pebbles amount to about 20 per cent of the material mined, and are 68 to 79 per cent tricalcium phosphate. They are found chiefly in Polk County, about forty-five miles west of Tampa. The mines produce from 150 to 3,000 tons each per day.

The hard rock is found about 100 miles north of the pebble fields, in Florida, and is mined by dipper dredges. Production at the various properties averages fifty tons per day. The rock is of higher grade than the pebbles, running from 77 to 89 per cent tricalcium phosphate.

Production of Tennessee

Tennessee produces two kinds of rock—brown Tennessee lump, which looks like brown sandstone but is softer, disintegrating easily, and blue rock, which is hard and dense and of a slate blue. The blue rock occurs in veins two to three ft. thick, and shows 70 to 72 per cent tricalcium phosphate, against 72 to 78 for the brown lump. Both grades are recovered by steam shovel or by pick and shovel. Present demand and high prices make this work profitable, but in normal times the cost is too great to encourage production.

Deposits of phosphate rock have been found in Idaho and neighboring states, but have not been developed importantly as yet. The tonnage from South Carolina also is negligible.

Algiers and Tunis produce a pebble running about 56 per cent tricalcium phosphate. There are deposits also in France and Belgium which supply the home consumption.

Fertilizer Makers Principal Buyers

Perhaps 95 per cent of the demand for phosphate rock is from fertilizer manufacturers, the rest going to the chemical trade, baking-powder manufacturers, and for minor uses generally. The demand from the fertilizer makers extends from October until February, when the manufacturing and shipping season opens.

The principal nations importing from the United States are the United Kingdom, the Scandinavian countries, Holland and Spain. Previous to the war Germany was the leading foreign buyer, but that country has not entered the market since. The foreign demand is particularly heavy at the present time.

The market is very strong. The Tennessee product is sold up months ahead, and much the same situation exists in Florida. The recent car shortage was acute in Florida, seriously interfering with shipments, which, however, are now going forward.

Producers Market Own Product

Most of the business in phosphate rock is carried on directly between the producers and the fertilizer manufacturers. Of course, some tonnage is handled through brokers in fertilizer materials, but for the most part producers market their own product. A thousand tons is considered a small sale, the usual contract being for 2,000 tons and up, on ninety days to a year. A fertilizer plant producing 12,000 to 15,000 tons of acid phosphate per season is rated small. Acid phosphate, sometimes called superphosphate, is made of about equal parts of 50-deg. sulphuric acid and phosphate rock.

Discoverers of new phosphate rock deposits in Tennessee might be able to mine and market the rock themselves under the present favorable conditions. In Florida, however, the situation is different. There a power plant costing $2,000,000 or more is required for commercial operation, with electric-driven mining outfit, dredging pumps, and motors for the mills. The discoverer of a new deposit in Florida would ordinarily try to interest one of the ten or twelve large operators by making test borings and submitting samples for analysis.

Phosphate Production in the Society Islands

Phosphate is the only mineral produced in or exported from the Society Islands, according to Consul Howard F. Withey, in *Commerce Reports*. It is produced and exported by one company, the Compagnie Francaise des Phosphates, a French corporation with head offices in Paris, and with a capital stock formerly of 6,000,000 fr., all French owned, except for a relatively small amount held in Tahiti. The capital stock is now 11,000,000 fr. This concern, organized in 1908, has the exclusive mineral rights of the Island of Makatea, which is about 120 miles north of Tahiti and has an area of roughly 1,200 acres. Two piers about 300 meters long, a part of which length however is on shore, have been constructed. Mooring buoys and lighters are used by the loading vessels.

The phosphate, as exported, is virtually the soil itself, which is dug with pick and shovel and loaded on cars on a short narrow gauge railway and drawn to the works, where it is put through crushing and drying processes. It is sold on a moisture percentage basis. After going through the drying process the product is stored in bins awaiting shipment. Most of the machinery used is of French manufacture.

At the present time nearly all the phosphate is exported to New Zealand. Before the war much of it went to San Francisco, some to Europe, particularly France, and a considerable quantity to Honolulu. It is expected that in the future the product will recover the markets of the prewar period.

The phosphate soil shipped runs about 80 per cent phosphate, according to the statement of the manager of the company. Before the war the annual production was from 80,000 to 90,000 metric tons. In 1919 the production was approximately 40,000 metric tons, and it is reasonable to expect that the production will rapidly increase.

The great difficulty encountered in this enterprise, as in all enterprises in this colony, is the difficulty of procuring suitable labor. At present the company employs about 500 workmen and employees, many of whom are Japanese. The French government recently enacted a decree providing for the importation of foreign labor and fixing the conditions of such importation. It remains to be seen whether it will prove profitable to import such labor under the conditions prescribed, but the probabilities are that it will, at least for the phosphate company.

Latest Rand Gold Production

During August, the gold production of the Rand, in South Africa, amounted to 702,083 oz., a decrease in output from the July figure, 736,099 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917-1920

(Fine Ounces)

	1920	1919	1918	1917
January	670,503	676,059	714,182	782,634
February	625,330	636,728	659,750	721,321
March	707,036	712,379	696,281	787,094
April	686,979	694,944	717,099	742,778
May	699,041	724,995	741,217	729,385
June	715,957	702,379	727,696	759,724
July	736,099	725,497	736,199	757,890
August	702,083	706,669	740,210	756,658
September		698,558	708,206	738,231
October		723,722	679,764	751,290
November		677,970	658,701	722,839
December		650,191	641,245	722,419

COMPANY REPORTS

American Smelting & Refining Co's. Earnings Increase

The report of the American Smelting & Refining Co. for the six months ending June 30, 1920, shows a decided improvement over a similar period in 1919. The net income for the six months, after deducting depreciation, ore depletion and bond interest, aggregated $4,030,840.88. Preferred-stock dividends aggregating $2,115,417 were declared. Dividends upon the common stock, on the basis of 1 per cent quarterly, have been declared, aggregating $1,219,960.

The six months in question show a profit, over and above dividends and bond interest, of $695,463.88, as against a deficit for the corresponding period of last year of $1,195,463.84, or a net betterment of $1,890,927.72. The earnings for the last six months of last year, over and above the same dividends and bond interest, amounted to $109,806.16. The earnings of the first six months of this year, therefore, were better than the last six months of last year to the extent of $585,657.72. The increased earnings have been due to the better conditions of the Mexican operations, the increased volume of business in the United States, and to increased treatment charges on many ores, more nearly comparable with our present costs. There are still some old, long-time contracts which are unsatisfactory.

The usual charge has been made to the profit-and-loss account for depreciation and depletion of ore reserves, and provision has been made for the estimated Federal income taxes for the period.

Mexico is now experiencing the general increases in wages and other costs which have been so prevalent in the United States during the last few years. The company is, however, glad to note that the prospects of a stable government in that country look brighter at present than at any period since the revolution of 1912. It is believed that at last a steady operation of Mexican properties is reasonably certain. Incidentally, it may be remarked that the military activities attending the end of the Carranza government commandeered most of the railroad equipment owned by the company, with consequent disruption of service and loss of earnings for a considerable period. The equipment has now been restored, and railroad conditions are as good as can be expected.

A statement summarizing operations follows:

SUMMARY OF CONSOLIDATED INCOME AND PROFIT AND LOSS, AMERICAN SMELTING & REFINING CO.

	Six Months Ended June 30, 1920	Six Months Ended June 30, 1919	Comparison
Net earnings of smelting and refining plants and industries immediately dependent thereon	$6,678,412 10	$5,285,698 03	Inc. $1,392,714 07
Net earnings from mining properties	2,070,773 12	428,080 65	Inc. 1,642,692 47
Total net earnings of operating properties	$8,749,185 22	$5,713,778 68	Inc $3,035,406 54
Other income—net:			
Interest, rents, dividends received, commissions, etc	941,902 11	307,904 85	Inc. 633,997 26
Gross income	$9,691,087 33	$6,021,683 53	Inc $3,669,403 80
Charges against gross income:			
Administrative expenses	605,347 17	481,995 46	Inc 183,351 71
Research and examination expenses	49,681 41	40,695 40	Inc. 8,986 01
Corporate taxes (including estimated Federal taxes)	502,771 47	412,354 99	Inc. 90,416 48
Interest on American Smelting & Refining Co. 5 per cent first mortgage bonds, outstanding with public	795,187 47	796,792 50	Dec. 1,605 03
Interest on Rosita Coal & Coke Co. 6 per cent collateral trust bonds, outstanding with public	39,070 00		Inc. 39,070 00
Depreciation and depletion of ore reserves	2,788,653 07	2,140,685 52	Inc 647,967 55
Miscellaneous profit-and-loss adjustment	819,535 80		Inc 819,535 80
Total charges	$5,660,246 45	$3,872,523 87	Inc $1,787,722 58
Net income for six months	$4,030,840 88	2,149,159 66	Inc. 1,881,681 22
Less dividends:			
On preferred stocks:			
American Smelting & Refining Co	1,750,000 00	1,750,000 00	
American Smelters Securities Co., Preferred "A"	287,982 00	292,140 00	Dec 4,158 00
American Smelters Securities Co., Preferred "B"	77,435 00	82,517 50	Dec 5,082 50
Total preferred stocks	$2,115,417 00	$2,124,663 50	Dec $9,246 50
On American Smelting & Refining Co., common stock	1,219,960 00	1,219,960 00	
Total dividends	$3,335,377 00	$3,344,623 50	Dec $9,246 50
Income transferred to profit-and-loss surplus	695,463 88	1,195,453 84(a)	Inc 1,890,927 72
Profit-and-loss surplus at beginning of year	25,974,571 20	27,060,228 88	Dec 1,085,657 68
Total	$26,670,035 08	$25,864,765 04	Inc $805,270 04

(a) Deficit.

Tonopah Belmont Development Co.

Gold, Silver; Nevada

The Tonopah Belmont Development Co. has issued the following statement covering operations for the quarter ending June 30, 1920:

OPERATING RESULTS

Received and receivable for ore	$384,594 12
Mining, milling and administration expenses	302,967 12
Net earnings for three months	$81,627 00
Miscellaneous income	7,433 32
Total net income for three months ended June 30, 1920	$89,060 32

AVAILABLE RESOURCES, JUNE 30, 1920

Due from smelters	$198,791 46
Due from others	13,324 83
Liberty bonds	22,250 00
Loans on collateral	50,000 00
Cash in banks	48,478 17
Total	$332,844 46

The net earnings for the quarter ended June 30, 1920, of the Belmont Surf Inlet Mines, Ltd., of which stock this company owns 80 per cent, were $77,535.28.

Output of Mexican Mines

Statistics showing the production of metals in Mexico from 1916 to September, 1919, have been published in "Iniciativa de la Ley de Ingresos" for the fiscal year 1920. The following table, taken from the publication mentioned, gives the production of 1916, 1917, 1918, and 1919 (January to September), quantities being stated in kilos of 2.204 lb. each:

Metals	1916 Kilos	1917 Kilos	1918 Kilos	1919 Kilos
Gold	11,748	23,543	25,313	22,944
Silver	926,142	1,306,988	1,944,542	1,949,673
Copper	28,411,248	50,985,923	70,223,454	50,893,612
Lead	19,970,986	64,124,752	98,837,154	67,378,353
Zinc	37,449,226	14,757,333	20,698,995	8,665,413
Antimony	828,767	2,646,544	3,268,546	627,704
Tin	292	9,214	13,537	2,117
Tungsten	12,250	187,637	140,485	29,292
Molybdenum			27,371	2,356
Manganese		73,387	2,878,383	2,849,979
Mercury		33,132	163,598	113,865
Arsenic		1,284,820	1,881,011	2,188,333
Amorphous graphite	470,343	420,046	6,190,819	5,011,619

MINING STOCKS

Week Ended October 9, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*65	*65	*65		
Ahmeek	Boston	56	55	56	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb	⅜		⅜		
Allouez	Boston	24	23¼	23¼	Mar. '19,	1.00
Anaconda	N. Y.	53½	51¾	51¾	Aug. '20, Q	1.00
Ariz. Com'l	Boston	9	9	9	Oct. '18,	.50
Big Ledge	N. Y. Curb	7/16		7/16		
Bingham Mines	Boston	9¼	9	9¼	Sept. '19, Q	.25
Calumet & Ariz.	Boston	56½	55½	56	Sept. '20, Q	1.00
Calumet & Hecla	Boston	285	275	275	June '20, Q	5.00
Canada Copper	N. Y. Curb			⅛		
Centennial	Boston			9¼	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	42	39	39½	Sept. '20, Q	1.00
Chief Consol.	Boston Curb	3½	3¼	3¼	Feb. '20, Q	.10
Chile Copper	N. Y.	14¼	13⅞	14		
Chino	N. Y.	27¼	26¼	26½	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake			*37½		
Con. Ariz.	N. Y. Curb			¼	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	*65	*61	*61		
Copper Range	Boston	35	33	34¾	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*38	*33	*34		
Davis-Daly	Boston	7¾	7½	7½	Mar. '20, Q	.25
East Butte	Boston	10½	10	10	Dec. '19, A	.50
First Nat'l	Boston Curb	*85	*80	*80	Feb. '19, SA	.15
Frankl'n	Boston	2 1/16	2	2 1/16		
Gadsden Copper	N. Y. Curb			*70		
Granby Consol.	N. Y.	34¾	34¼	34¼	May '19, Q	1.25
Greene Cananea	N. Y.	28¼	27⅛	27⅛	Aug. '20, Q	.50
Hancock	Boston	4	4	4		
Houghton	Boston Curb			*40		
Howe Sound	N. Y. Curb	3¾	3½	3½	July '20, Q	.05
Inspiration Con.	N. Y.	46⅝	44⅜	44½	July '20, Q	1.00
Iron Cap	Boston Curb	8⅛	8	8⅛	Sept. '20, K	.25
Isle Royale	Boston	26	25½	26	Sept. '19, SA	.50
Kennecott	N. Y.	25	23¼	23½	Sept. '20, Q	.50
Keweenaw	Boston			1¾		
Lake Copper	Boston	3	2⅞	3		
La Salle	Boston			2½		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb			17	Jan. '19, Q	.50
Majestic	Boston Curb	*12	*12	*12		
Mason Valley	Boston	1⅜	1¼	1⅜		
Mass. Con.	Boston	2⅜	2⅛	2⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅜	5¼	5¼		
Miami	N. Y.	19⅞	19¼	19½	Aug. '20, Q	.50
Michigan	Boston	3⅜	3⅛	3⅛		
Mohawk	Boston	58	56	56	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb	5⅞	5⅛	5⅞		
Nevada Con.	N. Y.	11⅞	11¼	11⅜	Sept. '20, Q	.25
New Arcadian	Boston			2⅜		
New Baltic	Boston Curb			3		
New Cornelia	Boston	18⅜	18	18⅛	Aug. '20,	.25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	15⅞	14¾	14¾	Oct. '18, Q	.25
North Lake	Boston			⅛		
Ohio Copper	N. Y. Curb			3/16		
Oiibway	Boston			1¼		
Old Dominion	Boston	23⅜	23	23	Dec. '18, Q	1.00
Osceola	Boston	36⅜	35	35	June '20, Q	.50
Phelps Dodge	Open Mar.	†190	†170		July '20, Q	2.50
Quincy	Boston	45	44½	45	Sept. '20, Q	1.00
Ray Con.	N. Y.	15⅛	14⅛	14⅜	June '20, Q	.25
Ray Hercules	Boston Curb			*50		
St. Mary's M. L.	Boston	37	35	35	June '20, K	2.00
Seneca	Boston	16	15	15		
Shannon	Boston	1⅛	1 1/16	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	8⅜	8⅛	8⅛	Jan. '20 Q	.25
South Lake	Boston	2	2	2		
South Utah	Boston	*16	*10	*10		
Superior	Boston			4⅜	Apr. '17,	1.00
Superior & Boston	Boston	3⅛	3	3		
Tenn. C. & C.	N. Y.	9⅞	9⅜	9¾	May '18, I	1.00
Tuolumne	Boston	*51	*50	*50	May '13,	.10
United Verde Ex.	Boston Curb	31	30⅜	30⅜	Aug. '20, Q	.50
Utah Con.	Boston	6⅜	6⅛	6⅜	Sept. '18,	.25
Utah Copper	N. Y.	63⅛	59⅛	59⅜	Sept. '20, Q	1.50
Utah M. & T.	Boston	1⅜	1⅛	1⅜	Dec. '17,	.30
Victoria	Boston			1⅜		
Winona	Boston	*50	*35	*50		
Wolverine	Boston	13⅛	13	13	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	4 1/16	4 1/16	4 1/16	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14⅛	14	14	Sept '20, QX	.50
Stewart	Boston Curb			*13	Dec. '15,	.05
Utah Apex	Boston	2⅛	2	2⅛	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	12	11⅞	11⅞	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	46	45	45	Aug. '20, Q	1.50
Butte C. & Z.	N. Y.	7⅛	6⅞	6⅞	June '18, I	.50
Butte & Superior	N. Y.	19⅜	16⅞	17	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	10⅛	9⅛	9¼	June '20, Q	.50
New Jersey Z.	N. Y. Curb	178	175	176	Aug. '20, Q	4.00
Success	N. Y. Curb	5	4	4⅛	July '16,	.03
Yellow Pine	Los Angeles			*95	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛		
Alaska Juneau	N. Y.	2⅛	1⅛	2		
Carson Hill	N. Y. Curb	23⅛	23⅛	23⅛		
Cresson Consol. G.	N. Y. Curb	1	⅞	1	June '20, Q	.10
Dome Ex.	Toronto					
Dome Mines	N. Y.	11⅞	11⅝	11⅝	July '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb	*9	*7	*8	Dec. '19,	.05
Hedley	Boston			4½	June '19,	.10
Hollinger Con.	Toronto	5.75	5.65	5.70	Sept. '20, X	.05
Homestake	N. Y.	47	46	47	Sept. '19,	.50
Kirkland Lake	Toronto	*49	*49	*49		
Lake Shore	Toronto	1.10	1.10	1.10	Oct. '19,	.02½
McIntyre-Porcupine	Toronto	2.06	2.02	2.04	Sept '20, K	.05
Porcupine Crown	Toronto	*29	*29	*29	July '17,	.03
Portland	Colo. Sprgs.	‡		*60	July '20, Q	.01½
Reorgan. Booth	N. Y. Curb	5½	4½	5	May '19,	.05
Silver Pick	N. Y. Curb	*6	*4	*4½		
Teck Hughes	Toronto	*8½	*8	*8½		
Tom Reed	Los Angeles	1.30	1.00	1.20	Dec. '19,	.02
United Eastern	N. Y. Curb	3½	2⅞	2⅞	Apr. '20, Q	.21
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome Consol	Toronto	*6½	*6½	*6½		
White Caps Min.	N. Y. Curb	*8	*7	*7½		
Yukon Gold	Boston Curb			1½	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*35	*18	*21	Apr '20, M	.03
Beaver Con.	Toronto	*40	*38	*38½	May '20, K	.03
Coniagas	Toronto		†2.50	2.55	Aug '20, Q	.12½
Crown Reserve	Toronto	*29	*27	*27	Jan. '17,	.05
Kerr Lake	Boston	3¼	3⅛	3⅛	Sept. '19,	1.00
La Rose	Toronto	*32	*32	*32	Apr '18,	.02
McKinley-Dar.	Toronto	*51	*51	*51	July '20, Q	.03
Mining Corp.	Toronto	1.65	1.63	1.64	Sept '20, Q	.12½
Nipissing	N. Y. Curb	9	8½	9	July '20, Q	.25
Ontario Silver	N. Y.	5⅛	5⅛	5⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	⅛		⅛	Jan. '12,	.10
Peterson Lake	Toronto	*14½	*14½	*14½	Jan. '17,	.01½
Temiskaming	Toronto			*35½	Jan. '20, K	.04
Trethewey	Toronto	*26½	*24½	*25	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*2	*1	*1½		
Barnes-King	Butte	‡		1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb	*8½	*7½	*8		
El Salvador	N. Y. Curb	1	⅞	1		
Jim Butler	N. Y. Curb	*16	*14	*16	Aug '18, SA	.07
Jumbo Extension	N. Y. Curb	*9	*6	*6	June '16,	.05
Louisiana Con.	N. Y. Curb			7/16		
MacNamara M.	N. Y. Curb			¼	May '10,	.02½
N.Y. Hond. Rosar	Open Mar.	†12½	†11		July '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅛	1 1/16	1⅛	Jan '20, Q	.05
Tonopah-Divide	N. Y. Curb	1⅛	1⅛	1⅛		
Tonopah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	July '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅜	1⅛	1⅛	Oct. '19, SA	.15
West End Con.	N. Y. Curb	1 1/16	1	1⅛	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*18	*16	*16	July '20, M	.01
Consol. M. & S.	Montreal	25	24½	24½	July '20, Q	.62½
Salt Lake	Salt Lake	2.50	2.45	2.50	July '20, Q	.10
Daly-West	Boston	4⅜	4⅛	4⅛	Sept. '20, Q	.25
Eagle & Blue Bell	Boston Curb			2½	Apr. '20, Q	.10
Electric Point	Spokane	*10	*12	*12	May '20, SA	.03
Fed. M. & S.	N. Y.			12	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	33⅛	32	32	Sept. '20, Q	1.75
Florence Silver	Spokane			*25	Apr. '19,	.01½
Grand Central	Salt Lake			*37½	June '20, K	.03
Iron Blossom	N. Y. Curb	1/16	⅛	⅛	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake			3.97½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*17	*14	*15		
Prince Consol.	N. Y. Curb	⅜	⅛	⅜	Nov. '17,	.02½
Rambler-Cariboo	Spokane			*9	Feb '19,	.01
Rex Con.	N. Y. Curb	*6	*6	*6		
South Hecla	Salt Lake	*90	*88	*88	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb	⅞	3/16	3/16	Oct. '17,	.05
Tamarack-Custer	Spokane	2.30	2.30	2.30	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.07½	3.00	3.00	June '20, Q	.10
Wilbert	N. Y. Curb	*5	*4	*4½	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	19½	17⅞	17⅞	Mar. '19,	.50
Internat'l Nick.pf.	N. Y.	83	81⅛	81⅛	Aug. '20, Q	1.50
QUICKSILVER						
New Idria	Boston			5	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsto	Boston Curb	*10	*10	*10		
VANADIUM						
Vanadium Corp.	N. Y.	68⅜	68⅜	63½	July '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	103	94½	102½	July '20, Q	1.50
Asbestos Corp. pf.	Montreal	104	103	104	July '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	63⅜	59⅛	60	Sept '20, Q	1.00
Am. S. & R. pf.	N. Y.	92⅜	90⅛	92⅜	Sept '20, Q	1.75
Am. Sm. pf. A	N. Y.	73⅜	73⅛	73⅜	July '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	57⅜	55⅛	55⅛	July '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44	42⅛	42⅞	July '20, Q	87½

*Cents per share. †Bid or asked. ‡Quotations missing Q, Quarterly.
SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York — Current	New York — One Yr. Ago
No. 10	$3 55-7 50	7 09	7 13	8 65	$7 23- 8 00	4 57
No. 12	3 60-7 55	7 09	7.18	8 70	7 25- 8 05	4 57
No. 14	3 65-7 60	7 09	7.23	8 75	7.33- 8 10	4 67
No. 16	3 75-7 70	7.09	7.28	8.85	7.43- 8.20	4 77
Black:						
*Nos. 18 and 20	4 15-8 30	8 10	7 90	10 60	8.41- 9 80	5 30
*Nos. 22 and 24	4 20-8 35	8 10	7 95	10 65	8 46- 9.85	5 35
*No 26	4 25 8 40	8 10	8 00	10.70	8.51- 9 90	5 40
*No. 28	4.35-8.50	8.10	8.10	10.80	8.61-10.00	5 50
Galvanized:						
No. 10	4 70-8 50	9 60	8 60	....	8 91-11.50	6.20
No. 12	4 80-8 60	9 60	8 70	11.35	9 01-11 50	6 25
No. 14	4.80-8 60	9 60	8.70	11.35	9 01-11 60	6 30
Nos. 18 and 20	5 10-8 90	9 60	9 00	11 65	9 76 11 90	6.60
Nos. 22 and 24	5.25 9 05	9 60	9 15	11.80	9 41 12 05	6 75
*No. 26	5 40 9 20	9 60	9 30	11 95	9 56 12 20	6 90
*No. 28	5 70-9 50	9 60	9 60	12.25	9 86-12 50	7 20

* For painted corrugated sheets, add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets, add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh — Current	Pittsburgh — One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝ in. and larger	$4 00	$3.35	$3 40@$4.00	$5 34	$7.75
Track bolts	6 00 6 50	4 35	4 60@ 5 00		9.25
Standard section angle bars	3.00 4 00	3 00	2 75@ 3 40		5.45

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the $2.55 places named:

	Mill Pittsburgh	New York — Current	New York — 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2 456@$3 10	$4 58	$3 47	$4 04	$3 97
Channels, 3 to 15 in.	2 456@ 3 10	4.58	3 47	4 04	3 97
Angles, 3 to 6 in., ¼ in. thick.	2 456@ 3 10	4 58	3 47	4 04	3 97
Tees, 3 in. and larger	2 456@ 3 75	4 63	3 52	4 09	4 02
Plates	2 656@ 4 00	4.78	3.67	4.24	4.17

STEEL SHEET PILING—The following prices are base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4 00@ $5 00	$4 00@$5 00	$2 25

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York — Current	New York — One Yr. Ago	Warehouse — Chicago	Warehouse — St. Louis	Warehouse — San Francisco
½ in. and larger	$4.50	$6.00	$4.72	$5 73	$5.69	$7 05

CONE HEAD BOILER

½ in. and larger	4 60	7 10	4 82	5 83	5 79	7 15
⅝ and ¾	4 75	7 25	4 97	5 98	5 94	7 40
½ and ⅞	5.00	7 00	5.32	6 33	6.19	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

Chicago, +10% on galvanized, 22½ 2½% off on bright.
Western and California Territory:
20%, plow steel; 22½%, galv. iron rigging and guy rope.
Montana, Idaho and Arizona
15, plow steel, 27½, galv. iron rigging and guy rope.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight	$5 75	$8 15	$7 00	$7 00	$7 00
Assorted	5 85	8 40	7 15	7 15	7 25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh

Iron bars	Steel bars
$2 35@$4 00	$4 27@$4 50

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago	Denver
$0 10	$0 16½	$0 18	$0 11½	$0 15	$0 18

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@14c.	13c.	15c.	14½
Hollow	18c.	...	...	21c.

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galv.	Inches	Iron Black	Iron Galv.
⅜ to 3	45 to 57½	41½ to 44	⅜	15½ to 25½	+ 1½ to 11½
			½	19½ to 29½	1½ to 11½
			¾ to 1½	24½ to 34½	8 to 18½

LAP WELD

2	47 to 50½	34½ to 38	2	20½ to 28½	6½ to 14
2½ to 6	50 to 53½	37½ to 41	2½ to 6	22½ to 30½	9½ to 17½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

2 to 3	53 to 56½	40½ to 44	¾ to 1½	24½ to 34½	9½ to 19½

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	45 to 48½	33½ to 37	2	21½ to 29½	8½ to 16½
2½ to 4	48 to 51½	3½ to 40	2½ to 4	23½ to 31½	11½ to 31½
4½ to 6	47 to 50½	35½ to 39	4½ to 6	22½ to 30½	10½ to 18½
7 to 8	43 to 46½	29½ to 33	7 to 8	14 to 22½	2½ to 10½
9 to 12	38 to 41½	24½ to 28	9 to 12	9½ to 17½	5½ to+2½

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

Black	New York	Cleveland	Chicago
⅜ to 3 in. butt welded	40%	40%	40@ 54%
3½ to 6 in. lap welded	35%	42%	40@ 50%

Galvanized	New York	Cleveland	Chicago
⅜ to 3 in. butt welded	24%	31%	30 @ 40%
3½ to 6 in. lap welded	20%	27%	27½@ 37½%

Malleable fittings, Class B and C, from New York stock sell at list plus 23%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$6 00	$1 50	List	$2.25	+$1 15	$1.05
Hot pressed hexagon	+ 6 00	1 50	List	2 25	+ 1 15	.85
Cold punched square	+ 6 00	1 50	List	2 25	+ 1 15	1 00
Cold punched hexagon	+ 6 00	1 50	List	2 25	+ 1.15	1.00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50–10%
Chicago	50%	50%
Cleveland	50%	60–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+20%	25%	20%
Larger and longer up to 1 in. by 30 in.	+20%	25%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York	List	Cleveland	$2 50	Chicago	$3.00

For cast-iron washers the base price per 100 lb. is as follows:

New York	$7 00	Cleveland	$4 50	Chicago	$4.75

CONSTRUCTION MATERIALS

PREPARED ROOFING—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points:

	New York — 1-Ply c.l.	New York — 2-Ply l.c.l.	New York — 3-Ply c.l.	Philadelphia — 1-Ply c.l.	Philadelphia — 2-Ply l.c.l.	Philadelphia — 3-Ply c.l.
No. 1 grade	$2 50	$3 00	$3.55	$2 40	$2 90	$3 45
No. 2 grade	2 25	2 70	3.20	2.15	2 00	3 10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $4.25 per roll in carload lots and $4.50 for smaller quantities.

Shingles, red and green slate finish, cost $8.75 per square in carloads; $9.00 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq.ft.), per roll	$3 55
Tar pitch (in 400-lb. bbl.), per 100 lb	2 25
Asphalt pitch (in barrels), per ton	56 50
Asphalt felt (light), per ton	132 00
Asphalt felt (heavy), per ton	138 00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis	$0 1192	$0 2086	$0 3278
Seattle	13	175	30
Los Angeles	10	175	
Cincinnati	.125	.2180	.3280

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under			12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$73.00	$70 00	....	$65 00	$85 00	$75.00
Kansas City	51 00	51 25	$51.25	51.25	60 00	51 25
Seattle	....	32 00	.....	.....	....	32 00
New Orleans	49 00	....	.....	.....	55 00	....
Baltimore	70 00	....	.....	.....	80 00	....
Cincinnati	45 00	50 00	50 00	.....	55 00	55 00
Montreal	87 00	87.00	70.00	85.00	79 00*	110 00
Los Angeles†	....	57.00	.....	.....	....	59 00
Detroit	67.00	....	.....	.....	79.00	79 00
Denver	....	43.75	.....	.....	.....	44 75

	1-In. Rough, 10-In. x 16-Ft. and under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$110 00	$102 00	$52 00	$105 00	....
Kansas City	102 00	106 50	106 50	113 00	$112.75
Seattle	.....	32.50	....	....	38.50
New Orleans	....	42.00	.....	46 50	.....
Baltimore (box)	56@60	.....	.....	64@67	.....
Cincinnati	50 00	55 00	50 00	45 00	50 00
Montreal	80 00	80.00	70 00	85 00	85 00
Los Angeles	....	58.00	....	....	....
Detroit	50 00	....	49 00	44 00	....
Denver	....	39.75	....	....	40 25

*Montreal—Up to 22 ft.; over which, $3.00 per M. increase up to 30 ft.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	Denver	Chicago	San Francisco
Wire	$4 25	$5 40	$4 45	$6 45
Cut	.....	5 90	6@8	8 95

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago Without Bags
New York (delivered)	$4 10	$4 25	$2 30
Jersey City (delivered)	4 39	4 25	2 27
Chicago	2 35	2 35	2 00
Pittsburgh	2 42	2.20	2 05
Cleveland	2.73	2.73	2 32
Denver	3 25	3 80	2 67
Los Angeles	3 10	3 10	2 78
San Francisco	3.09	2.88	2.43

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$21 00	$20.00	$3 80*at plant	$3 60*
Kansas City	27 20	26.20	2 50	2 40
Chicago	....	....	....	1 65
St. Louis	25 00	21 00	.....	2 50
San Francisco	25 40	22 00	....	2 25
Minneapolis	29 50	23 00	2.00†	1.85†
Denver	32.00	....	1.05 (bu.)	.....

NOTE—Refund of 10c per barrel, with 25c per ton off on hydrated.
* 300-lb. barrels. †180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Curreot	Year Ago
Raw per barrel (5 bbl. lots)	$1.25	$2.15	$1 40	$2.37
5-gal. cans	1.40	2.30	1.65	2.57

1-gal. cans $1.45

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		One Year Ago		Current Dry and In Oil		1 Yr. Ago Dry and In Oil	
	Dry	In Oil	Dry	In Oil				
100-lb. kegs	15.50	17.00	13 00	14 50	15 50		13 00	
25- and 50-lb. kegs	15.75	17.25	13 25	14 75	15 75		13 25	
12½-lb. kegs	16 00	17.50	13 50	15 00	16 00		13 50	
5-lb. cans	18.50	20 00	15 00	16.50	18 50		15 00	
1-lb. cans	20.50	22.00	16.00	17.50	20 50		16 00	

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	50-Ft. Lengths
Underwriters' 2½ in.		$0 85 per ft.
Common, 2½-in.		30%

AIR

¼-in. per ft.	First Grade $0.60	Second Grade $0 40	Third Grade $0.30

STEAM—DISCOUNTS FROM LIST

First grade..... 20% Second grade.... 30% Third grade..... 45%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	25%	20%

RAWHIDE LACING—For cut, best grade, 25%, 2nd grade, 30%. For laces in sides, 79c. per sq.ft.; 2nd, 75c. For semi-tanned: cut, 40%; sides, 83c. per sq. ft.

MANILA ROPE—For rope smaller than ½-in. the price is ½ to $0 02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0 01. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜ in., 6; ½-in., 4½; ⅝-in., 1½-in., 2 ft. 10 in.; 1¾-in., 2 ft. 4 in. Following is price per pound for ¼ in. and larger, in 1200-ft. coils:

New York	29	Kansas City	$0.30½
Cincinnati	.35	Seattle	.28
Chicago	.27½	St. Louis	.26½
Minneapolis	.29½	Denver	.30
San Francisco	.27	Los Angeles	31

PACKING—Prices per pound

Rubber and duck for low-pressure steam	$1.00
Asbestos for high-pressure steam	1.70
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.70
Compressed asbestos sheet	.90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.30
Asbestos wick, ½- and 1-lb. balls	.85

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$2 00	$2 25
Chicago—Creosoted	2 25	2 50
San Francisco—Douglas fir, green	1 35	96
San Francisco—Douglas fir, creosoted	2 50	1 92

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0 80	No. 1	$0.60
No. 2	90	No. 2	.70
No. 3	1 00	No. 3	.80
No. 4	1 25		

FLOTATION OILS—Prices of oils for flotation, in ceots per gal. in bbls.:

	New York	Chicago In. Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp.gr. 0 93-0 94	$2 30	$1 90	$1 85
Pure destructively distilled pine oil	1.80	1 90	1 85
Pine tar oil, sp.gr. 1 025-1 035	.48	.38	.32
Crude turpentine, sp.gr 0 900-0 970	2 00	1.56	1.47
Hardwood creosote, sp.gr 0 96-0 99*	.35	.12	.10½

*F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11 00-15 50	13 00	16 00	11 00-14 00
Colored mixed	7 00-10.50	9 00-12 00	12 00	9 50-12 00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13
Cleveland	$55 00	$65 00
Chicago	41.00	43 53

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York		$0.3325	$0 3625	....	$2 30
Kansas City	$0 2475	.27	.30	.34	2 40
Seattle	18	.205	.225	.29½	2 60
Chicago	.2175	.2525	.2975	.34	2 45
Minneapolis	.2272	.2629	.2935	....	2 90
St. Louis	.25	.285	.315	.3575	2 60
Denver	.2250	.26	.29	.3325	2 80
Los Angeles	.22	.27	.31	....	2 95
Atlanta	.2575	.2975	.3225	.3650	2.55
Cincinnati	.2275	.2525	.2725	....	2 30
Montreal	.30	.32	.37	.38	4.10

CHEMICALS

SODIUM CYANIDE—New York price is 25@30c. per lb.; Chicago, 30c.; St. Louis, 34c.; Birmingham, 45c.; Denver, 40c

SODIUM SULPHIDE—New York price per pound is 9c.@10c. for concentrated, Chicago, 5c for concentrated, 3½c for crystals. Denver price is 6c. for crystals. St. Louis, concentrated 10½c., crystals 11c. Concentrated comes in 500-lb. drums; crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 11@12c. per lb.; Chicago 12½c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1.52

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union Single 25-Lb. Drums	Union 25-Lb. Ton Lots
East of the Mississippi, North of Chattanooga	$106 00	$101 00	$1 52	$1 49
Southeastern portion U. S. A.	115 50	110 50	1 63	1 60
Texas (except E. Paso)	124 00	119 00	1.74	1.71
El Paso, Texas	126 00	121 00	1 77	1 73
Denver, Col.	124 00	119 00	1.74	1 71
West Coast	129 00	124 00	1.81	1.77

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Engineering and Mining Journal

A Weekly Journal of the Mining and Mineral Industries
METALS NON-METALS PETROLEUM

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Volume 110 New York, October 23, 1920 *Number* 17

Gossip: How Wags the World?

THOSE mining men who are in remote districts may be interested in the bird's-eye views or impressions of those who are situated at the nerve centers of modern life.

Looking out over the world on a fine October morning, we perceive that the wild onrush of historical events which has characterized the last six years is still progressing. The war between Poland and Russia draws at least to a temporary close with the defeat of the Reds. It was a great war, with vast armies involved; yet on our stunned perceptions it has made little impression. Future historians will celebrate the turning back of the Reds by the Poles as like the stemming of the German tide by the Belgians, or the turning back of the Turks at Vienna in the Middle Ages.

The rest of Europe is in a ferment—political, social, commercial, financial. Germany is busily spreading propaganda calculated to release her from paying the bills for the calculated damage that she wrought during the years that she had the upper hand, and apparently is having some little success here and there. The French are presenting a firm front to the Teutonic propaganda, and, having aided in the victory of Poland, now continue the pressure on the Reds; while Lloyd George apparently is still trying to figure which way England will make the most money.

Foreign travelers tell us Americans and English are popular in Germany, the former for the deeds of mercy of the Quakers and others, the latter because of a prospective trade alliance; and the Americans are unpopular with all the Allies, who consider them cocky and stingy. The old rule still works: if you want to lose a friend, lend him money.

To call a nation "a nation of shopkeepers" used to be a reproach. Yet shop—commerce, trade, economics—has run away with all and sundry; and what shall we eat, and if we shall drink, and wherewithal shall we be clothed, is our chiefest if not our only thought; also, how we shall maintain ourselves in comfort against our neighbor's effort to do likewise against us.

The world in general has spent all its money and exhausted all its credit, and now is facing the inevitable bills, and the threat "No pay, no eat." Russia finds the paper-money game played out, and is starving, and Austria, having tested this banking device to an equal extreme, is in almost as bad a way. Germany is treading the same primrose path. What of the rest of Europe?

The United States is relatively rich and really very prosperous, but she, too, has to liquidate and make good on her inflated dollar. The world is in liquidation, and we must share. It is said that the Federal Reserve system will prevent our having a panic, but it will not prevent Europe having one, nor can it prevent our feeling it acutely if Europe slumps still further. Anyhow, we are engaged in the fundamentally necessary surgical operation of paying up—deflation.

The products of the mines and the mining industries go with the current, with wool, cotton, hides, wheat, automobiles and the rest. Europe cannot buy sufficiently to sustain business—her money is no good, and her credit is not sound. On a declining market the psychology is not to buy; therefore our own industries hold back. So the prices of metals slide downward, and no buying is attracted. Nobody wants a thing when it is cheap. Yet for a long view ahead this would be the time to buy and equip mines, and be ready for the upward swing which will come in time. Adjustment took a long time after the Civil War, but we do those things more swiftly these days.

The greatest step for the healing of the world would apparently be a sound constructive foreign policy on the part of the United States. This, of course, will not occur till after the new President is inaugurated, but it may be foreshadowed. Harding lost some votes on account of a careless presentation of his opposition to "the League," but his subsequent proclamation of his belief in "a league" helps. Indications are strongly for his election; and there is no doubt that the people favor "a league."

Altogether, while storms still rage, and the tempest has scarcely passed its height, the outlook for Old Mother World is better than for some time past—even with declining markets and metal prices.

Concrete Hearths for Roasting Furnaces

WE ARE glad to see that the information which we recently published in the Consultation section on concrete hearths has brought forth considerable discussion from those who have had experience in this form of furnace construction. We are publishing three of the letters this week. We originally stated that concrete furnace hearths had been generally found wanting, although we mentioned that they might have been a success at Great Falls. Mr. Wiggin then informed us that they did good service in the McDougall furnaces, but that brick had been used in the new Wedge furnaces. One of our readers, on hearing this, suggested that this looked like another exemplification of the old wheeze about the patient who died, although the operation was perfectly successful. W. W. Taylor, who superintended the construction of the Braden furnaces in Chile, says that concrete hearths were a failure there, although considerable care was taken in their construction. Possibly the proportions were wrong, inasmuch as 1 part of portland cement was mixed with 2½ parts of granulated slag. No sand was used, and we would have anticipated better results with *crushed* slag. Frank Corwin comes to the defense of concrete for this purpose, as we hoped that he would. Mr. Corwin was one

of the originators of this type of construction and a patentee, and will make a success of it at Humboldt if possible. Metallurgists will watch the results there with interest, for this type of construction, if it can be made to stand up, will permit a considerable reduction in the original cost of roasting furnaces and also lower repair charges.

Our Declining Foreign Commerce

IT TAKES only a boat trip across New York Harbor forcibly and visually to impress upon one the fact that increased imports are coming to the United States. A few days ago, on such a trip, we counted over fifty merchant and tramp steamers anchored in the harbor alone, with more vessels at berths alongside the many docks and piers constructed to receive them. In fact, it looked to us as if there were a little congestion in New York's great bay and that the anchorages almost interfered with the regular ferryboat traffic in the harbor lanes. Some of these ships, no doubt, recently brought part of the lead and zinc to this country that had such a profound effect in lowering the market for those metals, and all of them are factors in a sweeping world trade readjustment, which is being reflected in the nation's trade balance, as figures covering our foreign commerce indicate.

Without giving a dry statistical table, it may be stated that, compared with the year 1913, our preponderance of exports over imports in 1919 *increased almost six times*, for reasons plain to everyone. At the same time the trade balance of the large majority of other nations, chiefly the warring ones, fell sharply. France, to take one example, had an *adverse* trade balance in 1913 which was multiplied almost fourteen-fold in 1919. Such disparities cannot continue for an extended period, for in the long run all trade between countries becomes neutralized, or balances—no one is giving anything away for nothing. This phase of readjustment is progressing at this time, and it is for that reason that current export and import figures are of prime importance. Thus, the foreign-commerce figures for August, consisting of exports valued at $584,000,000 and imports at $519,000,000, indicate the smallest monthly excess of exports shown for several years and compare with average excess exports for the earlier months of this year of over $200,000,000.

The year 1919 was a banner one in regard to favorable trade balances, because of the unabated foreign demand for our raw materials, regardless of exchange and high prices immediately after the war, but the tide ebbs as well as flows, a change slowly but surely is setting in, reversing the flow, and consequently it would appear that our export balance in 1920 will be less than half of the 1919 figure.

Expressed in other words, we must be prepared to receive a larger number of European commodities, as Europe gradually progresses with reconstruction, and at the same time we must realize that our exports cannot continue on the exaggerated war and post-war scale. Agricultural and mineral producers may complain that a decline in the volume of exports is unwelcome, and the trade inclination can easily be viewed with misgivings, but when the true significance of this trend of foreign commerce and its compensating effect on the high cost of living in the United States is understood, the result is more than gratifying. Although the nation's external trade suffers, the great consuming public gains by the increased domestic supply, and if any subject is more pressing, or, rather, oppressive today, it is the burdensome living cost.

City and Country

THE CENSUS BUREAU announces that the present population of the United States is 105,683,108, an increase of 13,710,842 since 1910. Outlying possessions and citizens now abroad, will, it is estimated, bring the total number under the American flag to 118,000,000.

During the last decade it is shown that there has been a strong flow of population from the country to the city, a trend that has been very much accentuated as compared with the previous decade; for the first time in the history of the country, 51 per cent, or more than one-half, of the total population live in cities.

This does not impress us as a healthy condition. Doubtless it has been brought about largely through the war, with the consequent high wages paid to industrial workers, and the resultant rich "pickings" by merchants and the whole urban tribe who struggle to share in the rewards of industrialism and production. The farmer tends to forsake the farm and find work in the factory, where he can earn more and spend more. Doubtless this has in part been artificial, and with the letting down or deflation which is now going on, with lowered wages or unemployment in towns, there may be a certain ebb "back to the land," to the farms, the forests, and the mines. The automobile boom in Detroit drew five or six thousand miners away from the copper country of Michigan. Will not some of these go back?

But something more than this deflation will be needed to foster the healthy growth of the country, whose prosperity is the best guarantee of the nation's welfare and stability. The farmer leaves the farm because the city dweller has the best of it. The natural urge toward the land is strong, but many a wage worker leaves his job and undertakes farming only to find he cannot earn a living at it; and, defeated, he goes back to the industrial ranks. As a farmer, he finds that the cards are stacked, and that the organization of the urban population is arrayed against him. If he triumphs over natural obstacles and accidents and produces a crop, he often finds that he cannot market it at a fair profit. In the greatest apple year of recent record in New York State, apples are offered four for fifty cents in New York streets. Rural organization, to match urban organization, is needed, if our abundant vacant fields are to be progressively cultivated. Similar fair and even favorable conditions are necessary for that other great basic industry, mining. The predominant city dwellers must concede a fair deal to those who produce the metals, whether gold, zinc, or copper, so that prospecting, enterprise, and production will be encouraged. Off this production, from farm, forest, and mine, all the population lives. Let the urbanite see that he does not let the cow that gives him the milk he lives on dry up under too little nourishment.

The Divining Rod Improved

A CORRESPONDENT interested in our recent editorial on the divining rod sends us in a long clipping from the *St. Louis Post-Despatch*, whereby we perceive that our earlier account of the divining rod was not up to date.

It appears that in the spring of 1919 there arrived in Pierre, S. D., an elderly man named Switzer, who prospected around and then informed the mayor that he had "positively located a spot where a large deposit of gold could be found." Some unusual interest seems to attach to getting Switzer's name right, which we do not rightly comprehend. We have heard it said that each one must be "a man, a mouse, or a piece of cheese," and if the name had been Schweitzer (and we suspect it) we should have had a clue. Anyhow, next the story of how the gold came there.

It appears that a barge laden with gold bullion bars was brought down the Missouri in 1850, "being attacked by a large force of Sioux Indians"—but you know the rest. The crew, being hard pressed, scuttled and sank the boat, hoping to return in happier days and dig up the gold. But, alas! all were killed. The same bunch hid their treasure, and were killed about this time, all over North America, and up and down the East and West coast.

The treasure near Pierre now slumbers awaiting the Prince Charming—and after just forty years in the wilderness he arrives—no other, impatient readers, than Mr. Roquefort. Schweitzer-Roquefort bore with him a magic device presumably given him by the Goddess of Cheese, the gentle Fromage de Brie—a "mineral indicator"—a divining rod, if you please. This led him on and on and on and on from Wyoming into Dakota. "Starting from Wyoming he approached Pierre, and as he neared that portion of South Dakota the indicator (he said) pointed ahead of him. Arriving at the St. Charles hotel in Pierre, the needle swerved in a southerly direction."

We have a correspondent in Boston that uses his divining rod mainly for locating whiskey; and we suggest to Mr. Cheese that the coincidence of arriving at the St. Charles hotel and the agitation of the faithful needle is too significant to be overlooked. Anyhow, his wanderings led him away from the hotel (we wonder why), and finally his needle settled on one spot—whereupon "Switzer departed," making it look more like black magic than ever. Next he apparently reappeared in a different form, as one Embrey, oil expert. We are inclined to suspect this a slight camouflage for Embryo oil expert. At any event, he had an indicator on the same principle as Limberger's, and he struck the same scent and settled on the same spot. Next came the digging, which is now going on—but whether for gold á la Welsh rarebit, or petroleum á la embryo the chronicler of the *Post-Despatch* does not inform us.

Romance has gone out of business, but not mining. We have the tommy-knocker, the busy little gnome woodpecker of the underground. We have heard him ourselves. And we have the divining rod, short-range and long-distance, as marvelous and intangible a fairy gift as seven league boots or cloak of invisibility. We have known several mines where the spirits instructed the owner in detail, periodically, what to do—"turn your tunnel to the left and drive fifty feet, and then crosscut west sixty-three feet and six inches." In one such case the patient owner, after driving like this for a year, broke into his own tunnel near the mouth—and who could do this without supernatural help?

We have only one suggestion for the *St. Louis Post-Despatch*—that it print these tales under "Bedtime Stories for Children."

Americans in Russian Jails

A RECENT dispatch to The Associated Press records the release from a Moscow jail of an American mining engineer, Dr. Alfred Wood Stickney. He was held only for a fortnight, and the excuse was that he was held pending identification. And for that reason he was kept in jail! The Russians have always been famous for their hospitality, and their reluctance to speed the parting guest is proverbial; but why lodge their guests in the jails?

The dispatch mentions by name a number of other Americans who still languish in the unsanitary jails in Moscow, and look forward to the rigors of a Russian winter.

There was a time in the history of the United States when the strong arm of the American navy (of sailing ships only) reached into any corner of the world where American rights were disregarded. American armed frigates descended on the coast of North Africa, at a time when the great European nations prudently stayed at home, sailed into the harbor at Tripoli and brought to terms the freebooters who had been attacking American commerce. This was the period when Thackeray offered America as a model which England would do well to emulate in this respect.

The second stage of America's defense of Americans abroad was the unhappy one from which we have just emerged, where the United States, grown rich and powerful but timid, with a vanished merchant marine, refused to accord any protection to the citizens abroad, and went so far as to inform them that they should have stayed at home! while England, following Thackeray's recommendation, made it uncomfortable for anyone who unfairly injured a British subject, anywhere.

Apparently we have now arrived at the third stage, when excessive caution characterizes both the United States and England. As a contrast, the other day France advised the Bolshevist-dictators, that if the French prisoners were not repatriated within twenty-four hours, the French Black Sea fleet would turn its guns upon Odessa, whereupon Lenine ironically but sincerely replied, "We bow to brute force."

As Thackeray once held up the United States as a model to England, we now hold up intrepid France as a model to both.

Our Foreign Service

WE HAVE recently made arrangements with Mr. W. A. Doman, mining editor of the *London Financial News*, for a weekly London letter covering high points of activity in the mining field which centers in London. We are publishing a monthly letter also from Mr. Sigmund Silberstein, chief editor of the *Hungarian Mining Journal*, in Vienna, giving the chief features of the mining and metal situation in Central Europe. We have special correspondents in Melbourne and Brisbane, Australia, from whom we publish a monthly general letter. We have correspondents in South Africa, and are arranging for a regular letter from that section. For Mexico and Canada, of course, we have the same extended system of correspondents that we have in the United States, and we are extending this system to South America. We wish to call these facts to our readers' attention, that they may be aware of the thought and expense that are being constantly devoted to building up the news service of the *Engineering and Mining Journal*.

WHAT OTHERS THINK

Concrete Hearths Successful if Properly Constructed

I have read with interest the criticisms in the Consultation section of the Aug. 28 issue of the *Engineering and Mining Journal* relative to the use of reinforced concrete for replacing brick in the construction of roasting furnace hearths. As this is a subject to which I have given considerable study during the past eight years, I take this opportunity to state some facts regarding the performance of this type of arch during this period.

The scheme for using reinforced concrete in a monolithic construction to replace brick in roasting furnace hearths originated and was patented by J. H. Klepinger and myself, the first hearths being installed in the McDougall furnaces at the Great Falls Reduction Works of the Anaconda Copper Mining Co. in 1912. Six hearths were installed at that time in two furnaces, the third, fourth and fifth hearths being selected as the ones that would receive the most severe treatment. After these hearths had been in service for over a year they showed no signs of wear whatever, and in a paper written by S. S. Rodgers and myself entitled "Increasing the Efficiency of McDougall Roasters," for presentation at the Butte meeting of the A. I. M. E. held in August, 1913, we made the statement that we considered the reinforced-concrete hearths practically indestructible. Now, after a period of eight years, I have a telegram in response to an inquiry made to A. E. Wiggin, general superintendent of the Great Falls Reduction Works, to the effect that the six reinforced-concrete hearths installed in 1912 are still in good condition, and were operated continuously up to April, 1919, when the roasting department was shut down.

I am aware of the adverse criticism that has been published from time to time, and I am also familiar with the experience that some of the smelting companies have had with the hearths. The information given out, however, has been somewhat misleading, as I have been connected with some of the companies where these hearths have been tried out. It is absolutely essential that care be given to the preparation of the concrete, and that the proper proportions of one part portland cement, two parts tailing sand and four parts crushed slag are intimately mixed and poured on the forms before any setting action takes place in the mixture. Then, after the concrete has set thoroughly and the forms removed, a light fire should be started on the lower hearth of the furnace and the arch thoroughly dried before the furnace is operated. Cement manufacturers have spent considerable sums of money during the last few years in the distribution of information relative to the proper handling of their product, but irrespective of this, concrete construction is usually turned over to some foreman whose only idea is low cost of construction. As these hearths, when properly constructed, will outlast any number of brick hearths, and can be constructed for one-half the cost of brick, it surely pays to give their construction the proper supervision.

We "blew in" our Wedge roasting plant here in February, 1918, and lost our first arch in February, 1920. Our furnaces receive severe treatment owing to the frequent change in the sulphur content of our charge, which makes it necessary intermittently to burn oil, and I consider that two years is good service for a brick arch in a furnace operating with frequent changes in temperature. We replaced the arch with reinforced concrete and it has been in service now over three months and shows no signs of wear whatever. The arch is just above the burners, and when oil is used the flame strikes the under surface of the arch. We have one other arch under construction and will replace all of the brick with reinforced concrete as soon as the brick arches "cave in." We are forced at times to operate all of our roasters at full capacity, and cannot take the time to shut down to replace brick arches, so we are following this plan, feeling satisfied that when we have all of our furnaces equipped throughout with reinforced concrete our arch troubles will be ended. As for the arches rising in the center and causing trouble, it is a very simple matter to allow a little more clearance between the surface of the arch and the rabble blades when the arch is being constructed.

FRANK R. CORWIN.

Humboldt, Ariz.

Concrete Hearths a Failure in Chile

In 1919 the Braden Copper Co. installed, in an extension to its acid plant at Sewell, Chile, a 22-ft. 6-in. seven-hearth Wedge roasting furnace. The construction of this plant was in charge of the writer.

As the cost of brick was very high, due to the ocean freight rates prevailing at that time, it was decided to try two experimental hearths of concrete, and, accordingly, the two upper hearths were so built. The concrete section was about the same shape and size as the other brick hearths, well reinforced with ⅜-in. and ½-in. rods, both radial and circumferential, to make it as strong as possible.

Concrete consisting of native portland cement (which had proved very satisfactory on other work) and granulated slag from the copper blast furnace was used, the proportion being about 1 to 2½. The material was well mixed and placed, the whole job being subject to very rigid inspection. Plenty of time was allowed for the concrete to set, and the furnace was warmed up very slowly, a period of a month elapsing between the time of placing the concrete and putting the furnace in commission.

After about one week of service the lower of the two hearths failed completely. The concrete cracked very badly, and the arch sagged down onto the rabble arms below. Upon examination the concrete was found to be badly disintegrated by the heat, so both hearths were removed and rebuilt with brick.

In regard to the materials used the granulated slag was the subject of a thorough test extending over a year and was used in placing some 30,000 cubic yards of concrete in Chile. It gave higher results even than standard Ottawa sand. The cement is the only other factor. Apparently it contained considerable free lime, but an analysis could not be obtained from the manufacturers, nor were our own laboratory facilities adequate for making one.

F. J. Brulé, construction engineer for the company, and who built the first successful concrete hearths for the Anaconda company, told me that those were the only successful hearths that he knew of, all the others having failed. As he was greatly interested in this matter he had complete data on a great many installations of like character.

I was quite confident at the time that the concrete hearth would be successful. In fact, the trial was made at my request, as I had previously built concrete furnaces to burn sulphur in Tennessee, using identical materials. These concrete furnaces, though subject to temperatures as high as 2,200 deg. F., were very satisfactory.

I regret that I have not my notes available so that I could give fuller details as to our construction. Under the circumstances, I am inclined to doubt the success of concrete hearths of a diameter exceeding 10 or 12 ft. W. W. TAYLOR.

Milwaukee, Wis.

More Information Wanted

The question and answer in regard to Concrete Furnace Hearths that appeared on page 411 of your issue of Aug. 28 was very interesting to me, because whoever wrote it seemed to have a great deal of unpublished information, but it does not refer to the only published statement on the subject except through the allusion to Hofman's "Metallurgy of Copper." In Vol. 46 of the Transactions, pages 419 and 420, Corwin and Rodgers describe the converting of furnaces at Great Falls to concrete hearths, and give the results of the six months' run, which are quite contrary to the general tenor of the reply made to your correspondent. I hope some further statement in regard to this will appear, for I shall be interested to know whether a more extended experience at Great Falls contradicted the conclusions given by Corwin and Rodgers. T. T. READ.

Washington, D. C.

[Mr. Wiggin advises us that the concrete hearths used in the McDougall furnaces at Great Falls gave very satisfactory service but that these furnaces have not been in use for some time. The zinc concentrate, which is the only material now being roasted at Great Falls, is treated in Wedge furnaces with brick hearths. —EDITOR.]

Mineral Statistics for the Census Bureau

A statement on the work of the census of mines and quarries appearing in the article on p. 525 of *Engineering and Mining Journal* for Sept. 11, requires an explanation. The statement is as follows:

The work has gone far enough to determine that 47 per cent of all mining and quarrying operations have as their object the securing of oil or gas. The remainder of such operations is divided as follows: Coal, 18 per cent; gold, silver, lead, copper, and zinc, 21 per cent; quarries, 11 per cent; iron, 2 per cent; all others, 1 per cent.

The percentages given are merely a sorting of establishments or enterprises, that is, of individuals or organizations, engaged in or interested in the various mineral industries as shown by the census lists prepared as a guide for the census canvass. These figures have no relation to the number of actual operations, the number of men engaged, the quantity or value of output, or the scale of operation measured by any standard. The lists from which these figures were obtained are based on U. S. Geological Survey records and lists from state mining and geological bureaus, industrial registers, state gazetteers, and other published directories and indices of various kinds. The figures will be very materially modified when the results of the canvass are compiled and tabulated.

Washington, D. C. FRANK J. KATZ.

The Formation of the Sevier Valley, In Utah

I have just read the review of "The Ore-Deposits of Utah," by B. S. Butler, G. F. Laughlin, V. C. Heikes, and others, as published in the Aug. 28 issue of *Engineering and Mining Journal*.

Although I agree with you that "geological literature is rotten with faults that 'ain't there'," as well as a lot of other things that "ain't there," I must differ with you about the Sevier Valley not being a structural depression, for if it has not been in large part produced by faulting, there are no such things as structural depressions.

Although the whole of Sevier Valley is undoubtedly a depressed area, it is more particularly evidenced from the vicinity of Marysvale, south to the south end of Circle Valley, a distance of almost thirty miles. Both to the east and west of Marysvale the evidences of faulting are clear, on the east there being two eastward-tilted blocks forming the foot-hills to the main mountains, and to the west immense walls of quartzite practically vertical for hundreds of feet. It is in the mountains around Circle Valley that the faulting in the Tertiary volcanics is best exemplified. The stratification of the rock here is more marked than further north, and tilting and displacement are more easily followed than was possible in contiguous formations.

I would say, however, that there are more than two faults which formed the valley. From the edge of the plateau country on each side there are a number of faults stepping down the country to the valley floor, and below. A noticeable feature is that the formation on the east side of the valley dips to the east, and that on the west side dips to the west, as though the axis of the valley had once been the axis of a low arched anticline.

In Alaska, I have seen wide, flat-bottomed valleys with vertical and steep sides which were mostly, if not wholly, formed by the cutting effect of glacial ice streams. That an ice sheet once covered this country is not to be denied, and Sevier Valley may, in part, have been shaped that way; but there is no doubt of the faults of recent displacement which now are to be seen on its east and west borders, and which from all the trustworthy evidence at present available would appear to be the main factors in the valley's present geological development. JACOB W. YOUNG.

Marysvale, Utah.

Mineral Resources of the Belgian Congo

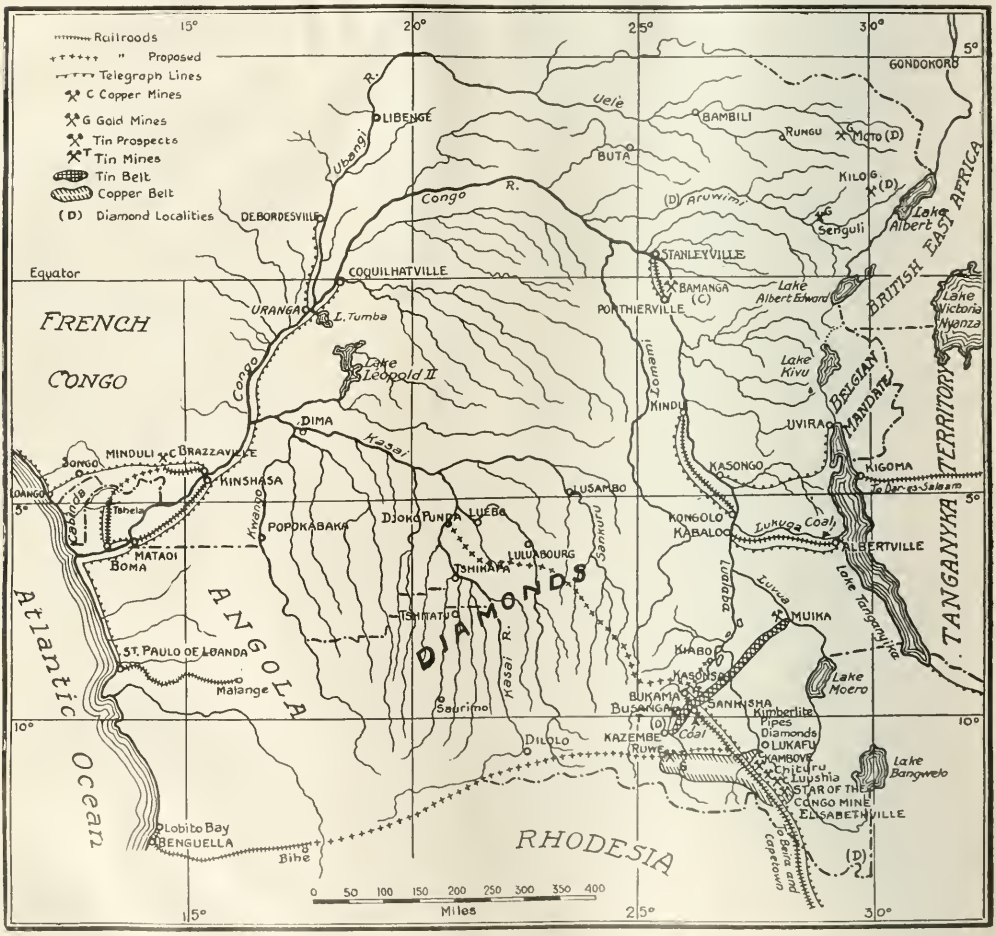
Development Formerly Much Hindered by Inaccessibility of the Colony, but Now Being Actively Pushed—Copper the Chief Product, but Gold, Tin, and Diamonds Also of Importance

BY SYDNEY H. BALL AND MILLARD K. SHALER
Written for *Engineering and Mining Journal*

BELGIUM, in her central African colony, the Belgian Congo, has a treasure house of natural resources from which raw materials, essential to stricken Europe, are being sent in increasing quantities to the mother country. The Belgian Congo comprises the greater portion of the Congo River basin, roughly one-third of its area lying north and two-thirds south of the Equator. The colony itself has an area of 909,000 square miles, and, in addition, the Belgians hold a mandate over 46,000 square miles in the northwestern part of what was formerly German East Africa. The combined area is a quarter that of the United States and Alaska.

Disregarding the narrow coastal plain, the colony lies on the African plateau, and consists of a basin, the centre of which is about 1,000 ft. above sea level. On the north frontier of the colony the elevations are from 2,500 to 4,200 ft., and to the south approximately 1,000 ft. higher. To the east are the high mountains of the lake region, Ruwenzori having an altitude of 16,800 ft.

Contrary to general opinion, one-half of the Belgian Congo is savanna, the great equatorial forest being



THE BELGIAN CONGO

confined largely to the south side of the great horseshoe bend of the Congo River. Heavy rainfall, high humidity, and relatively high temperature characterize the climate.

Interior transport, as in many countries, is the weak link which retards development. At present high freight rates permit the export of only relatively valuable raw materials and burden the cost sheets of all companies. Interior transport follows the Congo and its tributaries, the navigable stretches being linked to one another by railroads. Within the colony are over 9,000 miles of rivers navigable to steamers of light draft, but the service is slow and costly. Larger and faster steamers, channel improvements and loading facilities are necessary and are being provided.

Over a Thousand Miles of Railroad Built

The colony has 1,020 miles of railroad, and one can step off a boat from Antwerp at Matadi and from that port travel across the continent by all rail and steamer routes either to Cape Town, Beira, or Dar-es-Salaam. The building of the Bas-Congo-Katanga railroad between Bukama and Charlesville (Djoko-Punda), on the Kasai, would open up a fertile country, which is not only one of the best labor reservoirs in the Congo, but also is a diamond field of importance. It is not unlikely that construction of this line will begin soon from the Charlesville end. Eventual rail connection between Charlesville and Leopoldville is projected, which would furnish an all Congo rail route for the Katanga copper. The construction of one of the two proposed routes connecting the Congo and Nile rivers would better the transport facilities of the gold fields lying in northeast Congo.

Hydroplanes Used for Passenger, Mail, and Express Service

Fifteen hydroplanes with crews have been provided for the colony, and four are already in service. The program includes carrying passengers, mail, and express between Kinshasa and Stanleyville, a distance of 1,800 miles. It is expected that the round trip can be made in seventy hours, in place of the fifteen days which the river steamers take. Since June 1, a regular six-hour bi-monthly service between Kinshasa and Coquilhatville (360 miles) has been organized. The expansion of hydroplane service in the future is certain.

The climate, although tropical, should have, to a red-blooded person, none of the terrors which the story writers are prone to ascribe to Africa. White men, if proper care is exercised in their selection both as to physique and temperament, can serve their employers well during a continuous period of two years, the usual term of service in the colony, and that, too, without reason to regret later their sojourn in Africa.

Labor Is Cheap, but Natives Do Not Enjoy Work

The wage for common labor is low, varying according to the district from 5 to 10c. a day, although the companies also furnish food, lodging, medical care, bedding, and clothing in part. As a result, although general mining costs, for reasons other than labor, are high, certain types of work (shoveling of gravel and overburden for example) are done at small cost. As in most tropical countries, labor shortage is a chronic cause of complaint. This is due less to the lack of labor than to the unwillingness of many natives to work, and to the fact that some of the mining districts are relatively sparsely inhabited and lack means of easy and direct transportation from more densely populated regions.

Mining in the colony is mostly in the hands of ten or twelve companies and their associates and subsidiaries. Many of these companies are in a strong financial position and possess large concessions. A large number of the concessions held give the right to prospect large territories over a considerable period, at the expiration of which a certain number of smaller but still large mining claims may be staked out. The colony, in return for such rights, is given a participation in the mining companies varying from one-third to one-half of the stock issued. In addition, the colony is paying 2 per cent export tax on all minerals produced, and there is an import tax on supplies entering the colony. A graduated profit tax is proposed. The Katanga was thrown open to individual prospectors before the war, and eventually the whole colony will presumably be opened to general prospecting.

Since the war nationalistic tendencies have marked the policies of all European countries. With countries which have suffered as has Belgium, the policy is right and natural. The Congo gold is now all sent to Belgium, and used either in coinage or reserved for the use of Belgian goldsmiths. Part of the Katanga copper is being directed from England to Belgium, and this will be refined, as will be the Congo gold, in the Hoboken works near Antwerp. A large proportion of the Kasai diamonds must be sold to Belgian cutting works. Further, the mining companies must offer employment to Belgian engineers, and they are encouraged to purchase their supplies in Belgium.

As indicated, mining costs in the colony are relatively high, due to the following factors: high taxation, distance from the home office, slow transportation, high freight rates, and inefficient labor. Several of the operations are, however, carried on at an excellent profit.

Geology of the Region

The coastal plain is underlain by sandstones, limestone and shales of Cretaceous and Tertiary age, which dip gently toward the Atlantic. To the west is a belt of closely folded and ancient gneisses and schists of both sedimentary and igneous origin, intruded by granite bosses and diabase dikes. The central zone is composed of Devonian (?) limestone and the eastern belt is of red, flat-lying Permian (?) sandstones and shales. The interior basin is underlain by flat-lying interbedded sandstones and shales of Jura-Triassic age. As the north, south, and east frontiers are approached these sediments feather out, and rocks similar to those of the geologically complex Crystal Mountains outcrop. To the east, recent lava flows cover considerable areas north of Lake Tanganyika.

Many of the gold- and iron-ore deposits and some of the less important copper deposits are genetically related to the supposedly pre-Cambrian intrusions. The ancient African plateu has been deeply eroded, and these ore deposits are either replacements, fissure veins, series of linked lenses, magmatic segregations, or pegmatitic veins. The tin lode deposits of the Katanga are, however, dependent on the earlier of two Paleozoic

ROCKING SCREENS ON DEVELOPMENT WORK, KASAI DIAMOND FIELD

granites, whereas Studt ascribes the Katanga copper deposits to the latter. The origin of these deposits, however, remains a moot question.

Important mineralization apparently ceased by mid-Carboniferous times. Coal, oil shales, and diamondiferous conglomerates occur in the flat-lying shales and sandstones of the central basin, and it is possible that oil seeps in the coastal plain may lead to the discovery of petroleum.

The three important mining districts include the Katanga, to the southeast, with copper and tin and less important gold, coal, and diamond deposits; the Aruwimi-Uelle region, to the northeast, with gold deposits; and the Kasai region, to the southwest, with diamond deposits.

Extent of the Katanga Copper District

The Katanga copper belt is not only the site of the most important mining industry in the colony but its operating company, the Union Minière du Haut-Katanga, is one of the twenty most important copper producers in the world. Its reserves, proved and potential, warrant the belief that its future importance will be even greater.

The Katanga copper belt lies in the southeastern part of the colony, and, indeed, its lower tip extends into Rhodesia. Two hundred copper deposits have been discovered in a belt from 25 to 40 miles wide and about 200 miles long. The belt extends from east to west.

The ruggedly dissected plateau ranges in elevation from 3,900 to 5,200 ft. above sea level. The copper deposits were relatively easy to locate, as they usually rise above the surrounding territory as cones or ridges bare of verdure. The local natives were also familiar with the location of the numerous pits sunk by the old copper miners.

The copper-bearing rocks (probably of middle Silurian to Devonian-Silurian age) include sericite schist and quartzose rocks, ranging from shaly sandstone to quartzite, and less frequently slate, talc, limestone, and dolomite. The rocks are closely folded, and strike parallel to the extension of the belt, the predominant dip being north. Granites and basic igneous rocks occur in the vicinity. The orebodies are associated with sharp folding, faulting, and brecciation and an unusual degree of metamorphism. The orebodies are tabular masses conforming usually to the bedding planes but in instances to schistose planes cutting the former. Malachite and chrysocolla are the predominant minerals; azurite, copper pitch ore, and melaconite are less abundant; and cuprite, dioptase, native copper, lunite, libethenite, olivenite, and cyanotrichite are rare. Diamond drilling shows that copper sulphides (chalcopyrite, chalcocite, bornite, and covellite) and pyrite occur in several orebodies.

Although figures as to reserves are not available, substantial tonnages are practically in sight, and the amount of the ore which will eventually be developed will be very large. A number of deposits are large, as, for example, Kambove No. 2, reported to be 3,000 ft. long, and, so far as developed, from 240 to 400 ft. wide.

High-grade ore, containing 15 per cent or more copper, and suitable for direct blast-furnace smelting, is in relatively small amounts compared to 6½ to 7 per cent ore. Most of the ore is highly siliceous, although some is high in alumina and still other is dolomitic. Some of the ore carries appreciable quanties of precious metals. The cobalt content is high, and the Katanga copper belt could produce as a byproduct practically all the present world demand.

The copper belt is the property of the Union Minière du Haut-Katanga, in which the Tanganyika Concessions, Ltd., a British corporation, holds a 39 per cent stock interest.

Mining was begun in 1910, and smelting in June, 1911, the production in metric tons being as follows:

Date	Tons	Date	Tons
1911	998	1916	22,167
1912	2,492	1917	27,462
1913	7,407	1918	20,238
1914	10,722	1919	23,004
1915	14,041		
		Total	128,531

The drop in production in 1918 was due to transportation difficulties, labor shortage, and an influenza plague, whereas the production in 1919 was adversely affected by shortages of supplies and a strike of the white employees.

Americans Hold Important Executive Positions

The staff consists of about 800 whites, several of the more important positions being held by Americans, and a labor force of 12,000 to 13,000 natives. Mining is predominantly open-cut work by pick and shovel or steam shovel, although in several of the mines the ore

HAND-PICKING CONCENTRATES, RAMONA, KASAI DIAMOND FIELD

is milled down chutes to main haulageways. The less rich ore is either hand sorted or washed before reaching the smelter.

The Star of the Congo Mine, formerly the principal producer, produced in 1919 but 20 per cent of the ore; 65 per cent of the production came from the Kambove mine and 15 per cent from the Likashi and Chuturu group. The latter mines were opened up in 1918. To the end of 1919 the Star had produced 888,000 tons of smelting ore, besides the greater part of the dolomite used as flux until recently, when it has been supplanted by Kakontwe limestone. Kambove between June, 1913, and Dec. 31, 1919, furnished about 635,000 tons of smelting ore, and Likashi-Chituru 128,000 tons. The Fungurume mine is being opened up, and the Luishia, Luiswichi, Kakanda, and M'sesa mines have been satisfactorily developed. Development, particularly by diamond drilling, has been pushed in the western group of mines in 1920.

The ore is smelted in blast furnaces at Lubumbashi, near Elisabethville, to black copper containing from 96 to 97 per cent of the metal. In 1916, about 195,000 metric tons of ore, 70,000 tons of iron flux, 52,000 tons of dolomite and 2,700 tons of limestone were smelted, the coke consumed being about 70,000 tons (54 per cent Wankie Rhodesia coke and 45 per cent coke made in Katanga from Wankie coal). In 1919 a total of 189,169 tons of 16 per cent ore and 163,000 tons of flux were smelted. About 73 per cent of the copper content of the ore is recovered. Seven furnaces are in operation, of a theoretical total capacity of from 35,000 to 40,000 tons of copper per year. The plant was therefore running at about 50 per cent capacity during 1919.

A 4,000-ton mill to concentrate the malachite stringers in the lower-grade ore is being built this year near the Likashi and Chuturu mines, and will probably be put into operation during the second half of 1921. The tailings are to be stored for later treatment by a leaching plant. An experimental leaching plant (100 tons copper per month) was planned to be erected this year, and this pilot plant will be superseded, within the next three or four years, by one of a capacity of 55,000 tons of copper yearly. Its probable location is near N'Zilo, where hydro-electric power can be generated. In prewar days, the copper was sold in Germany, but during the war most of it went to England. Since 1919, part of the production is shipped to England and part to Antwerp, where it is refined at the Hoboken plant. The Union Minière holds a 25 per cent interest in this 20,000,000-fr. refining corporation.

Cupriferous quartz veins and lenses, lenses of chalcopyrite, magmatic segregations of chalcopyrite, and cupriferous beds in red sandstone occur in the older rocks of other portions of the Congo basin, but of the copper deposits those of the Katanga are alone known to be exploitable. Ten years ago a few tons of high-grade ore was shipped from quartz-chalcocite lenses at Bamanga, near Ponthierville. The Simkat is to continue development of the Kapulo copper mine, near Lake Mwero, a deposit found during the war.

The Belgian Congo produced to the end of 1919 from its placers about $16,626,255 worth of gold, or 24,750 kg.

GOLD PRODUCED IN BELGIAN CONGO TO END OF 1919

Property	Kg.	Property	Kg.
Kilo-moto	23,213.617	Nebula	(a)50.775
Sengule	17.797	Ruwe	530.000
Babeyru	750.000		
Kanwa	158.000	Total	24,750.189

(a) Figure of the Colonial Office.

The placers now worked are situated in the northeastern part of the colony, although gold is widely distributed around the rim of the basin and is even an occasional clastic constituent of the interior sandstones.

THE LUBUMBASHI SMELTER, KATANGA COPPER BELT

The northeastern part of the colony is a region of ancient rocks, which have undergone deep weathering and erosion, resulting in the concentration, in present-day streams, of gold once widely distributed in stringers and other non-exploitable bodies. The bullion runs about 93 per cent gold and 7 per cent silver.

The colony owns and operates the two important placers, namely Kilo and Moto, in the Ituri and Uelle basins. The two placers, which are about 100 miles apart (and this in Africa, due to difficulties of communication, is the equivalent of a thousand miles in America), were operated by a single management in Africa, but in 1918 the two mines were placed under separate African managements. In March, 1920, the Colonial Ministry placed the management of these placers in the hands of a committee sitting in Brussels and composed of experienced engineers and colonials, who are to be responsible for the mines paying a return on an assumed capitalization of 100,000,000 fr.

The gold is chiefly sold in England, and a part of it is reserved to Belgian goldsmiths. Recent production has been from one to two thousand kilograms a year each from Kilo and Moto.

The country rock at Kilo is diorite, schist, syenite, and granite. The gold probably originates from quartz-pyrite stringers in the diorite itself and along the diorite-granite contact, as the streams become barren as they pass from the diorite into the granite. The average depth of gravel is 2.75 ft. at Kilo and 1.85 ft. at

Moto. The bottom at Kilo is a greenish clay, an alteration product of the diorite into which the gold penetrates for four and in places over eight inches. Operations began in 1905. Excavation is largely by pick and shovel, although a small giant is used, and more machinery should by now have arrived at the mine. The gold is chiefly recovered in sluices. A dredge has been working the wash of Chari River since 1918, and gave for the year 1919 a production of 96.514 kg.

deposits at Kilo and Moto, and a sample of serpentine yielding platinum has been found at Kilo. The gold region is relatively sparsely settled and labor is difficult to procure. During the war there was a shortage of white staff, and since the armistice the region has suffered from several epidemics.

The Moto placer began operating in 1911. The country rock is reported to be granite, diorite, and hematitic schist. The Senguli placer of the Kasai company, also

PANORAMA OF KAMBORE MINE, KATANGA COPPER BELT

In 1918 the gravel treated averaged $2.17 per cu.yd., and costs are reported to be about $1.25 per cu.yd. Details concerning the two exploitations during 1919 follow:

	Kilo	Moto
Production	1,740.697 kg.	1,618.598 kg.
Cubic meters of gravel washed	350,436	700,000
Gold contents per cubic meter	4.96 g.	3.32 g.
Cubic meters of overburden	273,447	800,000
Number of native workmen	2,900	5,600
Number of white agents	37	23

The reserves now determined can be estimated at about 10,000 kg. for Kilo and 5,000 kg. for Moto. Part of the territory is not yet prospected.

Lode Deposits Also Known

Lode deposits have been found at Kilo, and these are soon to be exploited, as machinery is said to have arrived in the fields. The Colonial Office reports that about 432,000 tons of quartz, containing approximately 5,550 kg. of gold, or $7.50 per ton, has been developed. Certain lodes have been cut at a depth of 60 to 120 meters. Their thickness averages about one meter and they strike nearly E.-W. along a distance of over one kilometer. At Moto, lode prospecting is not yet sufficiently advanced to permit an estimate; however, the results obtained are encouraging.

Some diamonds have been discovered in the alluvial in the northeastern part of the Belgian Congo, was opened in 1919, and its production for the year was about 18 kg. of gold. The discovery, in May, 1919, of a new placer in the northeastern part of the Uelle basin, was also reported. West of Moto mines in the Uelle, and near Niangara, the bed of the river is reported to contain paying gold. The Orientale company (since taken over by the Intertropical) has located a placer in the Ituri region. Small placers derived from two of the Katanga deposits (the copper ore, as already stated, is slightly auriferous) were formerly worked; at Kambove very little gold has been extracted. The placers of the Forminière at Kanwa and Babeyru have been temporarily abandoned because of low grade and high working costs. The production from these mines totaled 908 kg.

The Ruwe mine structurally resembled the copper deposits, and, indeed, its ore contains some copper. The ore shoot is reported to be about 1,400 ft. long and to average 7.5 ft. wide. The ore was reported, prior to the war, to average $14 per ton in gold, platinum, palladium, and silver, equivalent, at present metal prices, to at least $28. There are rumors that it is soon to be worked. Between 1904 and 1908 about $330,000 worth of gold was washed from a detrital deposit derived from the weathering of this lode.

On the northwest face of the dissected plateau known as Monts Mutumba, in the Katanga, is a tin belt 250 miles long and of considerable promise. The strike of the belt is northeast to southwest. The rocks are mica-schist, tourmaline-bearing quartzite, and slate of pre-Cambrian or Cambrian age, which are intensely intruded by biotite granite and pegmatite of Ordovician age. The cassiterite occurs in pegmatites and greisens, but the commercial deposits are detrital and to a less extent stream deposits. The southern 175 miles of the belt is owned by the Union Minière du Haut-Katanga, the central portion by the Geomines, and the north end by the Simkat.

In 1906 the Union Minière smelted ten tons of tin concentrates at the Busanga mine in a locally constructed furnace. This mine was reopened in 1916. The company has contracted the mining, its engineers merely superintending the exploitation and doing development work. An epidemic of grippe and delays in road construction have held the work back, but it is hoped that the two contractors will soon be producing monthly the fifty tons of cassiterite (65 to 75 per cent) for which the contract was made. The first shipment of concentrates reached Elisabethville in April, 1920. The better gravel is said to carry about 1 per cent of cassiterite, and the reserves now developed contain approximately 10,000 tons of that mineral.

The Geomines is exploiting the Manono and three smaller placers near Kiambi, using giants and sluices. About ten white men and 600 natives are employed. From 15,000 to 20,000 tons of cassiterite in low grade gravel (0.1 to 0.01 per cent) have been blocked out. In 1917 a total of 103 tons of concentrates were sold, and in 1918, 274 tons. The concentrate carries 74 per cent tin and is highly prized by British smeltermen. The company's other tin placer at Naulongo-Kikondja is not now being exploited. Exploitation was begun in 1915, and to June 30, 1918, the production totaled 443 tons.

The Simkat is reported to have started work on its placer at Muika. The lode is reported to contain from 0.2 to 0.5 per cent and the placer from 0.05 to 0.07 per cent of cassiterite.

The reported tin production in metric tons follows:

Date	Carats	Date	Carats
1915	48,935	1918	164,000
1916	53,910	1919	215,000
1917	100,000		

Diamonds are widely distributed in the Belgian Congo. They exist at two alluvial occurrences and as constituents of several kimberlite pipes in the Katanga, as alluvial diamonds over an area of 45,000 square miles in the southwestern part of the Belgian Congo called the Kasai diamond fields, and at six places scattered over the northeastern part of the colony.

In the Kasai diamond fields are the only exploitable deposits so far found in the colony. The region consists of a foundation of ancient (pre-Cambian?) schists, gneisses, and granites, on the peneplaned surface of which rest flat-lying sandstones, shales, and conglomerates of Jura-Triassic age. The conglomerate lenses contain diamonds, in instances in commercial quantities, and in consequence the diamonds are much older than those mined from the South African pipes. The deposits now being exploited are, however, creek and terrace deposits, which are in instances rich. The stones are generally small, averaging about one-tenth of a carat; and the largest stone yet found weighs about 32 carats. In quality, the diamonds resemble those of the Southwest African Protectorate, and a large portion of them are suitable for cutting.

TAKING OFF OVERBURDEN IN THE GRAVEL PIT AT M'PESO, KASAI DIAMOND FIELDS

The field was discovered in 1907 by the Forminière, a Belgian corporation in which American capital is interested. Production began in June, 1913, since when 620,000 carats have been produced. Recent production follows:

Date	Metric Tons	Date	Metric Tons
1913	19,368	1917	103
1914	30,947	1918	274
1915	10,250	1919	163
1916	0,025		

From eight to ten different placer mines are under exploitation. Excavation is largely by pick and shovel, and concentration by pan plants, or (after sizing by rocking screens or trommels) by jigs. Fifty white men and 8,000 blacks are employed. The capital of this company has recently been increased from 8,000,000 to 16,000,000 fr. On Oct. 1, 1919, the company declared 6 per cent dividends on the preferred stock, covering the period from 1909 to 1913 inclusive. In 1919, the government requested that three-fourths of the production, as a minimum, be disposed of in the Belgian market.

The staff of the Forminière is prospecting the concessions of six other companies and syndicates in the Kasai diamond fields, of which the Beceka, a mining

company subsidiary to the Lower Congo-Katanga R.R. Co., will in 1920 begin to exploit at least one of the deposits which it has found to be northeast of the Forminière concessions. The Kasai company has also located some promising deposits and is forming a subsidiary company, which will soon start exploitation. These exploitations as well as further prospecting work will be carried out under the auspices of the Forminière. Capitalists associated with the Forminière have also obtained diamond prospecting concessions in the northern part of the Katanga, where prospecting work has begun.

In the southern part of the Katanga are about forty pipes composed of a rock resembling kimberlite, and, indeed, these pipes may well be contemporaneous with those of South Africa. The largest has an area of forty-five acres. Many of these pipes are known to be diamondiferous. Several hundred stones have been obtained from the Luanza pipe.

Fourteen known pipes are owned by the Simkat, others by the Geomines, and by the Kundelungu Exploitation Co., the latter a subsidiary of the Katanga Special Committee, and the Tanganyika Concessions, Ltd. Now that the war is over, further washing tests will be undertaken on certain of these pipes.

Colony Also Has Coal Deposits

The Geomines has uncovered coal beds at Kilometer 262 on the Kabolo-Lukuga railroad. Five seams of coal from four to six feet thick occur in rocks of Karoo age, which formation includes the coal-bearing strata of South Africa. The beds vary from horizontal to vertical. The weathered coal is reported to contain 61.9 per cent of carbon and 13.25 per cent of ash, and produces 5,891 B.t.u. Although it clinkers badly, it can doubtless be used locally on the railroads. The coal is known to underlie a considerable area.

The Geomines, Simkat, and the Paris Banks Consortium jointly own the Luena field, also in the Katanga. The coal is about four feet thick and the outcrop has been traced for thirty-two miles. The Luena field is twenty-six miles south of Bukama and a mile from the railroad. The field is to be immediately prospected.

The Union Minière du Haut-Katanga and the Compagnie du Chemin de Fer du Bas Congo au Katanga have taken up several circles for coal near Sankishia (on the Katanga railway), and methodical prospecting was started several months ago. Several drill holes and shafts have already been put down. They have proved the existence of an aggregate of coal beds approximately fifty feet in thickness containing approximately fourteen feet of clean coal in five seams. Two of the seams, as far as known, vary in thickness from three to five feet. One of the bore-holes struck the coal at about 225-ft. depth.

The outcrop of the overlying formation can be traced along a considerable distance, which justifies the conclusion that the coal field is of great extent. The coal is something between a true lignite and bituminous coal, and is non-coking where sampled. The volatile matter varies from 18 to 32 per cent; the ash from 22 to 41 per cent; and the sulphur from 1.4 to 4 per cent. Part of it is probably suitable for use in stationary boilers, locomotives, gas producers and reverberatory furnaces, either as it is or after pulverization.

It is anticipated that the discovery of this coal will facilitate considerably the fuel problem of the Union Minière and the Katanga railroad, which are at present using wood fuel exclusively for their stationary boilers and locomotives. The total monthly consumption of wood for this purpose is estimated for next year at not less than 50,000 tons, which could be replaced by 8,000 to 10,000 tons of coal. This substitution of coal for wood would release a considerable number of whites and native workmen.

Very impure coals have been found at several other places in the Katanga.

The Simkat is preparing to construct a cement plant in the Katanga, and another company (Société des Ciments du Congo) is to burn lime and manufacture cement bricks and other building materials in the Katanga. The Simkat and Geomines, besides their activities mentioned, form part of a syndicate for which the Forminière is prospecting for diamonds in the Kwango and Kasai regions. They are both to continue prospecting their mining blocks in the Katanga.

The above notes cover the Congo mining activities. Among the colony's undeveloped resources may, however, be mentioned considerable bodies of iron bauxite, manganese, tungsten, molybdenum, and lead ores, and uranium and radium minerals are also present. Monazite is a relatively common constituent of certain of the stream gravels, and thorianite is also reported.

In addition to diamonds, a number of other precious stones, including chrysoberyl, rose tourmaline, ruby, sapphire, meerschaum, cyanite, and amethyst, occur, although none so far as known are present in commercial quantities. Oil shales outcrop in the vicinity of Ponthierville. Apatite, fluorspar, barite, asbestos, muscovite, and strontianite, although occurring in fair quantities, are not exploited.

Branch of the Royal Mint Established

The creation of a mint in the Union of South Africa was provided for in legislation passed by the Union Parliament in June, 1919. The mint will be a branch of the Royal Mint so far as gold coinage is concerned, according to *Commerce Reports*. This insures that the output will be legal tender throughout the British Empire.

The gold mines in South Africa exist entirely by selling their gold. They strongly urged the creation of a mint, as it would have, under normal conditions, added to their profits and would have relieved them from the many difficulties which beset the industry during the past few years. Work on the mint is now proceeding, but with the high premium on gold which the mining companies are receiving since the placing of gold on the open market, minting at present would not be profitable. Until the premium disappears no advantage will be gained by minting locally.

Exports of Gold Dust, Graphite and Corundum From Madagascar

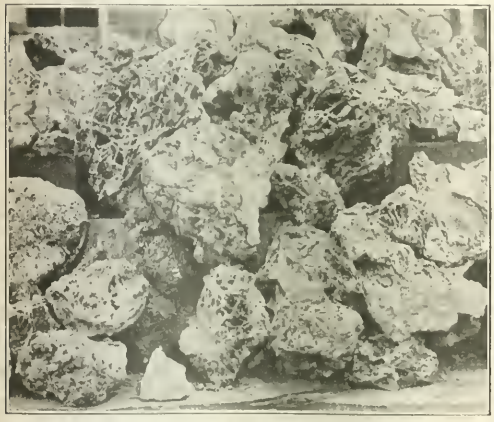
For the nine months ending Sept. 30, 1919, according to Vice Consul Feibelman, 725 metric tons of corundum, 13,278 troy ounces of gold dust and 2,363 metric tons of graphite were exported from Madagascar. During the last quarter of 1919, 99 metric tons of corundum, 4,501 troy ounces of gold dust, and 1,687 metric tons of graphite were exported.

Zinc Ores of the North Arkansas Field

Smithsonite and Calamine Are Easily Mined, and the Milling Methods Used Are Simple—Ores Are Especially Desirable in Chemical Industry for Manufacture Of Zinc Oxide, Lithopone, and Zinc Chloride

By Tom Shiras
Written for *Engineering and Mining Journal*

THE growing scarcity of smithsonite, or carbonate of zinc, and calamine, or silicate of zinc, in the United States, is creating a new interest among big consumers of these ores in the north Arkansas zinc field. The difference between the price of these ores, the selling base of which is 40 per cent metallic zinc, and the price of blende, the selling base of which is 60 per cent metallic zinc, is gradually growing smaller. On a basis of metallic content, the smithsonite and calamine should bring only two-thirds as much as blende, but recent market quotations have shown it to be bringing as high as slightly under seven-eighths as much and in some instances this year choice lots have brought as much as the lower-grade blende at Joplin.



REPRESENTATIVE DISPLAY OF NORTH ARKANSAS SMITHSONITE AND CALAMINE ORES

STARTING A NEW TUNNEL ON A SMITHSONITE OUTCROP ON RUSH CREEK

Nine-tenths or even more of all the developed zinc mines in the north Arkansas field are smithsonite or calamine mines, the bodies of "jack," or blende, being practically unexplored, and this condition will probably exist until the former ores are exhausted.

The development of the smithsonite and calamine instead of the blende was brought about by natural conditions. A miner is no different from the average human being. He follows the lines of the least resistance. Most of the orebodies lie in the upper ore-bearing stratas above water level, and are easily mined in practically dry ground by tunneling and drifting. Although some bodies of blende have been opened up at these higher levels, most of them have been encountered below the water level, and have to be mined by shafts and drifts which require pumping to be kept in a workable condition.

The smithsonite and calamine are distributed over a large area in the northern part of the state. Mining is actively carried on in Marion, Boone, Newton, Searcy, and Baxter counties. There are also commercial deposits of these ores in Sharp and Lawrence counties, which are worked spasmodically. The earliest mining done in the state for the ores mentioned has been in the two latter counties. In 1857 a zinc smelter was operated by the Independence Mining Co. at Calamine, in Sharp County. This company did a general mining and smelting business, but its operations were stopped by the Civil War, its machinery being confiscated or destroyed by the Confederate Army.

Large areas in the North Arkansas field are still unprospected, and places where development has made commercial bodies of ore available constitute but a small area of the field. Smithsonite outcrops are of common occurrence along the exposed ledges bordering the rivers, creeks, and hollows in many sections of the field. Only a few of the known outcrops have been investigated to determine whether commercial bodies of ore exist or not. From the number of commercial mines that have been developed during the last few years, and considering the character and number of the outcrops, it would seem that the field as a whole contains an unlimited quantity of these ores, the production being limited only by economical development and mining. The smithsonite is invariably found in greater or lesser abundance along the outcrops of beds that contain or did contain blende.

Discussing the origin of the smithsonite and calamine ores, John C. Branner, former State Geologist, says:

> It is evident in all cases that the smithsonite is formed by the alteration of zinc blende and its recrystallization in the form of smithsonite. Calamine, like smithsonite, is formed from blende, but is not of such common occurrence. It is especially abundant in the Zinc Camp, which lies around

the town of Zinc, in Boone County. The siliceous rocks there are much broken. At several places where the calamine is found the blande has been removed in solution from the compact chert gangue, and cavities thus left have been filled with calamine crystals. Like smithsonite, calamine is found in many instances in loose lumps in the surface clays, and wherever it has been found in hard rocks, the rocks bear unmistakable evidence of having been altered by the action of the surface waters.

The carbonate and calamine deposits are invariably found along faults, fractures and synclines. These afford convenient paths for underground waters, and waters percolating through them coming from bedded deposits of blende carrying zinc solution naturally deposit these values there.

An interesting feature in connection with the faults is that it sometimes happens that the ores have accumulated not in the faults themselves but close to them on one side or the other.

When the ores occur along the ancient underground watercourses guided by the folds, faults, or fractures, they can be located approximately, at least, by a study of the surface of the geological structure.

In drawing general conclusions regarding these ores, Mr. Branner states:

The position of the ores in the secondary deposits has been determined largely by those structural features that have guided the underground waters in their passage through the rocks.

In some cases the accumulations have taken place along synclinal troughs; in other cases, in fissures along fault lines, and in still others, in the breccias formed along ancient underground watercourses. The subterranean waterways have in many instances been closed by the deposition of these ores and the water forced into other channels. The smithsonite and calamine ores are produced by the alteration of blende mostly in place.

The rocks throughout the north Arkansas field are for the most part horizontal. To this rule there are a few important exceptions, and in these exceptions the bending or tilting of the beds is for the most part comparatively gentle. Faults, however, have performed a prominent part in the disturbance of the horizontal bedding and the continuity of the strata of the region. In some places these faults are of but local importance, though in other instances a single break may be traced almost continuously for thirty miles or more.

By far the greater part of smithsonite and calamine is found associated with gangue and must be milled to prepare it for the market. A small portion of the production comes from the ground in chunks, and with a little hand cleaning is ready for shipment.

Milling Practice Improved by Use of Tables

The milling plants used in the field are the regular Joplin type mills equipped with sludge tanks, or Dorr thickeners and tables. A few plants have been erected in which the jigs have been entirely eliminated, the concentrating being done entirely with tables. This type of plant has been found to be very successful. The first mills, erected in the field over twenty years ago, were not equipped with tables, the entire concentration process being done with jigs. Assays of the old tailings at these plants have run as high as 8 per cent metallic zinc and few have run under 5 per cent. With table equipment this loss has been reduced to a fraction.

Ores Desirable in Chemical Industry

The purity of the smithsonite and calamine produced in the north Arkansas field makes them especially desirable for many purposes. They contain no iron, lead, or other foreign matter detrimental to either their manufacture into chemicals or spelter. They produce the best spelter that can be made from virgin ores, for which they were used almost entirely until two years ago, when the chemical companies were attracted to them. In the chemical industry they are principally used in the manufacture of zinc oxide, lithophone, and zinc chloride.

In many of the mines, especially in those where the orebodies have been built up in ancient underground watercourses, rare specimens in the shape of stalactites have been found. Some specimens resemble old castles and spires with a shelly interior, and others show grille work in delicate patterns. In one mine fifty-one specimens were saved, each of a different texture or color. Owing to their range in color and texture, the new prospector in the field many times confuses some specimens with lime carbonate or crystalized silica. Native prospectors determine their value largely by their weight, the ore being much heavier than any other formation resembling it.

Select specimens of smithsonite run as high as 52 per cent. metallic zinc, and calamine 54 per cent. The average car of concentrates or hand-cobbed ore ready for the market runs from 40 to 44 per cent. Few run as high as 47 per cent, or as low as 36.

In the early history of the field these ores were not much sought, blende being the lure for the prospector. John C. Branner made the following statement at that time: "It should not be forgotten that some of the most important and best-paying zinc mines in the world have been mines of smithsonite." And in connection with the north Arkansas field, and its subsequent development, his statement has been well substantiated.

Japanese Aluminum Industry Dependent Upon Foreign Raw Materials

Although the aluminum industry is now well established in Japan, most of the forty-four manufacturers conduct business on only a small scale, chiefly for home consumption, says a recent article in the *World Salesman*. The variety of articles manufactured is comprehensive, including all kinds of cooking utensils, candlesticks, pipes, cigarette cases, alcohol lamps, army canteens, bottles, and various kinds of castings. Japan is entirely dependent upon the United States and England for raw material in connection with this industry, though at present, in co-operation with an American aluminum company, plans are under way for the erection of a plant in Fukui Prefecture, which, with the help of experienced American workmen, will later be able to supply the raw aluminum material needed. In 1918 imports of ingots from the United States amounted to 1,466,967 kin (kin = 1⅓ lb.), valued at 1,662,471 yen, and from England they reached 12,346 kin, valued at 13,652 yen.

Federated Malay States Gold Production

The quantity of gold placed upon the market by Federated Malay States producers was 18,309 oz. in 1918, an increase of 155 oz. over that of the previous year, according to *Commerce Reports*. The approximate value of the 1918 production was $345,157. The production of gold from the Raub mines, in Pahang, totaled 16,990 oz.

Mining Enterprise in 2020

A Concise Account of the Discovery, Examination, and Exploitation of a New Element Occurring In a Hitherto Unexplored Part of the Extreme Southern Tip of South America—Prospecting, Mining, and Reduction by Wireless Devices

By Jules Verne IV, Jr.*
Written for *Engineering and Mining Journal*

F. WALLINGCRUDE BLACKSTONE sat at his desk dribbling a small stone back and forth from hand to hand. He was evidently trying to make up his mind. If we could have looked more closely at the stone we would have noted that its black mass contained small cubes of a metallic-like mineral which glowed with a smouldering fluorescence. He had been turning over a series of reports from many professional mineralogists and chemists, the burden of which was to the effect that the metallic mineral was unlike anything that had ever been discovered. Its specific gravity was 5; it was distinctly brittle; it left a bright fluorescent streak, but it apparently had neither name nor place among the discovered minerals. One chemist who had made a more thorough investigation than others stated that the mineral was a new element and fell into Group IV, Period VII, of the Periodic Table of Elements.

The stone had been forwarded to F. Wallingcrude Blackstone by an aviator friend who, when investigating high-altitude conditions in the vicinity of the South Pole, had been compelled to land on a high plateau in almost the center of Terra del Fuego to make adjustments on his turbo-supercharger. As he was about to touch the ground he had noticed a large prominent mass of black rock, which glinted strangely in the soft rays of the setting sun. After making necessary repairs, he investigated the mass and found it to be of considerable extent. Scattered almost uniformly through every piece which he broke off were the strange crystals we have described. Knowing of the keen interest taken by F. Wallingcrude Blackstone in minerals and mines, he had sent a specimen, together with the latitude and longitude of the place, to him on returning to New York. An immediate investigation of the strange mineral had been made, with the results as already given.

F. Wallingcrude Blackstone placed the stone on his desk, moved a jeweled indicator to a number, and said: "J. Montmorency Findit?" Apparently from the air at his left a voice said: "Here, sir!" "Note these instructions and act on them immediately," said F. Wallingcrude. "Arrange with the International Electro Prospecting Company of Newark to have one of their latest Model D24, single-stage prospecting machines sent to your office at once. Leave tomorrow for latitude ——, longitude ——. There you will find a conspicuous mass of black rock showing a peculiar mineral. Ascertain the size of this deposit, the proportion of contained mineral, and such general conditions necessary for its exploitation as your judgment indicates. Have your report on my desk at 10 a. m. day after tomorrow. Good luck!"

J. Montmorency Findit leaned back in his chair, laid his pencil down, and picked up his half-consumed cigarette. Puffing away, he touched a dial indicator in his desk and said: "Is this the airage?" A voice answered at his elbow: "Right here, sir." "Observe these instructions," said J. Montmorency Findit. "Prepare two high altitude planes for immediate service. Expect party of four to leave at 8 a. m. tomorrow. Adjust latitude and longitude controls for latitude ——, longitude ——, South Hemisphere." J. Montmorency Findit then called up in turn the members of his party who were to accompany him and notified the Electro Prospecting Company of Newark. He then wandered over to his club and spent the rest of the day at a game of billiards, which, however, was not played in the ancient way by wooden cues but by an electric impulse and direction machine, which enabled a player to smoke comfortably while playing an exciting game with several opponents.

The next morning the party, consisting of J. Montmorency Findit, his assayer, K. Dore, and two assistants, climbed into the seats back of the respective pilots in the two machines, and the word was given to start. Without a sound the machines rose rapidly to an altitude of 40,000 ft., the passengers quickly adjusting the atmosphere within the closed fusilage. The assistants settled down to a two-handed game of cards, J. Montmorency Findit being busy with the final adjustments upon the prospecting machine. The pilots had little to do, for by means of the latitude and longitude control the two planes, at a fixed distance apart, went unerringly to the point selected. When they reached the locality they automatically spiraled down at 10 a. m. to the minute, within hands' reach of the black rock mass.

The Future Mode

J. Montmorency descended from his plane and lifted the prospecting machine down. He then lighted a cigarette, for in spite of the fact that he was one of the famous mining engineers of the time, he still adhered to the ancient habit of thinking through a haze of cigarette smoke. He handed two small metallic cylinders to the assistants and directed them to walk in a north-south direction at a distance 500 ft. apart, placing the little cylinders upon the ground at intervals of 200 ft. He then set up the prospecting machine, upon which were two dials, respectively marked "Quantity" and "Proportion." K. Dore took his position in front of the last named dial, J. Montmorency standing in front of the first. The machine was an automatic integrating device, which determined quantity and proportion with a single setting. After tuning the machine J. Montmorency gave the assistants the signal to start. At the end of an hour the index fingers upon the dials stopped. J. Montmorency touched a button to recall his assistants and took down the readings, which were 7,000,000,031 metric tons on the one and 5.378 per cent on the other. As soon as the assistants returned they all entered the machines and at 4 in the afternoon were at the airage in New York. J. Montmorency dismissed his assistants and hastened to his club.

The report which he submitted the next morning was on a slip of paper and simply reiterated the figures we

*The inspiration for this article is due to Mr. J. F. Kellock Brown, but he is not responsible for the vagaries of the execution, for the article has a composite authorship.

have already given. F. Wallingcrude Blackstone looked at the slip and said aloud: "An enormous quantity like that must have some use. I am going to put it up to Professor Relativity, and in the meantime I will proceed with the organization of the company." He sprang to the jeweled indicator, gave it a whirl and said: "Oh, Professor! Tune up with this office and J. Montmorency Findit. I want a conference." Thus with F. Wallingcrude Blackstone in New York on Broad Street and Professor Relativity at Bear Mountain, on the Hudson, and J. Montmorency Findit in Brooklyn, the three entered into an animated discussion, the outcome of which was that Professor Relativity was to enter into immediate research for a possible utilization of the new element and report the next morning.

Organization Preliminaries

J. Montmorency was to arrange a modern mining and reduction plant, which was to be shipped by high altitude aeroplanes within the week, and during the rest of the day he was to organize and finance a $100,000,000 company. J. Montmorency turned the company affair over to the Finance Foundation of America, and then got into wireless with the Emerald Ray Mining Machinery Company and the Airero Induction Reduction Company, and placed orders for a unit of 25,000 metric tons' capacity daily. He then arranged with the Wireless Power of America to set an extra switchboard panel in their power house to transmit 50,000 kw. daily to latitude ——, longitude ——, Terre del Fuego. With these essential details off his mind he departed for another game of cueless billiards at his club.

Professor Relativity got into communication with F. Wallingcrude Blackstone the next morning, and reported that the element had unique possibilities in that it appeared to be the unknown base out of which the individual elements were constructed. By a simple transmutation it could be converted into any metal. At the limitless possibilities, F. Wallingcrude gave a long low whistle which degenerated into a chuckle. "At last I have it," he muttered to himself. Professor Relativity continued with his report by saying: "Unfortunately I have to report that the transmutation will be very costly, prohibitive, in fact, for all metals with an atomic number between 30 and 80. I have made cost sheets for all the metals, and, comparing these with the quotations in the *Engineering and Mining Journal*, have arrived at the limits I mention. While this is disappointing, the range is such as to cover copper, lead, and zinc and a few other metals."

F. Wallingcrude slid a peculiar board from one side of his desk and touched a point on a intricate diagram thereon. Almost at once a voice was heard to say: "The latest statistical information as compiled by the *Engineering and Mining Journal* is to the effect that there is a considerable shortage in many of the base metals and that prices have been steadily advancing during the past seven decades. In fact, there is an impending shortage and little potential supply." With a satisfied smile the board was slid back to place and F. Wallingcrude turned to another set of reports.

Two weeks later F. Wallingcrude was dreaming away on other mighty projects when a voice out of the air said: "This is J. Montmorency Findit. I have to report that the plant has been installed and the first shipment will be made today. The Emerald Ray mining machine is eating into the deposit, disintegrating it into a fine powder of 60 mesh. The reduction plant receives this in a blast of air and makes a 99.8 per cent recovery. The whole plant is working sweetly and is automatic with the exception of five men, who are required to load concentrates into high altitude planes, of which a fleet has been organized. Professor Relativity has constructed an entirely automatic refining plant and is ready to receive the first shipment. Marketing of our product has already been arranged for by the Base Metal Exchange."

F. Wallingcrude Blackstone sat in deep thought for awhile, and then he made a memorandum to the effect that on the next day the directors of the new company and himself were to meet for the first time and that he would personally report the progress that had been made and which promised a huge success both financially and technically.

It was a happy group that gathered at a well-served table in the aërial gardens of a well-known New York hotel of the period. J. Wallingcrude Blackstone was at one end of the table, Professor Relativity at the other, and between were the directors and J. Montmorency Findit. At the last minute a cautious stockholder, who had dropped into J. Wallingcrude's office while he was in the midst of inviting the directors to the dinner and had been included in the invitations, dropped in and took his place. He was a meek-appearing person and scarcely filled his chair. In fact, his smooth-shaved chin just cleared the snowy white cloth.

We will not weary you with an account of the animated discussion that ensued at the completion of the meal, nor with the intricate explanations of the action of the new element by Professor Relativity, nor of the technical descriptions of the Emerald Ray mining machine, enthusiastically pictured by Findit, but it is worth recording that at the very end our meek little stockholder who had not uttered a word throughout the meeting, said:

"Professor Relativity, I would like to ask you a question. Could you have produced these base metals by the transmutations you have just described without the use of the new element?" "Oh, yes," said the professor. "We have long been in possession of the methods by which this can be done." "Well, why did the company go down and open up that mine then," said the inquisitive stockholder.

Impending Promotion Methods

The professor waved his hand as he turned to F. Wallingcrude nonchalantly, saying: "There are lots of things we can do, but we always rely upon men like F. Wallingcrude Blackstone to start them. The mine was only an accident. It served, however, a useful purpose in making possible the capitalization of the enterprise. If you will take the trouble to consult the Register of Mining History in the Bureau of Industry you will find that shortly after the Minerals Separation period, about a hundred years ago, there was established, as a principle of mining-company flotation, the rule that a mineral deposit must be developed and the quantity and grade of the orebody pretty conclusively determined before a company could be formed. Even our friend Wallingcrude, skilled though he is in financing large projects, could not have formed a company, in this instance, without filing an affidavit giving the critical facts of the case. Fortunately for us, the development of scientific prospecting apparatus enabled us to get these important data in an acceptable way. We can now shut down our mine but continue our oprations and maintain our enviable position in the metal markets."

Western Hearings of Minerals Separation Case by Federal Trade Commission

BY GILBERT H. MONTAGUE*
Written for *Engineering and Mining Journal*

THE vigorous prosecution of Minerals Separation, Ltd., for violation of the Clayton Act and the Federal Trade Commission Act, by the Federal Trade Commission, was resumed early in the summer and was continued with hearings in San Francisco, Salt Lake City, and Denver until the commission and counsel adjourned for the vacation season. Thirty-one witnesses were called by the commission's counsel, Hon. Claude R. Porter and Hon. Gaylord R. Hawkins. Among the witnesses were: Edward H. Nutter, chief engineer of Minerals Separation North American Corporation; Theodore J. Hoover, who was formerly with Minerals Separation, Ltd., and T. A. Rickard, editor of *Mining and Scientific Press*.

The Government's case was recorded with many interruptions, objections, exceptions, and arguments on the part of the Minerals Separation counsel, Alfred A. Cook, of New York. One such protest covered nine pages of the record, and was tersely characterized by the chief counsel of the commission as "camouflage." The strength of the Government's case is indicated by Mr. Cook's admission when he said, "This matter seems to be developing into a matter of considerable importance."

The royalty rates of Minerals Separation were under fire by the Government throughout the testimony of over a dozen witnesses. Counsel for Minerals Separation stated: "We have a right to deal with whomsoever we please, on such terms and conditions as we please, irrespective of the Clayton Act." One licensee, who testified that his relations with Minerals Separation had been pleasant, said, "The royalty is too high. . . . We regard it as entirely too high. . . It becomes a very burdensome charge."

Mr. Hoover, in giving his judgment on the subject, based on his extensive experience and knowledge, said, "A careful inspection of royalties charged by the flotation process, compared with the royalties charged elsewhere in metallurgical industry, convinces me they are excessive."

John V. Quigley, a Minerals Separation field man, testified, "I tried to get them to take up the proposition of securing a license with Minerals Separation company, and they told me that it would be practically impossible to pay royalty of two-fifths of a cent a pound at the present price."

A mine operator, who negotiated with Minerals Separation regarding a license, but refused when the terms were disclosed, said that "under the schedule of royalties which had theretofore been sent to him by Minerals Separation it would work out as a very great injustice to his company's particular conditions, inasmuch as it indicated a royalty of between four and five dollars per ton of ore. Such a royalty he said, was exorbitant beyond all question.

An official of a Minerals Separation licensee narrated in detail the story of "a highly dishonorable" attempt by Minerals Separation to increase the royalty rate from the agreed figure of 3½ or 4c. a ton to 6c. and later to 12c. To make its demand for a 25c. royalty effective, Minerals Separation stopped in transit necessary machinery which had been partially paid for by its client. "Mr. Nutter said that he regretted the situation had arisen, but that the London officials had refused to permit the 6c. agreement to be gone through with," said the witness. "We had already stood for an advance of 50 per cent approximately, in the royalty charge, and it was altogether unfair and improper to try and increase it 200 per cent, or up to 12c. . . . We considered it a gouge, a hold-up on the part of his company. . . . We replevined the machinery . . . refused to sign the agreement and finally they agreed to the 6c. license." Correspondence which fully substantiated the oral narrative of this attempted "hold-up" was offered in evidence.

The facts on which Minerals Separation based its charges of infringement against scores of mining companies were shown by the testimony to have been vague and indefinite. E. H. Nutter, chief engineer of Minerals Separation North American Corporation, testified: "I am not familiar with the interlocking of these different patents. . . . To tell the truth, I am not very familiar with them. . . I believe that our process patents cover, broadly, the commercial application of flotation, and where a commercial operation is going on, using flotation, that is presumptive evidence to my mind that they are infringing some one of our patents . . . the general theory being that they could not be using flotation in a commercial way without coming under some one of our patents."

Mr. Nutter told of visits to mills by his field men, and voiced the opinion that only infringers would refuse to permit the Minerals Separation representative's inspection of their plants. "They will say," said Mr. Nutter, "We are using flotation, perhaps, but we don't want you to go through! Well, that is a confession to our mind that they are infringing us there, if they don't want us to go through to see what they are doing."

"Every user of flotation not a Minerals Separation licensee is on our infringement list," said Mr. Nutter. Companies on this list were notified of their "infringement" by the Minerals Separation patent attorney, no mention being made by him as to how they were infringing or as to what specific patent was involved. Mr. Nutter first said, with regard to this infringement list of 250 or 300 names, "My opinion is that they are all infringers." Later he said: "I don't think there are that many actually operating the infringements of our patents. . . . I should think something less than one hundred, perhaps—perhaps more than that, but not nearly so many as we have on our preliminary list." From these admissions of the chief engineer of Minerals Separation it would appear that two-thirds of the notices of infringement sent out by their patent attorney were addressed to those who even Minerals Separation admits were not infringing.

In the light of this admission, Mr. Nutter's further testimony is of considerable interest. "In making the settlements," inquired the commission's counsel, "haven't you taken up with these infringers the ques-

*This summary gives the case from the point of view of the American Mining Congress, for which Mr. Montague is counsel.—EDITOR.

tion as to what constitutes infringement, and how they were infringing?"

"I don't recollect" replied Mr. Nutter, "that that has ever come up. I think it has always been taken for granted by both sides that they were infringers."

The commission's counsel brought out numerous instances in which alleged infringers, as a result of notice mailed by Minerals Separation patent attorney threatening a lawsuit, settled with Minerals Separation, although Mr. Nutter, the chief engineer of Minerals Separation, was not able to point out their infringement.

Of one operator Mr. Nutter said, "He was sinning against the law of using flotation illegally."

"How was he using flotation illegally?" asked the commission's counsel.

"I don't know," replied Mr. Nutter; "I don't recall making any investigation at all. I think his statement was the result of the letter which Mr. Henry D. Williams (Minerals Separation patent attorney) sent around generally to those on our list of infringers."

One mine operator, who testified that he had experimented with oil flotation, but had never treated any tonnage or used it on a commercial basis, produced a letter from Minerals Separation's patent attorney, in which the latter stated: "You are hereby notified of infringement of my clients' patents . . . you are thereby directed to send me a full statement of your infringing operations in accordance with the interrogatories inclosed herewith, in default whereof I am directed to commence suit against you for an injunction, profits, and damages, including a preliminary injunction at the commencement of the suit to immediately stop your infringing operations." Referring to this letter, Minerals Separation counsel said, "I think there are a great many similar to it."

Another operator told of a visit by a Minerals Separation field man, who, he said, "got into the subject of our infringing immediately." "Did he say you were infringing?" asked the commission's counsel. "Yes," was the reply. "Now, in what particular did he say you were infringing their patents?" asked the counsel. "Didn't go into particulars," said the operator. "Did he point out in any way whatever the manner in which you were infringing Minerals Separation patents?" continued the counsel. "No, merely by using flotation," replied the operator. Similar experiences were recounted by other operators.

"There are a number of the staff men," said Mr. Nutter, "who are sometimes, or have been in the past, field men, who are now chiefly engaged in litigation work in New York." This statement was confirmed by Chester B. Allen, secretary of North American Corporation, who added, "In the intervals when litigation is slack—a time that occurs very rarely—we send them out into the field."

A number of companies were segregated by Mr. Allen into the "litigation group." A letter from John Ballot, president of Minerals Separation North American Corporation, referred to "visits to important infringers, outside of the litigation group or combine."

In addition to the threats of lawsuits sent broadcast by its patent counsel, Minerals Separation suggested unpleasant eventualities through its field men. "I endeavored," testified one of the field men "to get them to come into the fold and take out a license with the Minerals Separation company, to avoid any disagreeable business that might follow up."

"What has deterred you from reopening your mill?" asked the commission's counsel of a mine operator on the stand. "Well, the price of copper, for one thing," was the answer, "and the fear of litigation." "Litigation by whom?" "By the Minerals Separation." To ascertain which of the two reasons given—the price of copper or the fear of Minerals Separation litigation—was the more cogent to the operator, the commission's counsel asked: "If you had not fear of litigation by the Minerals Separation company, and with the price of copper as it is now, would you reopen your mill or not?" "Very probably we would," he stated.

Another operator, who had paid Minerals Separation $35,000 in settlement of alleged infringement, was frank in giving his reason for so doing. "The fear of getting into a row with Minerals Separation was the only consideration in mind. . . . After talking the matter over with my counsel we both agreed that we could not get into a fight with Minerals Separation. It was not because we felt Minerals Separation was in the right—purely and simply because the cost of getting into a fight was wholly beyond what we could consider. It was purely a matter of expediency. . . . It seemed as though Minerals Separation were getting the best of it, but we felt perfectly sure they were not entitled to it."

Important and authoritative testimony was given by Theodore J. Hoover, now head of the School of Mines at Stanford University, but from 1906 to 1910 connected with Minerals Separation, and well known as the author of the first book published on flotation. Mr. Hoover visited Australia in 1907. "I found on my arrival," said Mr. Hoover, "four distinct flotation processes in operation. One known at that time as the Potter-Delprat; one known as the De Bavay process, Minerals Separation process is the third, and the Elmore vacuum process is the fourth." All these processes, stated Mr. Hoover, were being used on a large commercial and profitable scale. "During the year 1908 the Potter-Delprat process produced 65,000 tons of zinc concentrates," he said. "The De Bavay process produced 23,000 tons of zinc concentrates, and the Elmore process produced 50,000 tons." The total production of these processes was 138,000 tons, which was 11,000 tons more than the two Minerals Separation plants produced.

Regarding the present status of these operations, Mr. Hoover said, "the Potter-Delprat plant, at the time of the closing down by the recent strike of Broken Hill, was in good working order, working on as large a scale as it ever had in any of its period. The De Bavay plant had grown to be the largest plant in Australia. . . . I cannot say definitely with regard to the Elmore process."

The commission's counsel asked "whether or not each of these processes is capable of use in the competitive field generally?" "Certainly," responded Mr. Hoover, "It is not likely that any one or two or three or four of these processes would be equally adapted to the same ore."

"Do you know whether or not any of these processes that you have described have been acquired by Minerals Separation?" "Yes," Mr. Hoover replied, "I cannot fix the time, but some time, I should say, between 1911 and 1914, we were quite cognizant of a combination of the patents involved under the names of Potter-Delprat, De Bavay, and the long list of so-called Minerals Separation patents."

Mr. Hoover produced, and the commission's counsel

put in evidence, a treatise by H. L. Sulman and H. P. Picard, entitled "The Theory of Concentration Processes Involving Surface Tension," which was given to Mr. Hoover by Mr. Sulman in 1906 or 1907. The authors were at that time, and are still, consulting engineers of Minerals Separation, Ltd., and patentees of several patents now owned by Minerals Separation.

According to the chief engineer of Minerals Separation, the process of concentrating ores by means of flotation, wherein the elements are agitation, aëration, and froth formation by the use of soluble and certain other reagents, is what Minerals Separation consider their process. The statements of Mr. Sulman and Mr. Picard, two Minerals Separation engineers, whose connection with the company and with flotation matters antedates that of Mr. Nutter, form an interesting comparison, as they were not intended for publication.

Mr. Hoover pointed out statements in the treatise regarding the use of a thick coherent froth in the Potter-Delprat, the Froment process, the Cattermole-Sulman-Picard process and the Elmore vacuum process. He called attention to statements concerning the use of air or gas as the exclusive lifting force in all these processes. He referred to statements regarding the use of "a small quantity of oil, so minute as to form an infinitesimal film coating, which, to all intents and purposes, became a part and parcel of the particle in the mineral," in all of these different processes. These statements Mr. Hoover characterized as being different from the present statements of the inventors.

Mr. Hoover was asked whether his attention had been called at any time to any statements of the respondents in this case different than the statements that he pointed out to the commissioner as appearing in the treatise by Sulman and Picard? "Yes," he replied, "the first one that occurs to my mind was the statement made in this court two days ago, I think, by Mr. Nutter. . . . the general statement that anyone using the flotation process (without a license) was an infringer. . . . I think all the statements of counsel and witnesses for the Minerals Separation in the various lawsuits would be classified under that same heading, as being inconsistent with the statement of fact in the book."

Mr. Hoover told how, as a young engineer, he had agreed that after, as well as during, his connection with the company, he would maintain secrecy with regard to his work with Minerals Separation. "One of the chiefest of my own derelictions," said Mr. Hoover, "was the signing of this iniquitous contract. . . . The carrying out of that contract has been a constant burden, has been a handicap in my professional career of the most pronounced nature. It has, on occasions, caused me great mental distress, and great financial loss."

Mr. Hoover said this imposition of secrecy was carried out to the limit of human endurance and was only disregarded by him when he concluded that otherwise he became an accessory to whatever misconduct he conceived the Minerals Separation were engaged in. It was as a result of this decision that Mr. Hoover made public the treatise of Sulman & Picard, which had been withheld from the public by Minerals Separation.

Minerals Separation, according to Mr. Hoover, objected strongly to the publication of his book (on flotation), and submitted "rather ample suggestions." They also objected to the publication of articles prepared by him, both before and after his connection with the company.

"The progress of the art in this country," said Mr. Rickard, "has been retarded by the attempt to impose secrecy upon the experiments and the operations of those using the process by means, of course, of those license agreements and other methods, but more particularly by the effort to tie individual metallurgists to the chariot wheels of this patent-exploiting agency."

Thomas Varley, superintendent of the Salt Lake City experiment station of the U. S. Bureau of Mines, was asked: "From all your investigations, as an official of the U. S. Bureau of Mines, can you tell whether the effect of the attitude of Minerals Separation company and its license agreement has been to increase or retard the saving of mineral waste by the flotation process?" "Their attitude," responded Mr. Varley, "has been to retard the development of the flotation art."

Another metallurgist of the Bureau of Mines, Will H. Coghill, was asked: "Would you say, having in mind the license agreement that you say you have read, the attitude that you have described in the press on the part of Minerals Separation company—would you say as a student, an observer and an expert on flotation, that Minerals Separation company's efforts have been to retard the development of the art of flotation, or have they been to assist in its development?" "Tending more to retard than to accelerate," was the answer.

"I might add that it is our belief," said the chief engineer of North American Corporation, "that our technical knowledge of the use of flotation alone, if there were not any patent at all, is worth more than the royalty to our licensees—just our knowledge of the technique."

Testimony of licensees and others has already been quoted with regard to the royalty rates charged. It remains to report what was said by some licensees concerning the value of the respondents' technical knowledge of the flotation process.

"Were you satisfied," asked the prosecutor of one Minerals Separation licensee, "with the results that you were obtaining under their process?" "Oh, no," was the answer. "Mr. Nutter sent a representative at the time the plant was installed, and the results hardly came up to expectations, and since then we would send down ore to Mr. Nutter, and they would make experiments. . . . One of their suggestions, I think, was beneficial; but aside from that I don't think there was much that helped." After stating that a point was reached where Minerals Separation apparently could be of no further help to them, the witness told of consulting an outside metallurgist, acting on his suggestions, and raising their recovery 16 per cent above that attained with the assistance of Minerals Separation's technical knowledge.

A letter from Mr. Nutter to another licensee was quoted, in which Mr. Nutter said: "I think I should say from the tests we have so far made it can be assumed that from the ores amenable to flotation a little bit better than 90 per cent can be expected in a concentrate."

"After you started the mill," the commission's counsel asked an operator, "what recoveries did you make?" "We made very poor recoveries," was the reply. "In July, we made 54 per cent recovery; in August, 62 per cent; in September, 60 per cent." Minerals Separation was then asked for assistance, the operator stated. "We made some changes at his suggestion," he continued, "and it looked promising for a few days, but it did not last. . . . I wrote Mr.

Nutter very earnestly that we were in a very bad way, and I felt that they were largely responsible, and that they should accept the responsibility of getting us on our feet. . . . I was discouraged over their failure to help us, and in casting about for chances for relief I wrote to Mr. Will H. Coghill, of the Bureau of Mines. . . . The chief objection of Minerals Separation company was that we were not grinding our ore fine enough. . . . Mr. Coghill told us we were using improper oils and we were grinding our ore too fine." Following Mr. Coghill's instructions, the ore was ground coarse, and the oils were changed, stated the witness. "In October," he continued, "the per cent of recovery was 67; in November 80; in December 82.7; in January 78; in February 73.6; in March 74.1. I might say in regard to the decreasing recovery in the last two or three months that we were approaching the surface with a large stope, and found a great deal of oxidized material."

After this testimony, counsel for Minerals Separation stated, "I would just as leave concede that Mr. Coghill went there and that his operations were better than ours."

The Minerals Separation license agreement was again under fire by the Government. An operator who negotiated with Minerals Separation for a license, balked at the royalty and the license agreement. "The royalty," he said, "seemed prohibitive, and to give a warranty deed on the brains of our organization for any improvement we might discover seemed ridiculous."

Another operator refused to disclose his secret processes to Minerals Separation. "There were certain processes or steps in our work that I am not willing to advise anyone regarding; there were certain fixtures and various chemical treatments that we had discovered ourselves; I said, 'As to the various constituents we are using in addition to oil, that is where I draw the line,' because I thought that was our own private property that cost us a lot of money to find out."

Mr. Varley, of the Bureau of Mines, testified that one company had not installed the flotation process, due to rather complicated conditions in the metallurgical practice, that is in the art of flotation, and due to the fact that the contracts which were presented by Minerals Separation company were not attractive. Of another company he said, "My investigation showed that the reason for not installing the system was due to the cost, and the unattractive license presented by the Minerals Separation."

Another witness, who declined a license, said, "I told him (the Minerals Separation representative) I thought the royalties were excessive, and that I also very seriously objected to the clauses which provided that we had to release all inventions or improvements to the Minerals Separation company."

A manufacturer of flotation machinery told of one mine operator who stated that he would not purchase a machine as long as the Minerals Separation company offered such impossible contracts. "He would not put in a flotation machine," said the witness, "until the Minerals Separation company permitted people to operate under their contracts in such a form that they could make money without paying exorbitant rates, and without the all-around disagreeable methods of doing business with them."

"I have always objected," said another witness, "to some of the clauses of their contract—the clause requiring employees to sign contracts to report their improvements, etc., to the Minerals Separation."

"In regard to the use of Minerals Separation and Callow machines in conjunction," said Mr. Nutter in a letter to a prospective licensee, "I think it rather likely that Minerals Separation would not look with favor on this, as the Minerals Separation alone can be depended upon to give a maximum result."

"I instilled some doubt in his mind," reported a Minerals Separation field man regarding his interview with a prospective licensee, "that the Hyde machine which he was installing in one of his mills would do satisfactory work." Mr. Nutter supplemented this by saying, "I think possibly they (Minerals Separation field men) had rather a poor opinion of it (the Hyde machine) . . . I have an idea that there are two machines that Mr. Hyde has gotten up. . . . . One was a pretty close imitation of what we call our standard machine, and another was a pretty close imitation of the so-called Callow machine. . . . I think some engineer told me it was not much good."

A Minerals Separation licensee testified that their consulting engineers had recommended the installation of Janney flotation equipment, but, he said, "Mr. Nutter said at that time they were not encouraging the installation of the Janney machines, and it would be quite necessary for me to secure the written consent of the company to make the installation. . . . He doubted whether it would be granted; hardly thought it would. . . . In reply to my question as to what might happen, he thought our license might possibly be revoked if we went ahead and made this installation without the consent of the company." Minerals Separation machines were accordingly installed at the company's plant.

Negotiations were described between the Stimpson Equipment Co., which sells the Janney machine, and Minerals Separation, with a view to effecting an agreement for their sale to Minerals Separation licensees. The terms stipulated by Mr. Nutter were objected to by the Stimpson company. For the privilege of selling their patented machine to Minerals Separation licensees, Minerals Separation asked 25 per cent of the gross profits and the sole license for the machine. "The objections we raised to it," said the witness for the Stimpson company, "were that we thought 25 per cent of the gross profits was too much, that we did not see why we should have to let Minerals Separation become sole licensee of the Janney machines." No contract resulted from these negotiations.

The comparative test of the Janney and the Minerals Separation machines at the Ohio Copper Co.'s plant, results of which were circulated by Minerals Separation as demonstrating the superiority of their machine, was delved into by the prosecutor. The witness, who was general manager of the Ohio Copper Co. at the time of this test, testified that the Janney machine used was a cast-iron affair, bought for experimental purposes, and that at the time of the test with the Minerals Separation machine it was badly eaten out and corroded. The Minerals Separation machine, on the other hand, was new, and of their standard type of construction. "My conclusion," said the witness, "was that the Janney machine did slightly better metallurgical work than the other."

The hearings are to be resumed, it is understood, at the office of the Federal Trade Commission in Washington in the late fall.

Mining Engineers of Note

William Young Westervelt

IN THE ever-changing order of things today, it is refreshing to find consistency—consistency of purpose, of interest and of endeavor. After a quarter of a century the Ducktown Basin of Tennessee remains the dominating interest of William Young Westervelt.

Graduating from the Columbia School of Mines in 1894, Mr. Westervelt took his first job, that of chemist and surveyor, with the Ducktown Sulphur, Copper & Iron Co., Ltd. Later he became the company's engineer, then superintendent, and in 1898, when he entered consulting practice in New York City, he was retained as consulting engineer and was responsible for the development of the Ducktown company's mines. The same thoroughness which characterized his success in this enterprise has been evident in other undertakings. In 1905 Mr. Westervelt, as consulting engineer for the Anglo-American Copper Co. of London, directed and developed the Ray property to the point of successful sale to the present owners, the Ray Consolidated Copper Co. It is interesting to note in this connection that it was due to Mr. Westervelt's advice that the system of horizontal drifting in exploratory work was replaced by vertical drilling in that district, where the flat-lying orebodies lend themselves favorably to the latter method. In 1909, as consulting engineer to the Grasselli Chemical Co., Mr. Westervelt developed and organized the New Market zinc property at New Market, Tenn., and also valued for the first bond issue the Butte & Superior property at Butte, Mont. In 1910 he examined the copper mines of the New Lymni, Ltd., on the Island of Cyprus, in the Mediterranean Sea. As consulting engineer for the Wilkes-Barre Dredging Co. he organized the gold properties of that company in Folsum County, Cal., during 1914, and in 1916 he prepared a report on the pyrites resources of the world.

WILLIAM YOUNG WESTERVELT

It was the consideration of these signal accomplishments that decided the American Institute of Mining and Metallurgical Engineers and the Mining and Metallurgical Society of America in their designation of Mr. Westervelt as a member of the War Minerals Committee at Washington in 1917. As chairman of that committee he directed the preparation of the War Minerals Bill, the utility of which is generally known, and although the ending of the war terminated the necessity for passage of the bill and the further need for the committee, there remains no doubt as to the value of the work which was done by Mr. Westervelt and his associates.

Recently Mr. Westervelt organized the Copper Pyrites Corporation, of which he is president, in the Ducktown mining district of Tennessee. He is at present giving most of his attention to the development of the iron and sulphur resources of the Ducktown Basin, and it is safe to predict that the next few years will see great strides made in the treatment processes now being used in that district. In addition to his membership in the American Institute of Mining and Metallurgical Engineers and the Mining and Metallurgical Society of America, of which he is vice-president, Mr. Westervelt also is a member of the American Electrochemical Society and the American Mining Congress. He holds fellowships in the following: American Geographical Society, Royal Society of Arts (London), and the North British Academy of Arts. Although Mr. Westervelt's contributions to technical publications have not been numerous they make up in quality what they lack in quantity. His well-prepared chapter in Robert Peele's "Mining Engineers' Handbook," "Mine Examinations, Valuations and Reports," is exceptional in its clearness, and the examples given to illustrate various points leave no doubt as to the author's meaning and his complete familiarity with the subject. He has also written several valuable papers on shaft sinking and similar subjects.

Mr. Westervelt, during a recent interview, assured a representative of the *Engineering and Mining Journal* that he had met with no exciting adventures during his career, that his life had been devoid of "thrillers," and he had led the existence of an ordinary, typical mining engineer. Some of this may be true, but to the last statement we take exception. No "ordinary" engineer could fill the enviable record Mr. Westervelt has made. His familiarity with organization, thoroughness of execution, urbanity, and a keen interest in the affairs of engineering and engineers make William Young Westervelt an outstanding figure in his profession.

By The Way*

Tipped With Iron

Iron nails are acceptable in Soviet Russia as tips for courtesy or service, according to an Associated Press dispatch from Germany. Members of the German Economic Mission to Russia are said to have advised Herr Crispien to fill his pockets with nails on setting out on a journey through that country. One immediately thinks of all the little tips that could be taken from father Hindenburg's statue if it were still standing. But there is nothing new in the use of iron for currency. The ancient Greeks so used it, and the student doubtless remembers how one of them had to hitch up a yoke of oxen to carry $20 or so with him when he went traveling. If iron is so valuable in Russia, the junk man must be king, or would be, were it not for the Soviets. With equipment rapidly being reduced to junk from breakdowns and lack of spare parts, it seems as if a reel of baling wire would carry a traveler further than a pocketful of nails. Indeed, under the existing conditions it looks as if there might be several good opportunities in various plants in Soviet Russia for master mechanics having experience in making quick repairs solely with baling wire. Joplin papers please copy.

Possibilities of Tin

Henry Ford is said to have a "synthetic metal" that is to replace vanadium in construction of automobile chassis. According to reports, however, Mr. Ford refuses to confirm or deny the story. Is it possible that after all a synthetic process for making tin has been discovered? If it be true that tin can be successfully substituted for vanadium in making automobile parts, then the same metal can also be substituted for vanadium in making the countless other things for which vanadium steel is employed, all of which, if true, may keep vanadium producers awake nights. Mr. Ford has already invested in iron mines in northern Michigan. If our surmise about tin be true, we shall not be surprised at all if, by chance, we hear that Mr. Ford is seeking to acquire tin mines in the Black Hills of South Dakota, a locality that has already produced an infinitesimal part of the world's tin, with the production steadily becoming more and more infinitesimal as the district grows older. We had hopes a while back that South Dakota's tin output in 1920 would show an increase that would augur well for the future, but these hopes were dashed when a notorious non-producer almost produced but didn't. Still we have faith in Mr. Ford's productive genius, especially where tin is concerned. We are certain that if Mr. Ford undertakes to mine tin in the Black Hills or any other hills he will mine it, if he has to put it there first himself. If tin should come to be mined on a large scale in the Black Hills, and if Mr. Ford should invest in tin properties there, Hill City or some other mountain city there might eventually be chosen for the site of a great automobile plant, if there really is anything to this synthetic tin that we started to talk about. But we don't believe it.

A Metropolitan Gold Mine

Why journey from New York to see a gold mine, when all one has to do is step into the office of Glaus Consolidated, Inc., on Broadway, drop into an easy chair and by the aid of the magic carpet of the movies be transported to the Golden Chief mine, which is in "Yavapia" County, in the heart of the richest mining district in Arizona? "Here you can see the land surrounding the Golden Chief (to quote from the company's prospectus), including the ranch, orchards and the mine itself. See the ore dumps, the railroad, and supply depot at Turkey Creek. Then travel along to Humboldt, where the mammoth smelters are located. See how the ore is handled from the time it leaves the mine until it is loaded, in ingot form, into cars ready for shipment. It's an interesting, educational picture, which you will enjoy. It will do more than words can to vividly portray this eldorado to you." The company's property consists of 240 acres. To quote further:

> The ore is very favorable in having a very rich deposit of Silica and also having the formation of a granite schist with a quartz base. Golden Chief is being actively operated right now. In fact a 100-ft. tunnel has been installed and we are about to crosscut on the vein, and by diamond drilling will eventually come to our rich ore deposits.

There is no serpent in this Garden of Eden. The workers are happy and contented. Welfare work is unnecessary. Comfortable homes, a fruit orchard, truck gardens and a ranch, a half-mile away, all will help keep down the labor turnover. For the thirsty there is an abundant supply of good—yes, water, from Dripping Springs, another camp luxury, which the company's men are not denied. The company, indeed, has a gold mine right in its own office.

From Our Own Sermon Barrel

How hard it is for a rich man to enter Heaven! The acquisition of wealth is often but a stepping stone to irreligion. No sooner do some amass a few ducats than they stick up their noses at their household gods and all the other deities, and go straight to the devil. Nothing is sacred to them any longer. We had supposed that there was one law so sacred, so sacrosanct, that none knowingly would dare flout it, namely, the law of supply and demand, the law which economists, editors, and even plutocrats have always spoken of with bated breath, as though it had a name that might not be uttered. This is the law that must be allowed to work without interference, even though it kill in the act of working, just as the car of the Juggernaut crushes the devotees in worship before it as it passes on. What tears have been shed at its violation by the Food Control Act and other nefarious acts during the war! Yet recently one of those in high places, President Breitmeyer, of the Diamond Syndicate of London, has forsaken the faith. He states that diamonds will not decline in price, no matter what happens to other commodities. As far as diamonds are concerned, President Breitmeyer's syndicate has the world by the tail, for it controls 90 per cent of the diamond industry. Let the law of supply and demand act, we beseech you, Mr. Breitmeyer, even though diamonds are one of the necessities of life.

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*Editorial Notes

This page is not to be taken seriously. If our attempts at occasional humor are not detected as such, we at least wish to disclaim all responsibility. Our chronicling in a recent issue of the new German scheme for extracting gold from sea water has brought us in an honest offer to raise money for subscriptions. We have thought of labeling each of our whimsical paragraphs "Joke," but have concluded that perhaps a general notice will serve.

CONSULTATION

Liquid-Oxygen Explosives

"The principle upon which liquid oxygen is employed as an explosive is not quite clear to me—is it the physical property of the material that is relied upon to act? Is the explosive used to any extent commercially in this country? Where can I get further information?"

The use of liquid oxygen as an explosive is not new, as twenty-three years ago experiments showed that this material could be used as a powerful explosive. The principles upon which the explosive nature of liquid oxygen depend are both chemical and physical, but mainly chemical. Liquid oxygen alone is not utilized but is mixed with some carbonaceous material and the powerfully explosive mixture ignited. The rapidity with which oxygen will unite with finely divided carbon or carbonaceous material when intimately mixed with it is sufficient to generate great explosive force. The more condensed the oxygen (a greater amount for the same volume), the more violent is the explosion. Thus liquid oxygen, being very condensed and intensely cold, is employed. Liquid air has also been used, but as its explosive power depends upon the oxygen content, it is not as efficient as liquid oxygen.

The great drawbacks to using liquid oxygen as an explosive are the necessity of having an installation of a plant to liquefy the air, and the fact that ignition of the charge must take place within a very few minutes after setting it. On the other hand, this type of explosive is less dangerous to handle than dynamite or black powder, though care must be taken not to be "burned" by the exceedingly cold liquid. Misfires are not dangerous, as the unexploded oxygen evaporates in a relatively short time. Other advantages are claimed for the use of liquid oxygen, such as lower costs per unit of material blasted and elimination of the storage danger common to other explosives. The advantages claimed for the use of liquid oxygen explosives appear attractive.

Liquid oxygen has not been used commercially in this country so far as we are aware, and any introduction will have to overcome the familiarity of the miner with the present-day practice of using dynamite and black powder. The U. S. Bureau of Mines experimented with the material and reported upon the development of this class of explosives during the stress of the war, and has issued a Technical Paper, 243, upon the subject.

Uses and Production of Selenium

"Will you kindly tell me where and how much selenium is obtained in the United States, and what its chief uses are?"

The production of selenium in the United States is almost entirely confined to the electrolytic copper refineries of the country, which recover the metal from the sludge as a byproduct. In 1919, according to the U. S. Geological Survey, 60,025 lb. of selenium, valued at $125,966, was recovered in this fashion, compared with 103,694 lb., valued at $206,540, in 1918, and 39,630 lb., valued at $70,000, in 1917, indicating a high'y variable production for the past three years.

The demand for the metal is slight. It is used chiefly in the glass industry, in photographic chemistry, and for medicinal purposes. The peculiar electrical property which selenium possesses of having a varying conductivity, according to the intensity of light to which it is subjected, has led to its application in electrical work. Under the influence of light its conductivity may be 500 times more than its "dark" conductivity. It has been recently reported that as the result of research work at the University of Wisconsin by Prof. Lenher another property of selenium has been discovered which is likely to increase the demand for the metal. The discovery was made that selenium oxychloride acts as a strong solvent on certain organic substances. The unsaturated hydrocarbons such as acetylene, benzine, and toluene, dissolve readily, whereas the paraffine hydrocarbons are unaffected (vaseline, paraffine wax, gasoline). Pure rubber, asphalt, bitumen, and the casein glue used in aëroplane construction dissolve easily in selenium oxychloride, and it can be used in coal analysis to extract the bituminous material in soft coal.

The present price of selenium is between $2 and $2.25 per lb., practically the same price as in 1918 and 1919.

The Market for Quartz

"I see an advertisement in *Engineering and Mining Journal* for quartz rock at from $5 to $17.50 per ton, according to size. Will you kindly advise me what this quartz is used for, and if there is a ready market for any or all quartz that I may be able to produce. I am working on a copper mine [North Carolina] that has considerable quartz, which I should like to place on the market if the price justifies my doing so."

The quartz quotations as given by *Engineering and Mining Journal* refer to various grades of the material as used for different purposes. The largest size, "fist to head," which designates that the pieces of quartz vary from the size of a fist to that of a head, is used as a filler in the acid towers employed in chemical manufacture; the larger sizes of quartz are also used as fluxes in copper smelting. Crushed and graded to various sizes, quartz is used in making sandpaper and sand belts, in sand-blast apparatus for "frosting" glass, and for numerous other purposes. The finely ground quartz may be used in filters, by dentists in cleansing the teeth, and in tooth powders.

The quartz that is mined in North Carolina is used chiefly in packing acid towers, although part of it finds application in the manufacture of acid-proof cements. It would thus appear that the best market for material mined in that state is its employment in the chemical manufacturing industry.

Method of Marketing South African Gold

In the Oct. 16 issue of *Engineering and Mining Journal* the last sentence of the article "Method of Marketing South African Gold," should have read " . . . about 117*s.* is now being received for the *fine* ounce"—a *standard* ounce is ½ a fine ounce. Of course, as pointed out in the first paragraph, the payment for gold is made in depreciated paper currency, in contrast to pre-war payments with currency on a par with gold.

HANDY KNOWLEDGE

Patching the Roofs of Copper Reverberatory Furnaces

BY GEORGE J. YOUNG
Written for *Engineering and Mining Journal*

Patching reverberatory roofs may involve the replacement of a comparatively short longitudinal length up to as great a length as 35 ft., dependent on local failure or the general weakening of an entire section of the reverberatory. Where a reverberatory is to be shut down, the construction, whether of an entire roof section or a part only, does not involve any features particularly different from those used in its initial construction. If the furnace is in use and the requirement is put up to the mason to construct the patch in the most expeditious manner possible, considerable opportunity is offered for skill in devising methods.

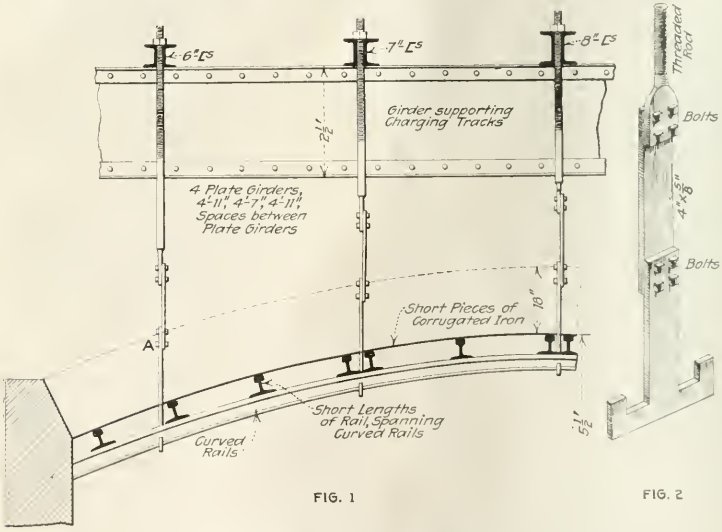


FIG. 1. METHOD OF SUPPORTING TEMPORARY BED FOR BRICKWORK
FIG. 2. SKETCH OF HANGER

One method is to fill the furnace space with calcine, flue dust, or crushed ore, after allowing a cooling interval sufficient to permit the workers to get at the furnace. This material is charged into the furnace through the opening made after breaking down the roof within the limits of the patch. It is rounded off to conform to the radius of the roof, making a center upon which the masons lay the arch. On completion, the filling is dragged out through side doors. It is evident that a considerable amount of labor and time is required. Another method requires a considerable time for cooling before work can begin. When the furnace has cooled sufficiently to permit the workmen to begin, a wooden arch centering is constructed, following the pattern used in the initial construction of the furnace. On this the roof is laid, and when completed the wooden centering is removed from the furnace through the bridge wall or side doors.

A third method in use by the Arizona Copper Co. at its smelter in Clifton, Ariz., has the merit of simplicity, reduces the time for cooling and the labor and time in constructing and removing arch centering, and effects a saving in material. The significant feature is a steel hanger, Fig. 2, which supports a light steel centering constructed of steel rails. The hanger consists of two parts, an upper threaded rod which is bolted to a ⅝ x 4-in. flat plate and a lower part which is bolted to the upper flat plate. On the lower part is a "tee," in which there are two receptacles for steel rails. The threaded rod is supported by a nut, which bears upon a pair of channel irons and enables the rods to be adjusted to the necessary height of the roof, as shown in Fig. 1.

The pairs of channels are supported on the track girders, which extend across the reverberatory roof at the charging end, the part of the reverberatory roof subjected to the greatest heat and most excessive corrosion. Five pairs of channels are used for the full width of the roof, the center pair being 8-in. channels, the two contiguous pairs being 7-in. and the outer pairs 6-in. Curved rails conforming to the radius of the roof are placed in the hangers and short lengths of rail across these. On the top of this centering, second-hand corrugated iron or tin plate is placed. A small amount of fine ore or flue dust is used to level up the inequalities of the surface, after which the centering is ready for the construction of the arch. On its completion the hangers are unbolted at "A," Fig. 1, and the steel centering is dropped. It is dragged out through the side doors, and the furnace is ready to resume operations.

In one case where a 35-ft. patch was necessary the reverberatory was shut down at 2 a.m. At 7:30 a.m. the repair gang went to work, and in 5½ hours the steel centering had been placed. Twenty hours was required for the mason work, using two masons and three helpers, and the steel was pulled by the furnace crew in two hours, making a total of 32½ hours for the completed job.

The method just described is in use at a number of smelters in the Southwest, and the novelty in this instance is its use for making larger patches than at other plants. The details were worked out by J. Owen Ambler, smelter superintendent for the Arizona Copper Co., Ltd., and his staff.

THE PETROLEUM INDUSTRY

Liquid Fuels—Wanted: A National Policy

Consideration Should Be Given to the Need for Securing Maximum Oil Production, Reduction of Consumption, or the Finding of New Sources, to the Obtaining Of Substitutes and to Adequate Distribution of Available Supplies

BY R. S. McBRIDE
Written for *Engineering and Mining Journal*

ONE day we read of the curtailment of Mexican oil supplies by a new revolution and the domination of the world petroleum markets by Great Britain. The next we are informed that the petroleum interests in Mexico are to be fully protected by the provisional government, and that Great Britain would not think of interfering with United States petroleum development or of attempting any of the unreasonable things which are charged. As a consequence, an uncertain state of mind has been developed with respect to the imminence of the liquid-fuel shortages which we know must ultimately confront this country. It is not worth while to speculate respecting the merit of these claims as to Great Britain, Mexico, Persia or any of the rest, for at best it would be speculation. It is worth while, however, to raise the more important question: What is going to be the United States policy with respect to the future of liquid fuels?

NEED OF A UNITED STATES FUEL POLICY

When the need of a national policy is suggested it is not meant that the Government should enter the petroleum business to direct or interfere. The industry must serve itself; but it must do this along national lines, and intelligently. Paternalism is not a successful stimulent; it is rather a prop for weak industries. Petroleum, or rather our liquid fuels, do not need such a cane or crutch. They need only a tonic for the nerves and then a vigorous prod from the rear to start things into action along the right line.

The needed national policy will consider three things:

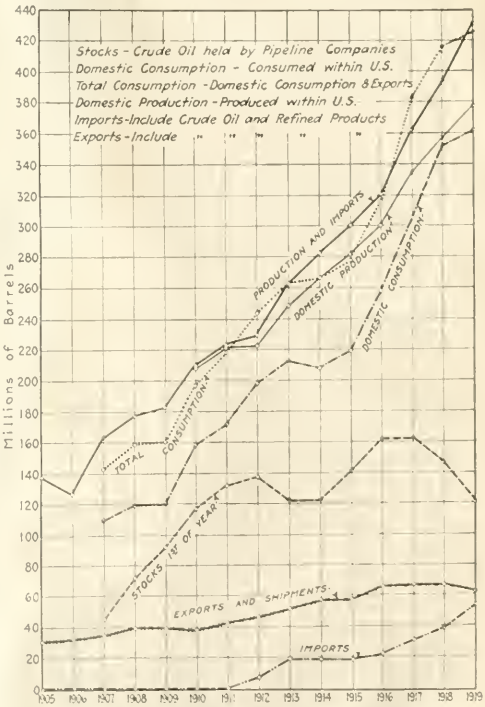
1. How can we secure the maximum petroleum production and delivery to markets, and what will this maximum be?

2. What substitutes or supplements in liquid fuel supply can be produced, and in what quantities?

3. How can the available supplies be best distributed among the various classes of users, when the total demand exceeds the available supply?

These three questions would each justify extended discussion, but for the present article they can be treated only briefly to show the need of further consideration on a broad basis.

One need not worry as to details or exact figures regarding petroleum resources or consumption of the next few years. It makes little difference, indeed, as to whose figures or interpretation of figures is used; there are at least three outstanding facts that are undisputed: (1) The United States still produces more than half of the oil marketed in the world. (2) At the same time, the United States uses about 80 per cent of the world's output. (3) The United States has approximately 10 to 15 per cent of the total known oil reserves of the world. These three facts are generally agreed upon, and almost any interpreter of them will agree that we are prodigal in this line as elsewhere and have rapidly built up so-called "essential" uses beyond our means of supply.

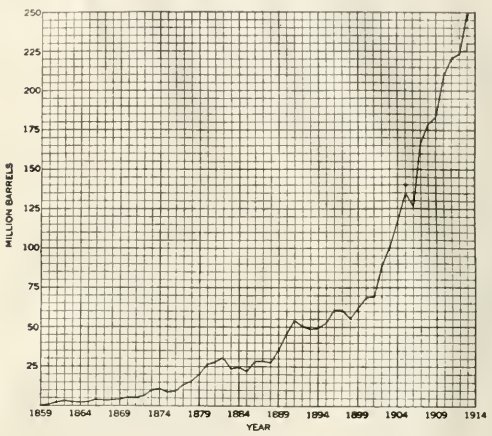


UNITED STATES PETROLEUM AND PRODUCTS
(Courtesy Bureau of Mines)

We can accept any of the several estimates of petroleum reserves, six, or eight, or ten billions of barrels, and then may use any particular system of estimating the rate at which consumption is going to increase, either gradually or by continually progressing steps, as in the past, and we have the same result. The best we can make of the situation when we set production and consumption figures side by side is to admit that with

petroleum alone we cannot maintain the present pace. David White, in a recent statement, summarizes the situation as follows:

The recoverable oil in this country, according to the conservative estimate, would probably be practically exhausted in seventeen years if the 1919 rate (nearly 380,000,000 bbl.)



ANNUAL PRODUCTION OF PETROLEUM IN THE UNITED STATES
(Courtesy Bureau of Mines)

of production could be maintained for so long, while a reserve of seven billion barrels, a moderately liberal estimate, would disappear in eighteen and one-half years.

Whether we agree exactly with this part of his statement or not, we cannot deny his later statement as follows:

The production of natural petroleum in the United States must pass its peak at an early date—probably within five years and possibly within three years—though the long sagging production curve may be carried out beyond the century. . . . The output of oil in 1919 could only with great difficulty be made to increase abreast of the increase of consumption in 1919, and possibly within three years and very probably within seven years, the production of this country would pass its climax, notwithstanding the growing deficiency as compared with the needs of the country.

Even the most sanguine, therefore, will have to agree that we are doomed either to reduce our liquid-fuel consumption or new sources must be sought. For the present article we go only this far in the discussion of the first question of national policy above mentioned.

Supplementary Supplies and Substitutes

The second question in national policy demands consideration of the substitutes and supplementary supplies of liquid fuel. Most discussions of this subject have given principal consideration to only one or two of the several possibilities. As a matter of fact, all means for supplementing existing liquid-fuel supplies are needed. Even taken together they are not enough adequately to satisfy the total of the liquid-fuel demands of the country.

The most obvious means of augmenting liquid-fuel supplies is, of course, increasing domestic production. An increasing import of foreign production, or, what is equivalent, a decreasing export, would work to the same end. The less obvious but equally effective method of increasing the efficiency of use, thereby decreasing demand, also requires consideration. These three considerations taken together afford the major means of supplementing the petroleum supply on which the United States must depend.

The question of substitutes is, however, quite a different one. Shale oil will in time become available in tremendous quantities in this country. It has afforded, therefore, a basis for most spectacular prophecy of new resources to substitute for petroleum. Alcohol and benzol from sources such as fermentation, coking of coal, and others offer promise on a smaller scale as substitutes for certain petroleum fractions, particularly gasoline. None of these suggestions, however, rival shale oil in available quantities nor general applicability of the liquids available.

Use of Coal, Byproduct Gas, and Electricity in Place of Petroleum

A third group of what may be termed petroleum substitutes is found in a field foreign to liquid fuels. Materials in this class are powdered coal, coal-oil mixtures, byproduct gas, and even electricity. These sources of heat, light, and power would, of course, readily lend themselves to many of the purposes for which petroleum is now applied. In any general discussion, therefore, the possibilities in these directions must be considered carefully.

An extended discussion might be developed of all these varieties of supplementary or substitute materials. For the present article, however, they cannot be considered in detail. As clearly pointed out, all materials and methods, taken together, are not enough to bring the present supply up to the total demand. For this reason, it is more profitable for the present to turn to the third national question as to how the available supplies can be used to best effect during such period of inadequacy.

Present Applications of Petroleum

It is not practicable to give any exact statement of the present uses of petroleum, but an excellent idea of the principal application is obtained from the Bureau of Mines figures of refinery output in this country during 1919. The important points in this summary are as follows:

Product	Output in Millions of Gallons
Gasoline	3,958
Kerosene	2,342
Gas and fuel oil	7,627
Lubricants	847
Miscellaneous	1,279
Total	16,053

The gasoline goes principally into automotive and other internal-engine uses. The kerosene is to some extent used for internal-combustion engines, but primarily is an illuminant. Lubricating oils have obvious application. The gas and fuel oils go into naval and marine-engine and power-plant applications, to the water-gas and oil-gas manufacturer, for a wide variety of industrial heating and steam raising, and to some extent to industrial chemical applications. The miscellaneous output is made up of specialized products which are applied in many fields, partly as fuels but also largely for other uses, such as inks, medicinal products, paints, road oils, and other minor uses.

A still more significant method of classifying the present distribution of petroleum was used by the U. S. Geological Survey in its study of the fuel and gas oil

requirements. This bureau summarizes some of the major demands in this field from official sources as follows:

	Barrels
Shipping Board—for merchant marine (1920)	40,000,000
Shipping Board—for merchant marine (1921)	60,000,000
Navy requirements (1918-19)	5,500,000
Navy requirements (1920-21)	8,000,000
Railroads (1918)	36,700,000
Gas manufacture	25,000,000
Other public utilities	11,000,000
Crude oil used on leases	5,700,000
Total accounted for (1920, approximately)	150,000,000

This tabulation is by no means a complete representation of fuel-oil demands, but it indicates the order of magnitude of the requirements of some of the principal users that have been conspicuously in the market during recent months. They, indeed, represent over 60 per cent of the United States fuel-oil requirements at present. The notable increase in the requirement of the merchant marine and Navy is a point that should be particularly considered in this connection.

Ranking of the Petroleum Users

Not all users of petroleum products are in competition with each other for their supply, because certain of the products are available only for a limited variety of uses. It is undoubtedly worth while, therefore, to consider the relative importance of the various demands for these materials. As a result, we can gain at least some measure of the economic justification of these applications and establish what might be termed an economic priority list for petroleum.

It is not intended to suggest that the Government should now establish any machinery for classifying petroleum uses or enforcing of priorities. The question may well be asked, therefore, as to what application is intended for any such preference list. Certainly, under our present scheme of regulation of industry, we cannot expect that a co-operation of petroleum producers will undertake to establish a distribution system giving priority to certain classes of users. Even if they wished to do so, the existing law forbidding such means for restraint of trade would prevent. On the other hand, that users will of their own volition comply with any schedule of priorities that may be advanced or suggested is beyond belief.

Despite these facts, there still remains an important function to be served by a system of classification of users of petroleum. This function is the direction of thought of the industry toward reasonable trade practices for the best interest of the industry, and the similar guidance of engineering plans by users of petroleum who must of necessity sooner or later be confronted with some limitations upon the purchase of liquid fuels. If we can establish even approximately what is to be, in the more or less immediate future, the order in which petroleum preference is granted, it will become a much simpler problem to determine where and in what manner essential liquid fuels are most advantageously to be applied.

News From The Oil Fields

Continental Mexican Brings in First Well in Chinampa Field

Several Companies in Tampico Region Pass Million Mark in September

From Our Special Correspondent

Another big gusher was brought in recently on the Continental Mexican Petroleum Co.'s Lot 95, Chinampa. It is estimated that the daily flow is in the neighborhood of 60,000 bbl. The oil was found at a depth of 2,083 ft. After closing the gate valve it was found that there was a leak between the 8¼-in. and the 10-in. casing which was flowing about 600 bbl. This was soon closed off tightly and no further trouble expected from it. This is the first well drilled in this field by the Continental Mexican Petroleum Co., as they have just recently commenced operations. They have a flow tank station at Palo Blanco, and their terminal and tank farm is opposite Tampico on the Panuco River.

The Compania Mexicana Petroleo, "El Aguila," lost their sixth 55,000-bbl. tank within the period of one month when their tank No. 116 was struck by lightning and destroyed. Much of the oil was saved by pumping it out of the tank but the estimated loss is $60,000.

Several of the companies passed the million barrel mark in September exports. Among the "top-notchers," are the Huasteca Petroleum Co., the Island Oil Co., and the Cortez Oil Corp.

Change in Mexican Petroleum Tax Considered

Petroleum companies have completed payment of their export taxes for July and August, the amount of revenue received by the treasury totaling more than 8,500,000 pesos. Announcement is made that more than 2,000,000 pesos paid to Gen. Pelaez and other revolutionary leaders would be applied to account as tax payments.

Consideration is being given complaints by oil companies relative to methods adopted for fixing the tax rate, and it is planned to change the system so that the average selling price for a period of six months will be taken as the basis, instead of prices for two months.

The Bolin Oil Co., of Casper, Wyo., has acquired leases on an extensive acreage near Round Butte, Col., 20 miles north of Fort Collins. Drilling will be started soon on the Grimes ranch in this leased area.

Controversy Over Oil Lands in Utah

From Our Special Correspondent

Interest in the oil fields of the San Rafael swell in Emery and Grand Counties, Utah, increases since the passage of the Federal Leasing Bill, which throws open large areas to development, and a controversy as to the ownership of certain sections has arisen between the state and Federal governments. The land in question comprises Sections 2, 16, 32, and 36 in each township in the San Rafael section, and the matter of ownership hinges on the question as to whether it was known to be mineral bearing at the time of cession to the state under the enabling act under which corresponding sections in each township in the state were granted to the state. Survey of the land in question was not undertaken until 1912, and a part of the area remains unsurveyed. The Government claims it was known to contain oil in commercial quantity at the time of the survey, and includes it in the naval reserve withdrawn from entry in 1912, and now offers it for lease for oil development. The state claims it as land known to be non-mineral in 1912, on grounds already set forth.

Date Set for Red River Boundary Case

Oil and Gas Leasers Given Time Extensions—Completions in Burkeburnett and West Columbia Fields

From Our Special Correspondent

The Supreme Court of the United States has set Dec. 13, 1920, for hearings in the Red River boundary case between Oklahoma and Texas. This case is of especial interest because of the valuable oil-producing area along the part of the boundary affected.

At the last special session of the Thirty-sixth Legislature Governor Hobby signed a bill extending the time in which holders of gas and oil leases on University lands may finish development work. Through an emergency clause the bill is in immediate effect. Lessees holding about 2,000,000 acres of University land in West Texas are affected by this bill, and $200,000 annually will be paid the University in rents.

Judgment was entered in the Fifty-third District Court of Travis County in favor of the State against eleven oil companies for violations of the regulations of the Railroad Commission. The fines were only $50 to $100 each, as it was shown that no wilful violation of the regulations was intended.

Stephens County oil production increased 5,000 bbl. per day for the week ended Oct. 9 over the production of the previous week.

A number of producing wells were completed in the Burkburnett district during the week ended Oct. 9, but all were within the known producing area. Northwest Burkburnett and the Texhoma section, south of the Breckenridge townsite, were the areas in which most of the wells were brought in.

The well of chief interest completed in the coastal fields during the week ended Oct. 9 is the Bassett Blakely No. B3 of the Gulf Production Co. at Blue Ridge, Fort Bend County. This well is reported to have made an initial production of 1,200 bbl. of oil daily from a depth between 2,800 and 2,900 ft. It finally proves Blue Ridge to be an oil field. Drilling has been carried on here for years, and nothing but indications were found until the Gulf Production Co. brought in its Nos. 1-B and 2-B, two small producers, during this year.

At West Columbia, the largest Gulf Coast producing field, the Humble Oil & Refining Co.'s. No. 1 Robertson was completed early in the week of Oct. 9 at 3,270 ft., making over 1,000 bbl. of oil. It sanded, and after bailing the flow increased until it was making 8,000 bbl. through a choker. This well is about 1,200 ft. north and west of the Abrams No. 1 well of the Texas Co. The Mary C. Masterson No. 1. well of the Gulf Production Co. was also completed during this week, flowing five hours at the rate of 10,000 bbl. daily, when it sanded. It is now being worked over. This well is also about 1,200 ft. north of the Abrams No. 1 well.

Operative Agreement Reached in Lander County, Wyo.

From Our Special Correspondent

The Producers & Refiners' Corporation and the Wind River Refining Co. recently signed an agreement whereby the former is to operate the eight Wind River wells in Lander County, belonging to the latter, pay all expenses, and divide the oil equally between the two companies. This agreement is in settlement of certain legal difficulties arising over sale of part of the Wind River property in the Lander Field to the Producers & Refiners' last December. It is stated that the Wind River Co. will reopen its refinery at Lander next spring, and operate it on its own and purchased oil to its full capacity of 1,000 bbl. daily.

The Twin Sisters Oil Co. recently filed articles of incorporation in the State of Wyoming. The capitalization is $3,000,000. The company will operate near Lander; the directors are: E. H. Fourt, J. F. Longenecker, and Charles Waters.

Well No. 4 of the Ohio Oil Co. on Sec. 34 of the Rock Creek field, recently completed, is making 250 bbl. daily from the first sand. It is expected this well will make a larger production when drilled deeper. Work has started on No. 1 well of Wilson & French on Sect. 24 of this field.

Western Illinois Oil Notes

From Our Special Correspondent

The Petro Oil & Gas Co. has moved in two drilling outfits to the Irvington district, in Washington County, near Centralia, where it will drill six or more test wells on a strong "structure" or anticline that has been favorably reported on by several geologists and mining engineers. Some oil has already been found in the No. 3 or "Stein" sand at 1,460 ft. and seepage occurs in neighboring coal shafts. It was through oil seepage in the coal shafts that led to the opening up of the Junction City, Sandoval and Centralia pools in the Nos. 3 and 4 sand. The Sandoval pool has been one of the most reliable pools in the state, the wells coming in with an average of 118 bbl. and are still making 5 to 12 bbl. when over ten years old. Some of the wells came in at 500 bbl. from the No. 4 sand, while the Carlyle pool, some 15 miles distant, produced 1,000 to 1,800 bbl. wells from the No. 3 sand.

The Centralia Oil Co. recently brought in a 20-bbl. well on the Langewisch farm and another well is now drilling at over 800 ft.

The value of the Illinois oil output this year is estimated at about $40,000,000,- which is the largest in the history of the state. As Illinois oil is now bringing $3.77 to $4 per bbl. at the well, this now old oil state is being given considerable attention by Mid-Continent oil men, many of whom got their start and made fortunes in Illinois 7 to 15 years ago when the oil sold for 60 to 70c., before the present extensive pipe lines were built.

Eastern Kentucky Leads in September Drilling

From Our Special Correspondent

In eastern Kentucky, Lee, Wolfe, Estill, and Powell Counties show the greatest part of the drilling during the month of September, with Magoffin, Johnson, Lawrence and Floyd showing an increasing amount of new work. Recently in Lee County, the Associated Producers' No. 7 on the Townsend lease made 20 bbl. The Security Producing and Refining Co. on the Estes lease got a 15-bbl. producer. In Powell, two strikes of 10 bbl. were made by the Ohio Oil Co., on the Brandenburg lease, and Ohio Fuel Oil Co., on the Smyth lease. In Wolfe, the Carter Oil Co. has a 10-bbl. well on the Honaker lease. A number of small pumpers were drilled in Lee, Estill, Powell and Wolfe Counties.

In the Johnson-Magoffin pool several 10 to 20 bbl. strikes have been made, while the Lawrence County field shows four new wells averaging 5 bbl. each.

Oil Activities in Arizona

From Our Special Correspondent

It is reported that gas is raising not only at the Adamana well near Holbrook, Ariz., but also at the well of the Holbrook Co., ten miles distant, and in the Black Canyon well, twenty miles to the northwest, indicating similar and encouraging conditions over a large area at the same depth, about 2,100 ft. The Adamana well is drilling steadily, with continuing gas pressure. The Holbrook Co. has received a supply of 8-inch casing that has been expected for a long time. The gas at the Black Canyon is said to have thrown water 12 ft. above the collar, though the water has been standing 400 ft. below the surface. The original Zuni well has been abandoned, with a string of tools left in it, and another has been started, 40 ft. distant. Work has been suspended for some time on the Hopi well. On complaint of a stockholder, President G. S. Mayfield and Secretary Thomas McCauley of the company have been summoned to appear November 5 before the State Corporation Commission at Phoenix to answer charges with regard to the use by them of moneys secured through the sale of stock.

Oil Excitement Starts in South Dakota District

From Our Special Correspondent

A standard oil rig has arrived and has been moved to the Crooked Oaks district in South Dakota, where Messrs. Norbeck and Nicholson will drill the first well in this new field. Twelve thousand acres have been leased by the above firm and the rig was brought in from Wyoming, where they already have several oil wells. A feeling of much excitement is in evidence throughout that part of Butte County and some of the larger oil concerns have geologists on the ground making investigations and taking leases.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

A Producer's View on Copper

Abnormal Profits of Manufacturers of Brass and Copper Goods Retarding Consumption

"Large profits that copper manufacturers are demanding on their products are doing much to keep down domestic consumption," said an official quoted by *Wall Street Journal*. "Personally, I know of a number of instances where copper and brass were to be used until the manufacturer found out the high prices demanded for those products.

"Producers have been mining their ore and making it into copper with practically no profit. Manufacturers have not been willing as yet to reduce their profits.

"Producers are getting tired of this. The result is quite likely to be an entry of the copper producers into copper and brass manufacturing, making copper companies self-maintained enterprises similar to steel companies.

"Anaconda has pointed the way. At Great Falls, Mont., that company is already drawing copper into wire, and it would not be surprising to see it making brass before long. American Smelting & Refining Co. has been rolling copper into sheets for years.

"Copper-wire drawers tell me that many companies have all the work booked that they can do for months to come. Much of this copper-wire drawing is for foreign account. It would seem there is no real reason for wire-drawers to keep out of the market. I know that their old contracts for copper are almost exhausted.

"What copper needs is concerted action by producers. However, the laws prevent this. The largest companies are in the main producing about half what they did in 1918. Some companies, however, are still mining at from 70 to 85 per cent, or even nearer, their war rate. All companies that are mining at more than 40 per cent their 1918 rate should curtail.

"If any important producers should find themselves forced to curtail production drastically within the next few weeks, you can be perfectly sure that they will make plans for entering upon the manufacture of copper goods, thereby protecting themselves in the future from the short-sightedly rapacious middlemen of the copper industry, the manufacturers."

Franch Gold Shipped by Germany

Bits of French gold paid to Germany as indemnity in 1872 are in the shipment of gold which arrived Oct. 4 in the United States and came indirectly from Germany. That gold is a part of that which Germany paid to the United States Food Commission.

Tin Deposits of Mexico Are Widespread and Promising

The failure to realize any successful tin-mining operations in the United States under the war stimulus to the general mining industry, except one inconsiderable operation in South Dakota, renews interest in the possibilities for the tin mining in Mexico. The Mexican tin deposits have been long known. In fact, they were worked in pre-Cortez times, and there has been a continuous production on a small scale in various parts of the republic. At no time has the total output of the Mexican tin mines reached large proportions, and the industrial operations have been on a small scale, and mostly by the Mexicans.

About twenty-five years ago a Pittsburgh syndicate undertook the development of tin in Durango. The capital raised and expended was large, and the operations for the time were elaborate. This undertaking was unsuccessful, according to *The World's Markets*, partly because of the extravagance of the ideas of its backers and certain internal financial features, but chiefly, of course, by reasons of the fact that tin was not found in commercial quantities. This failure and the publicity it engendered in the United States had a great deal to do with the neglect of the Mexican tin resources by the aggressive North American capital for nearly a quarter of a century after. Perhaps, also, the fact that there was practically no successful tin mining in the United States influenced the trend of American interests in the Mexican tin deposits.

During the later years of the Porfirio Diaz era several serious and reasonably promising attempts to realize on these Mexican tin deposits were made. Notable among these were the operations in the western part of the State of Aguas Calientes, in the southern part of the State of Zacatecas and near San Luis Potosi. Other promising but less accessible deposits, on the border of Durango and Zacatecas and in the south of Mexico, were controlled with a view to later developments.

It is known that the limited explorations which had been done on some of the more promising of these Mexican tin deposits resulted in favorable reports by engineers from the United States, and serious operations were planned. It is expected that the resumption of mining in Mexico will result in a continuation of these operations and probably in the inauguration of new ones. Well posted authorities express the opinion that tin mining in Mexico will be a successful branch of the industry. Considering the reported wide-spread occurrence of tin ores, it is also to be expected that tin mining will not be confined to a single locality.

Vanadium From Oil and Super-Steel Discussed

J. Leonard Replogle, president of the Vanadium Corporation of America, when interrogated at the annual meeting of the company regarding rumors of the discovery of vanadium substitutes, as well as vanadium ore having been obtained from oil seepage, replied that the so-called super-steel discovered by Professor Arnold, of Sheffield, England, one of the processes referred to, actually calls for use of 100 per cent more vanadium than is now employed in making high-grade steel. The Arnold steel also used more molybdenum, another alloy of which the Vanadium Corporation owns large deposits in Colorado. Development of molybdenum could only benefit the Vanadium Corporation.

The head of the Vanadium Corporation also expressed no apprehension regarding competition from oil producers. He said that vanadium in minute quantities is found in iron ore, clay, and even in oil, but the cost of production made development of these sources of supply utterly out of the question. Only recently a cable from England stated that the oil company reported to be obtaining vanadium from seepage had given up its experiments.

It developed that E. E. Fernandini, who originally owned the Peruvian vanadium deposits of the Vanadium Corporation of America, and who is accounted the wealthiest man in Peru, was some time ago elected a director.

Iron and Steel Engineers Meet in New York City

The Association of Iron and Steel Electrical Engineers held its fourteenth annual convention, in the Hotel Pennsylvania, New York City. After registration and business sessions during the forenoon of the first day, the technical program began that afternoon with papers on practical education by B. A. Cornwell, and standardization by Walter Greenwood. Tuesday's papers dealt with power transmission, A. L. Freret discussing "Underground Transmission," while Tuesday afternoon was devoted to an interesting excursion. Wednesday's sessions considered the annual report of the electrical development committee and two papers, "Determination of Auxiliary Drives" by Gordon Fox, and the tonnage of the reversing electric mill, by K. A. Pauly. The annual banquet was held on that evening and greatly enlivened by the presence of many wives of members.

The addresses were continued on Thursday and the convention closed on Friday with an excursion after hearing the standardization report.

Zion National Park, Utah, Dedicated

The formal dedication of Zion National Park, Utah, to the American people was held at the Park, Stephen T. Mather, director of the National Park Service, presiding. Congress created the Zion Park, Nov. 19, 1919, making it the ninetieth member of the National Park system. The area has been reserved since 1909 and was first known as the Mukuntuweap and later as the Zion National Monument.

Utah's interest in the dedication of her greatest scenic exhibit as a national park for all the people is worthy of special note. Governor Simon Bamberger and U. S. Senators Reed Smoot and William H. King all made appropriate addresses and the Salt Lake Commercial Club arranged a special trade excursion to the dedication.

Zion National Park is in extreme southwestern Utah. It is reached by rail from both Salt Lake City and Los Angeles by the Salt Lake route to Lund, thence by motor stage a distance of a hundred miles. It is also reached by motor from either Salt Lake City or Los Angeles over the Arrowhead Trail.

The park contains 120 square miles. Zion Canyon is the most important scenic feature, bisecting the park from north to south. This canyon is 15 miles in length varying in width from 50 to 2,500 feet, with walls 800 to 2,000 feet high. A well known writer says, "This canyon, winding like a snake, abounding in enormous peaks and domes, and glowing like a Roman sash, is one of the most striking spectacles which even America has to offer." Because of its gorgeous coloring Zion Canyon has been called the "Rainbow of the Desert."

Although the newest of our national parks, Zion Park is only new in presentation as an attraction for our traveler and lover of the marvelous in nature. Historically the canyon is probably thousands of years old. Only this year ruined cliff dwellings of the pre-historic race have been discovered in almost inaccessible places in the canyon walls. The Mormon pioneers were the first Europeans to discover the region, entering in 1858. In 1861 Brigham Young visited the region and named the canyon Little Zion. Capt. Clarence E. Dutton, geologist and explorer, wrote, "No wonder the fierce Mormon zealot who named it was reminded of the Great Zion on which his fervent thoughts were bent, of houses not built with hands, eternal in the heavens." Major John W. Powell visited the region in 1870. Captain Dutton studied it several years later.

However, until the coming of the railroad and the motor road few persons had ever seen the region. Those who did had described it in such glowing terms that it was supposed their enthusiasm had run away with their veracity. Elevated to parkhood in the age of automobiles and plentiful gasoline, and of an enthusiatstic nation, Zion Park may come into its own.

International Lists of Papers Need Support

Royal Society Calls a Conference To Discuss the International Catalog

The Royal Society of London called a conference to be held in London to consider the future of the *International Catalogue of Scientific Literature*. Financial problems confront this great compilation of selected titles of current contributions to all branches of scientific knowledge, and it is uncertain what further steps are necessary for its continuance or modification. American representatives are in attendance to speak for the National Research Council, the Smithsonian Institution, and the National Academy of Sciences of the United States. Robert Mearns Yerkes and Shepherd Ivory Franz of Washington, D. C., represent the National Research Council; Leonard Eugene Dickson, professor of mathematics in the University of Chicago, the National Academy of Sciences; and Leonard C. Gunnell of Washington, the Smithsonian Institution.

The Metric System Neglected by Australia's Parliament

During the past summer a motion in favor of the establishment of a metric system of weights and measures came before the Australian House of Representatives, but was shelved after brief debate.

"Some of the arguments advanced against the metric system were as diverting as ever" states *Chemical Engineering & Mining Review* of Melbourne. "For instance one opponent used the fact that under a metric system one-sixty-fourth would have to be referred to as 0.015625; but he carefully refrained from mentioning the further fact, that if a metric system were in universal use no one would want to refer to one-sixty-fourth at all.

"Another representative advanced the ingenuous argument that under a metric system goods could not be packed for transport so conveniently as under a system which dealt in cubes. Sir Granville Ryrie met his argument very effectively by asking him how he would deal with a cube of galvanized iron sheets 10 ft. long."

The labor of learning the metric system is not as great as the labor required to learn the much more complicated systems of weights and measures now in use; and as for changes in machinery required, the metric system advocates have shown that a very small percentage of the existing mechanisms would have to be actually scrapped, but as the *Review* remarks, "if the new apparatus would give more efficient service, the sooner the old is scrapped the better. The chemist . . . uses metric weights and measures in his laboratory, and the old heterogeneous collection of pints, pounds, and inches in his everyday relations to commerce. How many chemists would be found to vote against the adoption of a metric system?"

American Manufacturers' Export Association Holds Annual Meeting

The fact that during the war exports of machinery and raw materials from the United States increased tremendously in value and that now the tendency is for a contraction of this trade led to a discussion of this topic at the annual meeting of the American Manufacturers Export Association on Oct. 14 at the Waldorf-Astoria. W. L. Saunders, of the Ingersoll-Rand Co., a mining engineer and president of the association, presided and presented the initial paper. He pointed out that although the value of the commodities exported during the past six years had increased greatly, comparative consideration of the actual tonnage or bulk exported showed but a much smaller upward trend. The strong competition from European and other quarters that might be expected, was another subject emphasized in his paper. Financial cooperation is all essential to make an attempt to capture "the great promise and opportunity of export trade now before the country."

James S. Alexander, President of the National Bank of Commerce, spoke from the standpoint of the banker, outlining the abnormal credit situation in the country, the necessity of conserving credit and the co-operation that the banks can render in the matter of export trade. He also stressed the European need of raw products rather than manufactures, which Europe is gradually becoming in a position to manufacture herself. His paper was replete with practical suggestions for the guidance of the exporter.

W. A. Harriman, President of the American Shipping and Commerce Corporation, discussed "The Big Shipping Problems of the United States," the keen competition of foreign shipping interests, and the serious lack of proper personnel in the American Merchant Marine.

Then followed an address by Dr. MacElwee, Director of the Bureau of Foreign and Domestic Commerce, divulging the Bureau's plans for the future. Other papers of more or less economic nature followed, of importance particularly to exporters.

An interesting feature of the exhibit was a display in a side room of paper clothing from Austria. It was the first the writer had seen; the texture of the cloth rather resembles that of our grass-carpets.

Mining Society of Pennsylvania State College Meets

The first fall meeting of the College Mining Society was held Oct. 1 in the furnace room of the Old Mining Building at Pennsylvania State College School of Mines, State College, Pa. There was a large attendance, and an agreeable, profitable program for the coming winter was outlined. The officers are H. H. Fraser, president; G. R. Sutton, vice-president; C. E. Bersinger, secretary-treasurer.

Book Reviews

Steam Shovel Mining. By Robert Marsh, Jr. Cloth, pp. 258, 9 x 5½. First Edition. McGraw-Hill Book Co. Inc., New York. Price, $3.50.

Much has been written concerning the use of power excavators in the civil engineering field, but of their application in mining comparatively little has appeared in print except in scattered form, and the attempt of Mr. Marsh to segregate this data on steam-shovel mining will be highly appreciated by those who are interested in this method of mine operation. The first chapter discusses the utility of the power shovel and describes the general types. This is followed by the considerations governing the selection of equipment, such as shovels, locomotives, cars, track, and drills. Chapter 3 deals with the general problems of steam-shovel excavation and pit layouts. Chapter 4 contains descriptions of the methods of drilling and blasting which are used in the different districts. The disposal of material, under which is included transportation and the building and maintenance of dumps, is covered in Chapter 5. Chapter 6 deals with the engineering work necessary in planning the development of a power-shovel mine, also outlining the mapping and estimation of the orebody and the manner of reaching certain conclusions which affect the ultimate removal of the overburden and ore. Chapters 7 and 8 contain, respectively, data on the cost of shovel work and general administration. The matter is well arranged, and the author has carefully analyzed the problems of steam-shovel mining, making comparisons and suggestions in a most helpful manner. D. E. A. C.

Aluminium. By G. Mortimer. Cloth; 5 x 7¼; pp. 152. Isaac Pitman & Sons, New York. Price, $1.

A text on the metallurgy and application of aluminum is a rare thing, but in this handy little volume, which is a companion text to similar books upon other metals and commodities, are described the essential features of the manufacture, manipulation, and marketing of the metal.

The metallurgy of aluminum, as practiced nowadays, is comparatively simple; in fact, to use the author's own words, "The electrolytic process [for aluminum manufacture] is one of those fatally simple ideas which look so attractive on paper, beautifully conceived, and straightforward enough to describe. In practice, owing to the essential delicacy of the series of operations and the difficulty of insuring a consistent level of purity in large consignments of materials, the production of pure metal from one year's end to another demands experience and able management. The progress of the metal from the preparation of pure alumina to the final casting into slab form for rolling is girt about with pitfalls and chequered with the failure of concerns which had not just that meed of experience essential to the success of this most intriguing of industrial processes."

Sketching the early history of the chemical discovery and isolation of the metal, the author describes the relatively recent large-scale electro-metallurgical development of the aluminum industry, concurrent with the introduction of cheap electric power, and the epoch-making invention of Charles Hall, of Oberlin, by which large-scale commercial production was made practicable. In 1854 aluminum was worth aout $112 per lb. Its present price is about 35c.

In illustrating the narrow limits of working in the electric furnace, it is shown that in the solid condition aluminum is lighter than the other materials in the bath, but heavier in the fused state, enabling it to sink to the bottom of the furnace. If it did not sink a disorganization of the whole process would ensue.

The alloys of aluminum, their treatment, and hints on working the metal receive extended consideration in the text, and the growing tendency to use aluminum in the electrical trade, and thereby displace copper, is stressed. The crux of the matter, "that one pound of aluminum will do the work of two pounds of copper and that it must show a saving, therefore, at anything under double the price of the red metal," emphasizes the competition between these two metals in the electrical field, and in high-tension transmission work especially.

The book is well illustrated with photographs and diagrams, and we cannot but echo the opinion of a prominent metallurgist who has perused the volume, that "It enables one quickly to grasp the big outstanding features of aluminum metallurgy and is highly stimulative of thought upon various branches of the industry."

It is to be noted that the spelling used is the British form, aluminium (not aluminum). F. E. W.

Recent Patents

1,351,091. Method of Obtaining Zirconium Oxide. Louis E. Barton, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Co., New York, N. Y. Filed Sept. 24, 1919.

In obtaining zirconium oxide from a material containing an undesired substance, the steps which consist in melting said material with a carbonaceous reducing agent to production of zirconium cyanonitride; and subjecting the resulting product to the action of sulphate of an alkali metal.

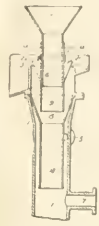
1,351,835. Reverberatory Furnace. Henry L. Charles, Butte, Mont. Filed Aug. 30, 1917.

The within described method of feeding ores into a reverberatory furnace consisting in dropping the same upon the hearth in such a manner as to pro-

vide piles or mounds at frequent intervals.

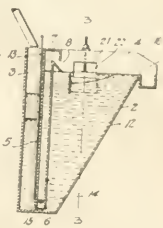
1,351,234. Separator for the Treatment of Coal, Clays, Ores, and the Like. John Marriott Draper, Bridgend, England. Filed Feb. 4, 1919.

A separator comprising an outer tube or receptacle, an inverted conical inner chamber contained within the upper part of said receptacle and from the apex of which a tube extends downward, a central feed fitted with a telescopic adjustable delivery tube to regulate the point of delivery in relation to the bottom or apex of the inverted conical chamber, a hydraulic connection for the admission of liquid to the outer tube or receptacle below the top of the inner chamber, and a circular or peripheral overflow ledge above the upper end of said chamber.



1,351,155. Ore-Flotation Apparatus. James B. Brown, Denver, Col. Filed Sept. 4, 1917.

A container divided into a feed chamber, a separating chamber provided with an overflow and a transfer conduit which adjacent its bottom communicates with each of the chambers for the reception of material, and which has an outlet adapted to deliver material in sheet-like form onto the liquid level in the separating chamber, determined by the overflow, and means for introducing a gas into the lower part of the transfer conduit.



1,352,075. Casing-Head. Henry S. McGarry and John D. Carr, Humble, Tex. Filed Mar. 28, 1919.

A device comprising a tubular member having an opening therethrough, provided to receive a pipe, said member being adapted to be screwed on the upper end of a well casing, and being provided with an annular recess in the upper end, a portion of the wall being formed with an upwardly inclined wall, and the covering adapted to fit into said recess and through which said pipe extends, said covering closing the openings through said tubular member.

MEN YOU SHOULD KNOW ABOUT

D. F. Hewett is making an examination of the Crimora mine in Virginia, for the U. S. Geological Survey.

E. F. Burchard has returned to his desk at Washington after an absence during most of the field season.

John Gross, of the U. S. Bureau of Mines, has been transferred from Fairbanks, Alaska, to the Rolla, Mo., station.

E. R. Mansfield has returned to Washington after completing an extensive examination of phosphate deposits in Idaho.

E. W. Shaw will sail from Buenos Aires on Nov. 1, for New York. Mr. Shaw has been working on oil geology in Bolivia.

W. Parsons Todd, vice-president of the Quincy Mining Co., is in the Michigan copper country on his regular inspection trip.

W. S. Murray, chief engineer of Super-Power Survey, addressed the Water Power League of America at Washington recently.

F. B. Laney has been placed in charge of the department of geology of the University of Idaho, at Moscow, to succeed D. C. Livingston.

Phillip Maverick has resigned as testing engineer with the Greene-Cananea Copper Co., at Cananea, and has gone to Tampico, Mexico.

Samuel W. Cohen, consulting mining engineer, of Montreal, sailed Oct. 6 for Europe, where he will spend two months on professional business.

S. M. Greenidge and Walker S. Clute have been appointed valuation engineers in the oil and gas section of the Bureau of Internal Revenue income tax unit.

George I. Adams, formerly on the geologic staff of the U. S. Geological Survey, was in Washington early in the month, having just returned from China.

David White, chief geologist of the U. S. Geological Survey, has completed an inspection trip through the oil and oil-shale regions in Utah and Colorado, and is now in Wyoming.

H. H. Armstead, president of Armstead Mines, Inc., and of Armstead United Cos., is in Talache, Bonner County, Idaho, inspecting one of the company's mines there.

Harry T. Hamilton, manager of the Moctezuma Copper Co., Nacozari, Sonora, Mexico, was a recent visitor to the Arizona Copper Co.'s Concentrator No. 6 at Morenci, Arizona.

Stephen L. Kapper, chief engineer, and Harold Yost, geologist, of the Phelps Dodge Corporation at Tyrone, N. M., attended the meeting of Phelps Dodge engineers recently at Nacozari, New Mexico.

Rienzi W. Macfarlane, assistant superintendent of the Arizona Copper Co., Ltd., Longfellow mining division, has returned to Morenci, Ariz., after a month's absence in Mexico.

William Russell, London manager of the Dorr Co., 101 Park Ave., New York City, is now studying the latest practices in metallurgical and chemical engineering fields in this country.

G. Perry Crawford has completed his work for the season in Spitzbergen and returned to London. Mr. Crawford will visit France, Switzerland and Italy before returning to the United States.

L.-A.-E. Sauvage, lately retired from L'Ecole Nationale Supérieure des Mines, Paris, writes that he still continues to lecture on machinery at the Conservatoire des Arts et Metiers. His present address is 292, rue St. Martin, Paris, 3me.

E. J. Donahue, for some time past the secretary-treasurer of Britannia Mining & Smelting Co., Ltd., has been promoted to be general manager vice J. W. D. Moodie, who recently retired. Mr. Donahue will be stationed at Britannia Beach, B. C.

N. C. Sheridan, mining engineer, of Wallace, Idaho, who has been in charge of operations for the Snake & Opportunity Mines Co., near Hillsboro, N. M., has returned to the Cœur d'Alene district as manager of the Midnight Mining Co., Mullan, Idaho.

Henry W. Crowther, after nearly five years' service, has resigned as manager of the Kingman Consolidated mines in Mohave County, Ariz., and has gone to Los Angeles, Cal. He has been succeeded by Will Halloran, former superintendent of the property.

A. J. Reef, formerly construction engineer at the Mammoth plant, Kennett, Cal., of the U. S. Smelting, Refining & Mining Co., and recently at the Salt Lake City office, has been transferred to the home office of the company at 55 Congress St., Boston, Mass.

H. L. Chamberlain, E. M., general efficiency engineer for the Quincy Mining Co., Hancock, Mich., has resigned. Mr. Chamberlain is a graduate of the Michigan College of Mines, class of 1903, and has been with the Quincy company for the last seven years.

F. G. Cottrell, Director of the Bureau of Mines, will leave Washington Nov. 8 for an absence of three weeks. He will visit the Bureau stations at Petrolia, Tex., and at Bartlesville, Okla. From Bartlesville he will proceed to Denver to attend the convention of the American Mining Congress.

J. A. Burgess, who resigned lately as manager of the United Eastern Mining Co., Oatman, Ariz., has opened an office in San Francisco, as a consulting engineer and geologist. He is making a geological examination of the Oatman district, preparatory to the hearing of the apex case of the United Eastern and Tom Reed companies.

Theodore Dengler, general manager of the Mohawk Mining Co. and of the Wolverine Copper Mining Co., has had the management of the Michigan Copper Mining Co., Ontonagon County, Michigan, added to his duties. Jesse Butler, who has been superintendent of this property since Mr. Brady's death, will continue to act in that capacity.

OBITUARY

Michael L. Foley, of the Foley O'Brien Mining Co., Toronto, died Oct. 9 in that city at the age of 51. Mr. Foley was for many years actively associated with mining and oil interests and was widely known in the mining districts of northern Ontario. Previous to his last illness he was manager of the Canadian Petroleum Co.

David A. Herron, for the past 15 years manager of the Tomboy Gold Mines Co.'s properties near Telluride, Col., died Sept. 24, in Denver, Col. Mr. Herron was born in Dehra, India, Dec. 24, 1860, but received his technical education in Pennsylvania and Illinois. For a time he practiced civil engineering, and later followed mining. He succeeded his brother John Herron as manager of the Tomboy properties, and was an eminently successful mining executive, devoting almost his entire time to his work. He was a kind, thoughtful man and was respected and loved by his employees. The banks and many of the business houses of Telluride closed during his funeral and for the balance of the day, in token of respect for the deceased and his family. He was buried in Telluride on Sept. 27.

SOCIETY MEETINGS ANNOUNCED

The American Society of Safety Engineers met at 29 W. 39th St., New York City on Oct. 22, in joint session with the New York section of the Illuminating Engineering Society. The program was devoted to papers that brought out the various ways by which good lighting arrangements promoted the safety of employees in various occupations. An informal dinner at Healy's preceded the meeting.

The Northwest Mining Convention will be held in Spokane, Wash., Feb. 28 to Mar. 5, 1921. In addition to the mineral exhibit the committee is planning for an educational and machinery exhibit. Members of the national bureaus, including the Geological Survey, the Bureau of Mines and the Forestry Service, will be invited to address the convention. Topics to be discussed will include the price fixing, importing, and exporting of gold, silver and other metals. Each of the several societies identified with the convention will have charge of a session.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Joplin Zinc Producers Again Shut Down for Two Weeks

This To Be Followed by Drastic Curtailment for Rest of Year—Hope To Extend Movement

Zinc ore producers, representing over 90 per cent of the entire production of the Joplin - Miami district, voted on Oct. 15 to shut down for two weeks, this shutdown to be followed by drastic curtailment for the remainder of the year. Virtually all of the large producing companies are in the agreement, including the Eagle-Picher Lead Co., which it is understood, was willing to shut down for one month. It is estimated the shutdown will mean a decrease in production of at least 9,000 tons of ore and probably 9,500 or 10,000 tons.

A shutdown similar to this was tried last June and was quite successful. Organizations at the mines were regained almost intact and it is believed this will be the case this time. The companies, of course, will endeavor to give employment to as many of their men as possible in development or prospect work, or any other work not actual production. The men mostly are acquiescent to the shutdown, believing that it was either that or a cut in wages. Operators frankly state they do not believe they could fairly cut wages so long as the price of living remains what it is in this district.

An effort is being made to get the co-operation of large zinc producers in the Montana, Tennessee and Wisconsin fields in the shutdown movement. Many mines shut down on Oct. 15, and the remainder the following day.

Broken Hill Strike May Be Settled Soon

The prospects of an early resumption of work at Broken Hill and Port Pirie, New South Wales, Australia, are favorable. An independent tribunal was appointed to consider the matters in dispute, Mr. Justice Edmunds, of New South Wales, being appointed chairman. It is unofficially reported that the claims of the union for a reduction in the hours of work underground have been dismissed and that the judge's award provides for a 48-hour week for surface men and a 44-hour week underground. It is also reported that Justice Edmunds refuses to abolish the contract system. Increases will probably be given in the rates of pay but no information is yet available as to this.

WEEKLY RÉSUMÉ

Zinc producers of the Joplin-Miami district have shut down for two weeks, as a result of market conditions; this is to be followed by a policy of drastic curtailment during the balance of the year. In Colorado the carriers have undertaken to readjust freight rates on ores and concentrates within the state in response to appeals from shippers. In Utah, many companies are pushing the assessment work that must be done on claims in 1920. In Arizona on Oct. 11, fire destroyed part of the town of Lowell in the Warren district. The labor survey recently undertaken by the provincial government in northern Ontario has shown the mining camps to be in need of 2,000 men. Twenty-five million dollars worth of bonds, the balance of those authorized almost two years ago, has been issued by the Anaconda Copper Mining Co. Ore shipments sent to Ashland docks from the Gogebic Range in northern Michigan were recently interfered with for a few days by forest and brush fires along the C. & N-W. It is reported from Australia that the chances are good for a speedy settlement of the strike at Broken Hill and Port Pirie; also that various state mining ventures in Queensland have recently suffered setbacks.

From Washington it is stated that W. R. Crane has been appointed head of the new Bureau of Mines experiment station at Tuscaloosa, Ala.

Anaconda Issues Balance of Bonds Authorized Two Years Ago

A new issue of $25,000,000 of Anaconda Copper Mining Co. 7 per cent secured gold bonds, series B, is offered at 96¾ and interest, to yield about 7⅜ per cent, by a syndicate of which the National City Company and the Guaranty Trust Company of New York are the joint managers. The bonds are due in 1929 and close the issue of $50,000,000, $25,000,000 Series A of which were sold in January, 1919. The proceeds of this issue are to provide additional working capital. This issue completes the financing authorized nearly two years ago, when $50,000,000 in bonds was authorized and half of them sold at 6 per cent, paying in part for development of South American properties.

According to John D. Ryan, chairman of the board of directors, earnings of the company for the seven years ended Dec. 31, 1919, averaged more than $24,500,000 annually after paying interest and all taxes, but before depreciation charges. The average yearly earnings have been equal to nearly 50 per cent of the Series A and B bonds, which constitute the sole funded debt of this company. The bonds are secured by a pledge of stocks of constituent companies.

Denver Convention of American Mining Congress Next Month

Approaching Meeting of Great Importance to Metal Mining Industry, Particularly to Colorado

The 23rd annual convention of the American Mining Congress will be held in Denver, commencing Nov. 15. This will be an event of importance to the metal mining industry, and therefore to several of the western states besides Colorado. The convention will not be confined exclusively to the consideration of the metal mining industry. Nine general divisions of the convention's work will be considered as follows:

1. Present-day relations between employer and employee; improvement in efficiency; wages; hours; working conditions; and contracts.

2. Tariff pertaining to mine products; and uniformity of national and state mining laws.

3. A national conference on the standardization of mining machinery, labor and life-saving devices.

4. The existing excess profits tax law, which has proved unworkable, unfair, and destructive to business, will be considered in connection with the report on the subject by a committee now at work.

5. The problem of the decline of the national gold production, and steps to prevent the further depletion of the nation's monetary gold reserve will be considered.

6. War minerals will receive attention, and the relief of worthy claimants who, under the technicalities of the existing law, have been refused relief.

7. The petroleum industry and the development of the vast oil shale deposits of Colorado and other states will receive special attention.

8. There will be a conference of coal operators to consider many problems of vital importance to the industry nationally and locally; also a conference of users of oil flotation processes.

9. There will be a conference for educational and scientific purposes, under a special committee working with the permanent American Mining Congress committee on standardization.

A publicity committee has been organized in connection with the convention, consisting of Warren E. Boyer, of the Denver tourist bureau; Edward Foster, Colorado commissioner of immigration; Dowell Livesey, editor of the Denver *Commercial;* Alva A. Swain,

Pueblo Chieftain; and Thomas Tonge, of Denver, as chairman.

The convention is of special interest to Denver as a mining and mining machinery center. The metal mining industry of the whole country is confronted by adverse post-war conditions. Unsatisfactory labor supply, high price of all mining supplies, and increase in freight, smelting, and power charges conspire to increase the cost of production. In many cases the margin of profit has been wiped out, and mines will close down. Many properties have suspended development work, are curtailing their output, and reducing the number of men employed. It is generally understood that some gold mining companies are actually planning to shut down for an indefinite period as soon as present ore reserves have been reduced to a point where they will no longer return a profit under present conditions, and with this end in view the companies are letting their equipment run down, and are not making the customary replacements and renewals. Under these conditions it is difficult, if not impossible, to interest new capital in mining enterprises of a speculative nature. This condition is resulting in a migration from mining districts, thus reducing the local demand for farm produce and manufactured goods. This, in turn, adversely affects commercial centers like Denver, and reduces railroad business to and from mining districts. Moreover, the decreased taxable values in mining districts will mean that the other districts, such as farming and city communities, will have to supply the deficit. If agricultural interests were forced to carry a large part of the burden of such redistribution of taxation, little sympathy would be wasted on them by mining men, for during the past several years the agricultural interests in Colorado have exercised a predominating influence in legislative affairs, and have had little consideration for mining interests.

Overlapping Research Work Causes Dissatisfaction

The resignation of Dr. A. B. McCallum as chairman of the Canadian Advisory Council for Scientific and Industrial Research is stated to be due to dissatisfaction with the overlapping in research work and conflict between different organizations having similar objects. The Mines Branch and Geological Survey have their functions along lines of research which from time to time infringe upon the work of the Conservation Commissions or conflict with the plans of the Research Council. It is stated further that the Council has been subjected to the inconvenience of having to ask the Civil Service Commission for those it employed even for expert work. The Council moreover was greatly disappointed over the failure of the Government to approximate $500,000 for the establishment of a laboratory and bureau for research at Ottawa in accordance with the recommendation of a parliamentary committee.

New Developments in Don Luis District, Ariz., Important

About 80,000 Tons Shipped From Extension of Warren District Ore Zone—Sulphide at Depth

Recent developments have shown a very interesting extension of the ore zone of the Warren district, in Cochise County, Ariz., on the south side of the range. This ore area, the development of which has been independent of that of the main zone, is known as the Don Luis district. The probable connection with the main zone is through the Cole orebodies of the Calumet & Arizona Mining Co. However, insufficient work has been done to prove this.

Good orebodies have been developed by the Wolverine & Arizona, the White Tailed Deer mine of the Copper Queen, the Night Hawk Leasing Co., and the Boras Leasing Co. Small ore showings have also been encountered in the Wade Hampton mine of the Copper Queen and the L. S. & P. No. 3 workings of the C. & A. company.

The first work done in this area was from 1900 to 1902 on the White Tailed Deer claim on which copper and gold-silver ore outcropped. Subsequent to this early work, the White Tailed Deer group of claims was bought by the Copper Queen.

In 1902 the L. S. & P. Mining Co. acquired ground in this area, the ground being the southern extension of their South Bisbee Group of claims. In 1903 they sank the L. S. & P. shaft No. 3 on the Uncle Sam claim and did some drifting with indifferent results.

The Wolverine & Arizona Mining Co.'s group also extends into this area. This company in 1903 sank a shaft on the Broken Promise claim. Considerable development was done from this shaft both by drifting and by diamond drilling, but no ore was encountered, and work was discontinued in 1906.

The area lay dormant until 1910 when Mr. Lundvall, of Don Luis, obtained a lease on the White Tailed Deer mine. Work was done in a small way by him on the outcrop, and considerable silver and copper ore was shipped. In 1911 the White Tailed Deer shaft was sunk with the idea of prospecting for the extension of the ore outcropping. This ore dipped into the hill to the north. In 1912 a large orebody was encountered on the 150 level in the Sweepstakes claim. Shipments from this orebody continued on lease account until 1916, when operations were discontinued. In the latter part of the same year the Copper Queen company reopened the mine, developing considerable new ore and extensions The mine was shut down in 1918. Considerable ore is still in sight.

In 1912 Mark Dixon, of Don Luis, obtained a lease on the Wade Hampton mine. Stringers of silver bearing copper ore outcrop there, and were followed down. Considerable prospecting was done, but ore did not open up and work was discontinued in 1915. The ground was leased again in 1918 and some ore shipped as special silica ore to the Copper Queen smelter. The copper content was very low and the mine was again shut down in 1919.

In 1916 a lease was granted to Messrs. White and Verfurth by the Wolverine & Arizona Mining Co. on their Broken Promise claim. The shaft was started on an outcrop of iron and silica. Ore was entered at 240 ft. and some shipped. The company, on the discontinuance of the lease, developed this showing which proved to be a large orebody. Shipments have been continued intermittently to date and considerable ore is blocked out.

In 1917 the Boras claim of the Copper Queen was leased to the Boras Leasing Co., which was backed by local capital. Work was started on a stringer of copper ore outcropping on the claim. Operations were continued in a small way from an inclined shaft until the early part of 1919, when it was decided to sink a vertical shaft and prospect for the continuation of this stringer in depth. M. J. Elsing, formerly mine superintendent at Greene Cananea, was put in charge of operations. The shaft was sunk and toward the end of 1919 ore was encountered on the 400 level. This ore developed rapidly into a large high-grade compact orebody, from which steady shipments have been made and continue to date. This ore and all of the previous ore developed in the district was oxidized ore. In August, 1920, sulphide ore was encountered on the 600 level which has developed into a large orebody.

In 1917 the Night Hawk Leasing Co. was started by local capital to operate the Night Hawk claim, situated between the Boras and White Tailed Deer claims. Considerable work was done before ore was encountered. In 1919 a winze from the 450 level struck ore, which was subsequently developed on the 650 level, into a body of fair size from which steady shipments have been made. In September, 1920, a new orebody was encountered on the 650 level which is very promising. The work has been under the management of James McKenna, of Bisbee.

During the war a considerable tonnage of manganese ore was mined on the No. 4 claim of the Copper Queen. This ore outcropped and was worked by surface cut. Some of this type of ore was also mined on the Loyalty and Happy Home claims of the Copper Queen.

The encouraging results obtained by all operators in the Don Luis district is significant of the possibilities of outlying ground away from the main ore zone. This area has the advantage over other areas in that the ore appears to lie at shallow depths.

The total ore shipped to date is about 80,000 tons. The tenor of the ore is as good as that in the rest of the camp. As only a small part of the area has been prospected, the outlook is good here for a very valuable addition to the ore reserves of the Warren district.

Miami produced 4,549,140 lb. copper in September and 4,630,720 in August.

Readjusting Freight Rates in Colorado

But Those on Ore and Concentrates Shipped to Eastern Points Are Called Prohibitive

In compliance with the application of the Colorado Metal Mining Association for a readjustment of freight rates on ores and concentrates shipped from points of production in Colorado to destinations within the state, the carriers are now readjusting rates throughout the metal mining districts.

On Sept. 13, at a general conference of operators and traffic managers of Colorado roads, assurances were given that although no general order would be issued concerning the increased rate authorized by the Interstate Commerce Commission, readjustments would be made to meet conditions of each particular district. Operators were assured that if the shippers from each district would present their problems to their carriers, adjustments would be promptly made.

Readjustments have already been made in the San Juan, Leadville and Aspen districts and rapid progress is being made in fixing a rate satisfactory to shippers from various other districts. In most instances the rate in effect up to Aug. 26 has been restored on ores and concentrates carrying values less than $25 per ton, though in some instances, the lower rate is extended to a product of higher grade where it is shown that the rate was necessary to move the ore.

In the main, the adjustment of rates on intra-state shipments have been satisfactory, but operators declare that rates on ores and concentrates shipped to the zinc plants in Kansas, Oklahoma and other eastern points, under the increased schedule, are prohibitive and will result in a total cessation of shipments unless the former rates are restored. On Oct. 12, the Colorado Metal Mining Association made application to the Western Trunk Line Committee at Chicago, asking that it submit to the carriers a proposition looking to the restoration of the rates of Aug. 25. In the petition it was stated that:

"Increased production costs due largely to increased freight rates have resulted in an alarming decrease in production of zinc-bearing ore in this state, and the recent further increase threatens to effect an almost entire cessation of shipments of zinc ore and concentrates from Colorado common points to Kansas and Oklahoma smelters. In 1917 the production of zinc from Colorado ore amounted to 130,115,000 lb.; the production in 1919 decreased to 51,445,000 lb. At present there remain but three important shippers of these ores, and in the case of at least two of them, the increased rate wipes out the margin of profit and unless a readjustment of rates is made at an early day, these mines will cease production.

"The situation as to zinc ores in Colorado is such that outside of a very few exceptionally favored cases, the increased rate entirely absorbed the small margin of profit previously awarded mines which depended on shipping to eastern plants. Any further increase will terminate the existence of the few mines which are still shipping.

"The reason why increased freight rates are especially burdensome to Colorado zinc mines is that their product nearly always contains precious metals, lead and copper as well as zinc, and in order to recover them, after distilling off the zinc, the residue has to be shipped back to Colorado for smelting. Finally the crude bullion produced by smelting has to be shipped back to the eastern refineries. In this way the industry has to bear a triple freight charge and the effect of each increase is tripled, the final outcome being that most Colorado zinc producers can no longer compete with the Missouri and Oklahoma mines."

It is believed that an early date will be fixed for the hearing, and that the old rate, or possibly a lower one will be established.

Skip Wrecks Head Gear in Spite of Safety Devices

A serious overwinding accident occurred at "C" shaft of the East Norrie mine on the Gogebic Range in northern Michigan on Oct. 14, although no casualties occurred. With the empty skip a short distance below the collar and the loaded one on the first level the engineer made a mistake, reversed his engine and hoisted the empty skip at full speed. The hoist is driven through a reduction gear by an 875-hp. induction motor, has post brakes, and is fitted with two safety devices of recent design to prevent overwinding and overspeed, but these were improperly adjusted or were inadequate to prevent hoisting the skip up against the headsheave causing considerable damage.

The steelwork in the dump was wrecked, the crosshead torn from the skip and over to the first idler stand, and the body of the skip jammed just below the headsheave. It will require several days to repair the damage. Fortunately ore can be hoisted meanwhile at "D" shaft. The accident emphasizes the importance of frequent adjusting and testing of safety devices on hoists.

Forest Fires Hamper Shipping from Gogebic Range

During the last week shipments of ore from the Gogebic Range to the Ashland docks were greatly interfered with by brush and forest fires along the right-of-way of the C. & N-W. Ry. The Soo Line escaped the fires pretty well and many of the C. & N-W. trains were run over its tracks. However, many mines could not get enough cars even for the daily hoist let alone stockpile shipments. Many train crews were sent out to fight the fires and managed to prevent serious damage to the tracks. Heavy rains finally removed all further danger.

Utah Companies Getting Busy on Assessment Work

Little Chance of Exemption for 1920 Causes Work To Be Pushed—Chief Con. Active

Assessment work, allowed to lapse with government permission during the period of the war and subsequently owing to labor shortage and abnormal conditions, is being done in various Utah camps to hold unpatented ground for 1920. There is a good deal work of this kind going on in the Tintic district where some of the larger companies have been taking new ground, and where many new enterprises were undertaken following the coming in of a new producer in the Tintic Standard in the eastern end of the district. Much deep work is necessary in Tintic, where the ores are found largely some distance below the surface, and shaft sinking, although in its nature expensive, has been the best method of development.

The Chief Consolidated, which from its older ground is the largest producer of silver ores in the state, is this year doing its assessment work on its large holdings of newer territory, some of which is unpatented, by means of shaft work centrally located to benefit the group in question and of permanent value to it. It is now starting two new shafts, one to the northeast of the Central Standard, and another southwest of the Copper Leaf near the old Baltimore claims, which it acquired a number of years ago. A third shaft is projected for the extreme northern end of the Chief holdings. Last year this company spent over $25,000 in assessment work on its unpatented claims, although not obliged to by law to develop its holdings. Other companies are starting their assessment work. The East Crown Point is understood to be arranging a contract for the further sinking of its main shaft as assessment work. The Tintic Humboldt has put a small force on assessment work.

B. C. Operators Would Change Tax Act To Allow for Depletion

Representatives of the mine operators of British Columbia are anxious to induce the provincial government to amend the Taxation Act in order that allowance may be made for the depletion of ore reserves in mining property. As it now stands anything that is allowed comes as a concession from the minister of finance after an investigation. The opinion among mining men is that the principle of allowance for depletion of ore reserves should be recognized in arriving at the basis for the taxation of a producing mine. A delegation from mining companies interested in this Province recently met the Premier and members of the Executive to discuss this and other phases of the Taxation Act. They are confident that their arguments will have the effect of producing the desired amendments at the next session of the legislature.

Army Gas Mask and Dust Respirator Worthless in Mine Fire

Two Men So Equipped Killed in Recent Fire in Calaveras Copper Co.'s Mine in California

The following report of the recent fire in the mine of the Calaveras Copper Co., at Copperopolis, Cal., has been published in the California Metal and Mineral Producers' *Bulletin* to correct any erroneous impression that may have been received from the incorrect and garbled accounts published in the daily press:

"On Sept. 30 at 12:20 a.m. a fire was discovered in buildings near the collar of the Union shaft. As soon as possible all men were taken from the mine. The next morning about 9 a.m., an ex-soldier wearing his army mask started for the 1,200 level of the Discovery shaft, the main working shaft, to open an air valve. The mine at this time was filled with gas from the fire which had burned down the headframe at the Union shaft and the falling burning timbers had ignited the timbering in the shaft.

"This man did not return and two other men wearing the ordinary dust respirators started for the 1,200 level to recover the first man who had gone into the mine. Just what happened to these two men is uncertain, but one of them got back to the surface alive but suffering from the effects of gas.

"Mr. Kelsey, manager of the Argonaut mine, with three men and mine rescue apparatus arrived at the mine during the day but acting under instructions from the chief mining engineer of Industrial Accident Commission made no attempt to enter the mine until more trained men and apparatus were at hand.

"F. L. Lowell, deputy mining engineer of the Industrial Accident Commission, and Mr. Cooke, of the Bureau of Mines, left Berkeley on Thursday with the Bureau of Mines Rescue Truck No. 6 and had arrived within eight miles of Copperopolis at 4 a.m., Oct. 1, when the magneto drive shaft on the truck broke. The rescue apparatus from the truck was then taken to the mine in an automobile. B. O. Pickard, district engineer of the Bureau of Mines, and Mr. Gardner, in charge of Mine Rescue Car No. 1, of the Bureau of Mines, were at Reno when advised of the fire and arrived at Copperopolis on the morning of Oct. 1. Mine Rescue Car No. 1 was at Tonopah and arrived at Milton, the nearest railroad point to Copperopolis, at 2 p.m., Oct. 2.

"As soon as the mine rescue apparatus from the truck reached the camp preparations were made to train men in its use. The first descent into the mine was made on the afternoon of Oct. 1. Upon the arrival of the crew of Mine Rescue Car No. 1 rescue crews were organized and the bodies of the two men were recovered on the night of Oct. 2. Their bodies were found in the sump below the 1,200 level and apparently both men had been overcome by the gas and had fallen into the sump. Both men were killed either by gas or by falls, as their necks were broken and the bodies were otherwise bruised, but their lungs contained no water.

"*We wish to state in the most emphatic terms in the English language or in any other language that to wear an army gas mask when entering places containing gases from mine fires or from blasting is certain death to the man wearing the mask and as in the above case other men may lose their lives in trying to recover the first man.*

"*Do not allow an army mask to be brought onto your property for any purpose whatsoever.*

"*Dust respirators are good for dust only.*"

New Dredging Project To Be Undertaken in Guianas

Guiana Development Co. Plans To Instal Dredge and To Build Modern Camp on Upper Maroni

Perry Tiffany, president of the Liberty Company, and George A. Laird, general manager of the Guiana Development Co., with a party of ten engineers and operators, will sail for South America about Oct. 20 to begin active work on installation of dredging equipment on the Maroni River, between French and Dutch Guiana. The company intends extensive development work including the construction of docks, power plant, machine shops, and other buildings, as well as the building of a modern camp, to be equipped with ice and cold storage plant, water works and sewage system. A large part of the equipment has already been shipped to San Laurent, French Guiana.

No. 1 dredge, now being built by the Yuba Construction Co., of Marysville, Calif., will be shipped from San Francisco early in January by which time it is expected that barges for river transfer of equipment and a road passing around the Armira Falls will be ready for the transfer of equipment to the plant where operations will be started. While attempts have been made at various times to install equipment in the upper waters of the Maroni, the obstacles in the way of transportation have been too great for the successful culmination of the venture. The Guiana Development Co. is prepared to meet any emergency and is thoroughly equipped for marine and land transportation.

Reno Chamber of Commerce Establishes Bureau of Mining Information

Development of the little known minerals and metals of Nevada is contemplated by the Reno Chamber of Commerce through a recently established bureau of mining information. The bureau proposes to bring together buyers of these minerals and owners of deposits. Owners have been invited to send in descriptions of their properties to the bureau for listing.

First National Standardization Conference at Denver in November

The standardization committees of the American Mining Congress recently issued invitations to a National Standardization Conference, to be held in Denver, Col., in conjunction with the 23rd Annual Convention of the American Mining Congress, to be held Nov. 15 to 20, 1920. The purpose of the conference is to discuss improvement and standardization of mining practice, or mining methods, as applied to mining equipment and machinery, labor and labor saving devices, safety codes, costs, accounting, government and state co-operation with mining companies. The invitation is signed by Colonel Warren R. Roberts, of Chicago, Ill., chairman of the coal mines section, and Charles A. Mitke of Bisbee, Ariz., chairman of the metal mines section of the standardization committee; Horace F. Lunt, State Commissioner of Mines of Colorado, and Richard A. Parker, chairman of the mining bureau of the Denver Civic and Commercial Association.

The standardization committee of the American Mining Congress is divided into the coal and metal sections. Each section is composed of a general committee, and a number of subcommittees, the chairmen of which automatically become members of the general committee.

The metal mines section of the committee came into existence this spring with the appointment of a number of subcommittees, and others are planned. Seven subcommittees have already been appointed. They are:

The subcommittee on standardization of drilling machines and drill steel; on standardization of steam shovel equipment; on standardization of underground power shovels; on standardization of underground transportation; on standardization of fire-fighting equipment; on standardization of mine timbers; and on standardization of mine ventilating equipment.

The personnel of these subcommittees is representative of the large metal producers of the country, and efforts were directed toward the making of an impartial selection, in order that the standards finally adopted might be the result of the concentrated thought of the best talent in the industry.

As the committee members are very widely scattered, frequent meetings were considered an impossibility, and the work of the committees is therefore being carried on largely through correspondence. In order to collect material for a working basis, and to obtain an idea of the needs of the industry, a questionnaire embodying the main points proposed to be taken up by the various committees is sent to each committee member and to operators in districts not represented by committee members. Upon the return of this information, the chairman of the subcommittee compiles and tabulates the data thus obtained, sending

copies to each of his committee members, with a request that after carefully studying the same he will furnish the chairman with suggestions and comments. A further exchange of such suggestions is then made, which paves the way for a general discussion between the chairman and his committee members, and which, it is hoped, will ultimately result in the evolution of standards of value to the mining industry.

Lake Iron Ore Shipments Put At $57,000,000 Tons for Season

It has been estimated that about 57,000,000 tons of iron ore will be sent out from the Lake Superior district during the 1920 season. This will be several million tons short of requirements, due to the fact that the boats lost considerable time during the early part of the navigation season and it was close to mid-summer before the mines were able to ship steadily. The coal shortage also has had something to do with slowing up the shipments. However, the season's movement will be close to 10,000,000 tons ahead of 1919, but about 8,000,000 tons short of the biggest year. It is reported from Cleveland that some furnaces will be short of ore for the winter run and they are willing to contract now for more ore if they can get the vessels to haul the ore. It is almost impossible to make vessel contracts at present as many of the boats will soon enter the grain trade and the others will have all they can do to meet present requirements.

Some operators are already trying to figure what the iron ore price for 1921 will be in view of the fact that pig iron is a trifle weaker and steel is expected to take a drop. Ore is selling higher than ever before and it is not believed that the price can be maintained if pig and steel go down. The recent increase in rail and freight rates hit the mining companies hard as they must pay the transportation charges on ore to lower lake ports from the mines. Many a small operator would suffer if the price declined and wages and freight rates remained at the existing levels.

Mount Bischoff Tin Reserves Less

J. D. Millen, late general manager of the Mt. Bischoff Tin Mining Co., operating at Waratah, Tasmania, is now a senator in the Commonwealth Parliament. C. W. Gudgeon, the new mine manager, has issued an estimate of the ore reserves showing a considerable reduction in the tonnage estimated by Mr. Millen. Mr. Gudgeon estimates that there are 123,870 tons, averaging 0.35 per cent tin, in sight together with 266,000 tons of "probable" ore. This is equivalent approximately to three years output, but active development work is proceeding and the mine has been such a consistent producer for so many years that its supporters are optimistic as to the result. The output during the half year ended July 31 was 49,098 tons.

Ontario Mining Camps Short 2,000 Men

Labor Survey Completed by Government Finds Shovelers and Trammers Most Scarce

Following the inspection of the labor situation in Northern Ontario by the general superintendent of the employment service of Ontario, it was found that the actual shortage in Cobalt, Porcupine and Kirkland Lake amounts to 2,000 men. This figure applies only to the operating mines and does not take into account the smaller properties, nor the number of men required for new exploration work, which would be undertaken if labor were available. The mine managers have been trying to arrange to have foreign labor imported to fill this shortage. Although there is a certain amount of unemployment in the factory centers, it is generally found that this class of labor is not suitable for mining purposes. In Cobalt the average labor turnover is about 25 per cent a month, and it is impossible for the companies to do efficient work under these conditions. The shortage of shovellers and trammers is most acute and this class of labor was generally recruited from foreign countries previous to the war.

Fire Destroys Part of Lowell in Warren District, Ariz.

Fire on the night of Oct. 11 wiped out more than one-half of the town of Lowell, a suburb of Bisbee, sweeping everything on the north side of Main Street and up to the municipal market on Naco road. The damage is estimated at $750,000.

Claims of Returned Soldiers Opened for Re-staking, it Is Charged

Complaints have been made to the Ontario government that in many cases claims staked by returned soldiers have been thrown open for re-staking and taken up by other parties in disregard of an Order-in-Council issued Dec. 18, 1919, relieving such claims from forfeiture for non-performance of assessment work until Jan. 1, 1921. The Minister of Mines has issued instructions to mining recorders to protect the holders of such claims against forfeiture, but in the meantime the situation has been complicated by reason of the new holders having performed assessment work in good faith. What measure of relief will be adopted in such cases is as yet undecided.

Lectures for Prospectors

Instructions have been given the different government mining engineers of British Columbia to prepare to deliver a series of lectures on elementary geology and mineralogy at the different important centers of their several districts during the winter. This is being done at the suggestion of the Prospectors' Protective Association of British Columbia.

Tintic Standard Co. Erecting Ore Treatment Plant

The Tintic Standard Mining Co. is erecting an ore-treatment plant at Harold, Utah, 12 miles from their mine in the East Tintic district and on the Tintic branch of the D. & R. G. The process to be used will be the Holt-Dern, at present in use at Silver City, Utah. Only low-grade and highly siliceous ore will be treated at the plant. The high-grade and basic ores are to be shipped directly to the smelters. The unit under construction at present will consist of seven standard Holt-Dern roasters, each of an average daily capacity of 160 tons of charge. The crushing plant will be of sufficient capacity for two units of the size now being installed. It will consist of a gyratory, Symons disc crusher and two sets of 48 x 16-in. rolls. The leaching and solution tanks will be of concrete construction. A boarding house, machine shop, carpenter shop and warehouse will also be constructed. In addition to scrap iron precipitation erection of an electrolytic precipitation unit is planned after the plant is started. This will be about Dec. 1.

Recent Production Reports

The Rand's gold output in September was 682,000 oz. against 702,000 in August.

Butte & Superior produced 7,500,000 lb. zinc in concentrates and 138,000 oz. silver in September compared with 7,800,000 lb. zinc and 140,000 oz. silver in August.

Utah Copper produced 8,420,000 lb. copper in September compared with 8,820,000 in August.

Chino Copper's September output was 5,161,894 lb. copper compared with 4,000,148 in August.

Ray Consolidated's output in September was 4,502,000 lb. copper compared with 4,505,000 in August.

Nevada Consolidated's production in September was 4,650,000 lb. copper, the same as in August.

Granby Cons. M. S. & P. Co. produced 2,239,174 lb. copper in September compared with 2,471,200 in August.

Chile Copper produced 9,496,000 lb. copper in September compared with 10,640,000 in August.

Calumet & Hecla produced 7,278,215 lb. copper in September against 7,520,107 in August. Production by companies in September was: Ahmeek, 1,618,300; Allouez, 0; C. & H., 4,169,788; Centennial, 0; Isle Royale, 727,864; La Salle, 0; Osceola, 643,200; Superior, 46,893; and White Pine, 82,169.

Shipments of copper ore, matte, etc., to the United States from Alaska in September were 2,287 gross tons containing 1,635,677 lb. copper. Other metal shipments were: Palladium, 175 oz.; platinum, 19 oz.; gold ore and base bullion, $263,850; gold bullion, 36,592 oz., and silver ore and bullion, $13,687.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Cottrell's Successor a Topic of Discussion

Chemists Want a Chemist, Geologists a Geologist, and Oil Men a Petroleum Technologist

Country-wide interest is being evidenced in the type of man who is to succeed Dr. F. G. Cottrell as director of the U. S. Bureau of Mines. Chemists are taking exception to the assumption that the new director must be a metal-mining executive. They see no reason why a chemist, who is a good executive, should not be a perfectly proper director for a Bureau which is divided into branches of chemistry, petroleum, coal mining, metal mining and safety.

The geologists also have been heard from and they suggest that one of their profession may possess the necessary requisities for the directorship. Some oil men are of the opinion that, since their industry represents investments greater than those in any other branch of mining, a petroleum technologist should be considered, thereby insuring that the Bureau would expand its petroleum work, which is held to be entirely inadequate to the importance of that industry.

Crane Heads New Tuscaloosa Experiment Station

W. R. Crane, who has been chief engineer of the War Minerals Relief Commission, has been chosen to be superintendent of the new experiment station of the Bureau of Mines at Tuscaloosa, Ala. The work of the station is to be largely on coking and by-product problems, but two non-metals specialists will be assigned to the station. It is the hope of Bureau officials that eventually this station can be expanded to the point where coking and byproduct experimentation may be commensurate with the importance of those industries.

There is an insistent demand on the part of the industries interested in non-metallics that they have a station of their own in the center of the non-metals producing region. They are anxious that the work done by the two specialists at Tuscaloosa be regarded as temporary, pending the granting of the appropriation for another station which they fully expect to be devoted exclusively to non-metals work.

Bert W. Dyer New Federal Mine Inspector for Alaska

In the future the work of the Federal mine inspector for Alaska is to be on a somewhat different basis. The vacancy, which has existed in this position since the resignation several months ago of Sumner Smith, has been filled by the appointment of Bert W. Dyer, who has been in charge of one of the Bureau's mine rescue cars. He is a mining engineer and has had experience in both metal and coal mining.

In the past the headquarters of the Federal mine inspector have been at Juneau. Mr. Dyer's headquarters will be at the mining experiment station at Fairbanks. It is believed that his field work will tie in effectively with the work of the station. It is believed that the territorial mine inspector can take care of the metal mines without a great deal of assistance from the Federal inspector. This will give the Federal inspector a chance to devote more of his time to the coal mine areas.

Disabled Soldiers Studying Mining Engineering

Courses in mining engineering are being pursued by 104 disabled former service men under the vocational education statute. The total number taking engineering courses is 1,949. The work in mining engineering is divided among thirty-seven schools, of which two are in New England, nine in the east, four in the south, eight in the middle west and fourteen in the west.

Courses in oil engineering are being pursued at the University of Pittsburgh, University of Florida, Marietta College (Michigan), National Petroleum School (Chicago), University of Utah, California Polytechnic School, Occidental College (Los Angeles), and State School of Mines (Oklahoma). Eighteen ex-service men are enrolled at these schools. The work is under the auspices of the Federal Board for Vocational Education.

War Minerals Awards

Only two awards were recommended by the War Minerals Relief Commission during the week ended Oct. 9. Both were chrome cases. In one, Walker & Arnold made claim for $5,174.47 and were awarded $713.34. The other claim was that of C. D. McGonnigal. He asked to be reimbursed to the extent of $1,910.62, but the Commission awarded only $51.78.

In addition, re-allowances totaling $2,731.05 were recommended. In the claim of Fred A. Babcock, an additional $159.95 was allowed. A review of the claim of Gaylord & Landis, which had been disallowed, resulted in an award of $680.93. An additional $610 was allowed in the claim of the Hillside mine which already had been awarded $10,642.27. In the claim of E. C. Trask, the original award was $483.99. On review an additional $1,280.17 was allowed.

Operators Meet Bureau of Mines' Officials at St. Louis

Ways of Aiding Zinc and Lead Industries in Tributary Districts Discussed

That the Bureau of Mines can extend material assistance to the zinc and the lead industries in the region tributary to St. Louis was an opinion unanimously expressed at the conference in that city on Oct. 9, when Bureau officials met representatives of the operators.

It was agreed that the Bureau should confine itself to problems common to all mines, rather than undertake to be of any great amount of assistance in aiding individual companies. The problems of the district are divided into three classes—those of metallurgy, ore dressing and mining. The underground handling of ore is the principal mining problem common to all properties in the region. John Gross, one of the Bureau's ore-dressing engineers already is on the ground. A survey is to be made of milling operations. Work is to be begun at once on the Illinois ores containing fluorspar. This will be followed by a study of the ores in the Joplin district.

In the metallurgical studies efforts will not be confined to the improvement of the retort practice but will include efforts to develop new thermal metallurgy. Dorsey A. Lyon, the supervisor of the Bureau's experiment stations, is now casting about for the necessary personnel to organize the highly specialized work necessary in conducting the Rolla station.

Goodpaster-Salchaket Area Surveyed in Alaska

During the field season, just closed, in Alaska a geologic survey was made of the eastern extension of the rocks which in the Fairbanks district have proven so richly auriferous. The region in which the survey was made last summer is known as the Goodpaster-Salchaket area. Most of the general region east of Fairbanks already had been surveyed, but this area, which contains some 2,000 square miles, never had been covered. The work was done by P. S. Smith, of the Survey.

To Study Effect of Oxy-Acetylene

Increasing use of the oxy-acetylene torch in underground mining operations is bringing many inquiries to the Bureau of Mines as to the possible injurious effects which may result from this operation when carried on in confined places. It is known that some irritation to the eyes and lungs results from the use of these torches, even in the open air.

NEWS BY MINING DISTRICTS

Special London Letter

Excited Trading in Esperanza on News of Rich Strike—Passing Rio Tinto Dividend Causes No Surprise —Rand Stocks Prominent

BY W. A. DOMAN

London, Oct. 5—Relief to the otherwise stagnant condition of the mining market has been provided by excited dealings in Esperanza shares. The mine is managed in America, but the holding company is a London undertaking. At the last annual meeting of shareholders the chairman, R. J. Frecheville, referred to development work that was in progress, and his remarks led to high expectations as to the values that would be encountered in the Descubridora vein. These have proved to be of a very remarkable character, and the price of the shares jumped, by stages, from about 15s. to 52s. 6d. Jobbers were caught short, and some of them are reported to have cut very substantial losses. With business quiet in other departments dealers flocked to the Esperanza arena, and helped themselves more or less liberally. The interesting point in the mine at the moment appears to be the No. 5 level. In the north drift 10 ft. gave the extraordinary values of 64.84 oz. gold and 577 oz. silver; the previous 16 ft. assayed 40.5 oz. gold and 664 oz. silver. Of this very rich ore there is a length of 47 ft. Latest disclosures are not so high, though they are still of a remarkable character, 21 ft. showing the reef to be 25 in. wide, and containing 13 oz. gold and 397 oz. silver to the ton of 2,000 lb. In the south drift latest advices are to the effect that 15 ft. over 12 in. show 4 dwt. gold and 13 oz. silver. Apparently a fair sized bonanza has been struck, the point being emphasized by news that good values have been met with 150 ft. higher in the mine, but such values are not yet announced. The above figures might not of themselves warrant such an improvement in price as has taken place, but the Esperanza company possesses other important interests that are expected to turn out well.

To anyone who had followed events the non-declaration of an interim dividend by the Rio Tinto company did not come as a surprise. Apart from that in October, 1914, this is the sole occasion when the interim dividend on the ordinary shares has been passed. The Rio Tinto makes more out of its pyrites nowadays than out of copper, and the European market has ruled decidedly dull. The company has also felt the competition of America, where during the war greater quantities of pyrites were produced. Added to this there has been a strike of workmen which the management attribute to external influences. Other parties blame the company for not raising wages, because the whole district is dependent upon the mine, and it is a serious thing when 10,000 men cease operations. In order to avoid starvation thousands of miners have left the district. The shares are mainly held in France, and from Paris they have recently been turned out, with the result that the quotation is the somewhat nominal one of £30. Previously double this figure was nearer the mark.

As the premium on gold is being maintained at a high level, and as there are indications that the South African gold mining companies will declare enhanced dividends for the current half year, public attention is again being directed to this market. Many companies are making more out of the premium than out of working profit at standard price. The East Rand Proprietary Mines which, before a free market in its product was permitted, could see the end approaching, has taken on a new lease of life, and its profits are becoming very substantial. At the moment the shares are more or less of a gambling counter, but the position of the debenture holders is greatly improved.

CANADA

British Columbia

Labor Situation in Slocan Unchanged—Trail Smoke Nuisance Case Being Arbitrated

Nelson—The strike in the Slocan continues in effect, operators showing no dispostion to return to their former state of activity, even if the One Big Union organization should officially declare the strike ended. Operations are being maintained at the Silversmith Mines, at Sandon, with an O. B. U. crew. The Bosun, between New Denver and Silverton, is working with a force recruited from the diminished ranks of the International Union of Mine, Mill and Smelter Workers, and a start has been made in the direction of resuming operations at Noble Five and Rambler-Cariboo. Outside of these properties, and a number of leasing syndicates, the Florence at Ainsworth and the Blue Bell at Riondel, mining activity in the Slocan and Ainsworth mining divisions is at a very low ebb. There is no prospect of improvement this winter, unless the labor situation eases up. The lumber operators' demand for labor is lessening.

The California mine, near Nelson, continues development with a small crew, although milling operations have been temporarily suspended. The milling done this fall has been more in the nature of a test of a process worked out for concentration of ores of the California mine, the old Athabasca gold stamp mill being leased and practically rebuilt for that purpose.

Trail—Much interest is being shown in the outcome of the case involving claims for damages by ranchers near Trail against the Consolidated M. & S. Co., on account of alleged injury to fruit trees by smoke and fumes from the smelter at Trail. The case has gone to arbitration, with Judge Forin, of Nelson, as arbiter. Voluminous evidence is now being taken, but it is not anticipated that a decision will be reached until the end of the year.

Allenby—Canada Copper Co.'s 2,000-ton concentrator is ready to start. The power line was completed in September and at present the company is drying out the transformers. The ratio of concentration will be approximately 19 to 1.

Yukon Territory

Operations in Keno Hill Region

W. E. Cockfield, of the Canadian Geological Survey, who has been working in the Keno Hill, Mayo, and other adjacent sections of the Yukon during the summer, says that there is much activity in the Keno Hill region and that much development is being carried on by the Yukon Gold Co. The company expected to ship 3,000 tons of ore this winter. The ore assayed high grade silver-lead, running 200 oz. of silver and 50 to 60 per cent lead to the ton. The principal ore, he said, was galena, siderite, and manganese, occasionally carrying freibergite. The gold content was small, not exceeding, as a rule, $4 to the ton. On the upper Stewart River there were some stamp mills in operation but little placer mining was being done. A gold dredge had been in operation on Highett Creek during the summer. Mr. Cockfield has gone East.

Ontario

May Merge Orr Gold Mines With Kirkland Lake and Teck Hughes—No Oil at Paradis Bay

Gowganda—The Trethewey mine in Gowganda has shipped another ten tons of high-grade ore.

Elk Lake—The Cane property in the Elk Lake district has shipped 200 bags of ore, and has an additional quantity on hand. This ore, it is expected, will run approximately 400 oz. to the ton.

Cobalt—The annual report of the Hudson Bay mine shows a total income of $102,000 and expenses of $99,000, leaving a profit of $3,000 for the year.

There appears to be very little foundation for the recent report of oil at Paradis Bay, near Cobalt. An investigation by the Provincial Department shows that no oil exists, but that there is a possibility of there being gas.

Kirkland Lake—Since the recent reopening of the Orr Gold Mines in Kirkland, the orebody has been further extended, and has now been proven for a length of about 400 ft. and a width of 10 ft. The amalgamation of this property with the Kirkland Lake and Teck Hughes mines is being talked of.

ALASKA

The matter of using part of the mill equipment of the Alaska Gold Mines for the manufacture of wood pulp is under consideration by the company and certain outside interests. Nothing definite has developed to date, it is stated.

CALIFORNIA

Electro Metals Co. To Build Smelter at Trinidad

Quincy—The Seneca-Eureka mine in the Seneca district of Plumas County, about five miles from Lake Almanor, a gold property of some promise, is now being actively developed by its owner, C. D. Hazzard, of Quincy. The property covers an area about two miles long and one mile wide reaching from the North Fork of the Feather River to the top of the mountain. All claims are contiguous and the entire group is covered with good timber and has two streams of water on it that may be used for power purposes. The property contains five ledges, four of which show good values in free gold and the fifth carries considerable arsenical sulphides.

The Blue King group of claims, five miles northeast of the Walker mine, and which is now being operated by the Mason Valley Mines Co., has one of the widest mineralized zones on the surface to be found on the Plumas copper belt. There are three parallel veins, 150 ft. apart, with sufficient values between so that the mineralized zone is considered 300 ft. wide. The veins are 8 ft., 12 ft. and 20 ft. wide, respectively, and are traced by croppings for a length of 800 ft. There are seams of high-grade which run 6 per cent copper, though the average near the surface is not believed to be over 2 per cent. The ore, however, runs better in silver and gold than most of the ores of the belt.

Eureka—The old town of Trinidad, 30 miles north of Eureka, which was once one of the principal lumber shipping ports of the county, is getting on the map once more. An electric smelter for producing aluminum and the treatment of other metallic ores by electro-chemical processes is to be built. A deed conveying the whole property and rights and another instrument placing the property in the hands of trustees to operate and conduct it for a term of 25 years from July 31, 1920, have been filed with the County Recorder. The deed is from Frank and Carl Langford, of Eureka, and W. G. Devereaux, of San Francisco, to B. L. Thane, Roy H. Elliott, Frank R. Wehe and E. K. and F. Solinsky of San Francisco. The company will be known as the Electro Metals Co.

Downieville—Work on the 3,000-ft. tunnel to tap the channel in the Bella Union-Poor Boy ground will begin shortly. Most of the tunnel will have to be run through hard rock, and it is planned to instal power as early as possible next spring, but it will be several months before definite plans can be made.

NEVADA

Arrowhead's First Shipment Nets $57.40 Per Ton—Nevada Packard in Receiver's Hands

Arrowhead—The first shipment of 30 tons from the Arrowhead mine netted the company an average of $57.40 per ton. Mark Bradshaw is now consulting engineer.

Packard—The Nevada Packard mine is now in the hands of a receiver as a result of action taken by creditors to whom about $55,000 is owed. Captain Herman Davis, superintendent, has been named as receiver. The Packard has been shut down for some weeks owing to lack of power and this precipitated the action.

Eureka—Shipments for the first week in October were as follows: Eureka Holly, 13 cars of ore; Eureka-Croesus, 6; Eureka-Prince, 5; Cyanide mine, 3; Silver West slag dump, 3 cars of speiss; Richmond-Eureka Mining Co., 29 cars spiess.

Virginia City—The production of the Con. Virginia for the first week in October is given a gross value of $15,000. The north drift from the bottom of winze on 2,150 level was advaneed 41 ft. and is credited with yielding 134 tons of ore assaying $77.84 per ton.

Pioche—Ore shipments from the Pioche district for the week ended Oct. 7 were 50 per cent below normal owing to increased freight rates. A reduction of train service is already reported. Shippers were as follows: Prince Consolidated, 950 tons; Virginia Louise, 400; Bristol Silver Mines Co., 150; Black Metals Co., 110; Emerick Deerfoot Lease, 85; Combined Metals Co., 50, and S. T. Campbell Bristol, 50; total, 1,795.

ARIZONA

Shannon Working Yeager Canyon Property

Jerome—Shannon has resumed development of its Yeager Canyon property, near Jerome, intending to sink to depth and outline the copper deposit that has been cut above. In Cochise County ore is being shipped from the Gleeson mine to the Douglas furnaces of the Copper Queen. The Shannon directorate had been empowered to venture in Texas oil, backed by the money realized from the sale of its property in the Clifton-Metcalf district, but the officers have found nothing attractive and are turning back to their Arizona mines. Much of the cash realized has been securely placed in bonds.

Globe—A station has been cut on the 1,500 level of Iron Cap and extensive lateral development work will be started at that depth, as well as upon the 800 level, where there will be exploration to the westward. The new mill is reported working well, with a high percentage of recovery from 300 tons treated daily. A fire control system is being established underground, with doors that are closed by release of pneumatic pressure on the surface.

NEW MEXICO

Great Eagle Fluorspar Mine Sold—Amory Stevens Manganese Properties To Resume Shipments

Lordsburg—The Great Eagle fluorspar mine on the Gila River north of Lordsburg was sold Oct. 2 to Michigan capitalists represented by A. Ross, mining engineer. A considerable cash payment was made with balance to follow in a short time. The deal was consummated by D. L. Hill, president of the Bonney-Consolidated Copper Co. A mill will be erected at once, some of the machinery being contracted for by wire. A finished high-grade product will be turned out, suitable for acid and enamel purposes, the middlings being sold and shipped subsequently for metallurgical purposes.

The Co-operative Mining Co. has purchased all the equipment of the Radium Co. of America's property at White Signal. The new hoist has been installed and the main shaft will be sunk 200 ft. below the present level, which is 235 ft. A car of mine-run ore is shipped about every two weeks to the El Paso smelter.

Silver City—Judge M. W. Porterfield, who has been in charge of the Amory Stevens manganese properties on Boston Hill, has been in Chicago, Washington and Pittsburgh in an effort to have the old freight rates restored on this product, which is low grade, the advanee in freight rates having utterly killed the business. He reports that his efforts have been successful and shipments will start again just as soon as the old rates are officially restored. These properties had been shipping about 300 tons daily to the C. F. & I. at Pueblo.

COLORADO

New Plant for Treating Radium Ores Erected in Boulder

Ouray—Development at the Camp Bird in the east heading from the tunnel level has been unencouraging. Only short stretches of commercial ore have been opened, and these are in narrow widths. It is not believed that these ore showings will afford a sufficient daly tonnage for profitable milling. Therefore work in this part of the mine has been suspended for the present, and activities have been transferred to the west end workings from the tunnel level and reaching out under the past productive area in this end of the mine. The west heading is 614 ft. long, measuring from the tunnel intersection with the vein. For a distance the vein was pinched and indistinct, but widened to 4 or 5 ft. near the breast, having all the characteristics of the vein in overlying levels, except that it is lean in values, and no payable ore has been encountered. During April the heavy snowfall did some damage to buildings. The roof of one wing of the cyanide mill collapsed. During the quarter ended June 30, 1920, 881 ft. of development work was performed. The length of the east heading was 2,270 ft.

Boulder — The Tungsten Products Co. has expended about $7,000 in the erection of a chemical plant for treating radium ores. The plant is located in Boulder at the corner of Pearl and Third Streets. The ores which will be treated at this plant are being mined in the company's property at Gateway, Col., on the southwestern slope.

SOUTH DAKOTA

Bob Ingersoll Mine Sold, Also Swansea Lithia Property—Golden Summit Shuts Down—Cutting to Resume

Keystone—The Bob Ingersoll has been sold to Dennis Henault and associates. This property has produced considerable lithia ore, mica and beryl during past years and it is expected that under the new ownership the output will be greatly increased.

The Swansea lithia mine in the same district was also sold within the last few weeks and active work is to be started soon.

The Maywood Chemical Co. continue shipments of spodumene to their plant in New Jersey, the Etta mine supplying most of the material.

Hill City—Work at the Golden Summit mine, under lease and option to the First National Gold Mining Co., has been suspended owing to scarcity of labor and high costs of operation.

Deadwood—Preparations are under way to resume work at the Cutting property. New pumps capable of handling the large amount of water have been ordered and upon their arrival will be installed and the development work will be continued.

UTAH

Utah Apex To Add Flotation Unit—Homestake, at Park City, Being Reopened

Bingham Canyon—The Utah Apex is sinking its shaft to the 2,000-ft. level to reach the downward extension of the orebody on the 1,800 level. A flotation unit will be added to the mill, which will reduce costs on low-grade ores. A decision in the suit with the Utah Consolidated is expected before long from the United States District Court at Salt Lake City which has had the case under advisement for nearly a year.

Park City—The Homestake situated near the Glen-Allen and the Park-Utah in the southeastern part of the camp is being reopened after several years, owing to promising developments in neighboring properties. There is a 150-ft. shaft on the ground and a tunnel reaching the vein at a depth of 200 ft. The first work to be undertaken will be drifting on the vein. Samuel Paul is president and general manager and Robert Gorlinski, vice president.

The Ontario has resumed work on the 2,000-ft. level, the lowest level in the mine, after a months' intermission, owing to breaking a crank shaft on the compressor. A new pump has been installed on the 2,000 level which has been unwatered.

MONTANA

Silver Butte To Reopen Balaklava—Cascade M. & M. Co. Leases Property of Cascade Con.

The Silver Butte Mines Corporation has acquired through purchase and under a reorganization plan all of the Butte-Balaklava's $225,000 bond issue. Under the reorganization scheme Balaklava stockholders received 50 per cent of the bonds in cash and the balance in stock of the Silver Butte Mines at a par value of $1. Holders of Butte-Balaklava stock can exchange it share for share with Silver Butte Mines with 50c. added for each share exchanged. Considerable stock, it is stated, already has been exchanged. Arrangements are under way for the immediate reopening of the old Balaklava mine in the Butte district, which has not been operated since 1917. The Balaklava shaft is down to a depth of 1,600 ft. but is in need of repairs. From 20 to 30 leasing applications to work the Balaklava have been received. The Corbin property of the Silver Butte Mines embraces the Corbin King group of 26 acres, through which four known veins strike, three of which have been cut at a depth of 400 ft. by a two-compartment shaft, conditions being promising with respect to vein filling. Six carloads of ore already have been shipped from development operations, which averaged 21 oz. of silver and a 12 per cent copper. Unwatering and cleaning out will require about a month's time. Lumber was shipped to Corbin recently. An electric hoist, good for 1,000 ft. in depth, will be installed together with a compressor plant.

The stockholders of the Cascade Mines & Mills Co., operating in the Neihart district, have leased to the Cascade Consolidated Silver Mines Co. its property, including mines and mill, for three years. W. L. Creden, formerly of the Davis Daly, is in charge.

ARKANSAS

Arkansas Lime Co. Adopts New Methods To Overcome Labor Shortage

Ruddells—The Arkansas Lime Co. has almost eliminated hand labor from its quarry operations. A steam shovel replacing twenty-five men was recently installed. George Weigart, manager, states that a saving of $50 a day over the old method is being made. A churn drill has also been installed and jackhammers and other rock drills are now used only for breaking large boulders. The churn drill is now at work on a round of four holes at the south end of the quarry, the face being 250 ft. wide and 85 ft. high. The holes will be 75 ft. deep and are about 15 ft. behind the face. It is estimated that these four holes can be shot successfully with 1,200 lb. of dynamite breaking 10,000 tons of rock. This blast will be fired next month after which a round of fifteen 75-ft. holes will be drilled back of the whole face. It will take until spring to complete this work. It is estimated that 36,000 tons will be broken with this round. These methods have been adopted to overcome the labor shortage which has hampered operations for the last two years.

MICHIGAN

The Copper District

Superior's Shafts Closed—Quincy Not To Absorb Hancock

Calumet—Both shafts of the Superior Copper Co. are completely shut down, the rails having been removed from No. 2 shaft. The winze which was sunk from the 31st level at a point 1,400 ft. south of No. 1 shaft did not show up copper bearing ground of commercial quality.

The persistent rumor to the effect that the Hancock Consolidated Mining Co. was to be absorbed by the Quincy Mining Co. has been officially denied. The basis of this rumor has probably been the fact that they have been working together in building the concrete reservoir at the 53rd level of the Hancock mine.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Picher, Okla.—The Mogul Mining Co. is sinking to 230 ft. after operating for several months at the 217-ft. level. Heavy water has kept the company from sinking deeper heretofore, but now by joining with the St. Louis Smelting & Refining Co. the water problem is believed solved. The company expects to sink two shafts near the mill to a deeper level later on and to operate the mine double shift. A. E. Dunlap, Miami, is manager and J. B. Stringer, Carterville, Mo., superintendent.

The Vinegar Hill Zinc Co. has taken an option on the Texas mine and mill and has placed four drill rigs upon the ground for prospecting purposes. The mine is located southwest of Hockerville, Okla., in good territory, but the company has been handicapped with lack of money for operation.

ALABAMA

Helen Bess Mines Recovering from Recent Fire

Birmingham—The Helen Bess mines of the Birmingham Ore & Mining Co., after suffering a disastrous fire which burned its washing plant, machine shop and other buildings recently, is again getting out ore in limited quantities. The fire started, it is believed, from high voltage wires on the top of the washing plant. The loss is estimated at $150,000 with partial insurance. A tipple and other buildings needed for actual operation are being built and some ore is again being mined. Labor trouble was recently nipped in the bud at this plant and at first it was thought that the fire was incendiary origin. The company does a commercial ore business.

THE MARKET REPORT

Daily Prices of Metals

Oct.	Copper, N. Y. net refinery* Electrolytic	Tin		Lead		Zinc
		99 Per Cent	Straits	N. Y.	St. L.	St. L.
14	16.00	37.75	38.75@39.00	7.00@7.10	7.00@7.10	7.20
15	15.60	37.00	38.00@38.50	7.00	7.00@7.10	7.15
16	15.35	37.00	38.00@38.50	7.00@7.20	7.00@7.10	7.15
18	15.10	36.50	37.50@38.00	7.00@7.10	6.85@7.20	7.10@7.15
19	15.10	37.00	38.25@38.75	6.85@7.10	6.85@7.15	7.10@7.15
20	15.10	38.50	41.00@41.25	6.85@7.10	6.85@7.00	7.10

*These prices correspond to the following quotations for copper, "delivered": 16.15, 15.75, 15.50, 15.25, 15.25 and 15.25c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
14	93¼	91¼	106	249	254½	34½	34¼	40⅛	41⅛
15	92½	88½	104	244½	249½	34⅞	34½	39½	40½
16	....	....	...	...	....	...	...	...	...
18	93	88¼	102	238½	245	35¼	34⅜	39⅜	40⅜
19	92½	89½	102	241¾	247½	35⅜	35½	39	40
20	92	88½	101	250	255½	35¾	35⅝	38¾	39¾

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver			Oct.	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
14	349	99½	85⅝	55¼	18	342½	99½	79¼	52½
15	346	99½	82⅝	53⅝	19	340	99½	76¼	50½
16	345½	99½	81¼	53	20	342	99½	78⅛	51⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Oct. 20, 1920

Metal-marketing conditions are much the same as last week. The trend of prices is still downward, but has not been met by any startling response on the part of consumers. Some experienced dealers feel that prices may be near the bottom in the case of copper, zinc, and tin, and that the wisdom of buying will soon be apparent to consumers. The latter are, however, in many instances financially unable, or unwilling, to lay in stocks at any price, and are using the last pound of metal which they can clean up in odd corners. The large quantities of scrap metal which have been available have exerted a particularly depressing influence, especially in the case of copper. These stocks have existed in Europe as well as in this country, and so have affected the foreign trade.

Copper

This metal has declined particularly rapidly, about 2½c. in three weeks. The cheap prices at which copper is now being offered in an effort to stimulate sales have been mildly successful in some quarters, and the sales reported to us, principally for forward delivery, were the largest for several weeks. These sales were, however, not due to any particular consumer demand. Inquiries have been few and for small lots. Nobody seems to want immediate shipment.

Cancellation of orders and demoralized trade conditions have been felt more by producers during the last week than at any previous time. It is questionable whether 15c. copper will attract any great demand from consumers, but the metal can hardly go much lower without being bought up by speculative interests, who rightly feel that such cheap copper is as good to have on hand as cash.

Lead

Conforming to the market trend, the A. S. & R. price was reduced ½c. to 7.25c., New York, on Friday the 15th. The outside market is even below this figure. Lead is the only major metal selling for what is considered to be a fair price, but at 7c. producers are certainly not profiteering. Production continues below normal, and supplies for the current month have generally been marketed. On the other hand, there is no particular scarcity. The market is being allowed to drift along, and demand is just about equal to supply. Inquiries have not been numerous; battery and lead-pipe manufacturers particularly have kept out of the market, though the demand from the paint and cable companies continues good.

Imported lead is reported to have been offered during the last week at 6.70@7.10c. The London advance was a surprise to the trade. Importations will now hardly pay, and, as long as present conditions hold, the market has seen the last of European lead. Mexican production is also cut down, owing to the strike of the coal miners in Coahuila; the low price of silver also exerts an influence. There are, therefore, some bullish factors to offset general trade conditions, and lead producers may consider themselves fairly well off.

The market for forward delivery is absent, buyers demanding a discount from prompt, which sellers are not willing to give.

Zinc

Some metal has been sold, but at declining prices. Producers are losing money on zinc now marketed, and are generally unwilling to sell into speculative hands, even at five to ten points' premium over the prices which they obtain from actual consumers. Production is rapidly decreasing, and it is felt that this will automatically stop any further large decline. Reports state that many producers will shut down entirely for two weeks, and at least one large smelting interest has practically ceased operations.

Tin

The extremely low prices of tin, only 3 or 4c. higher than the average for any of the last ten years, has stimulated interest among consumers in the last three days. The market is still dull and weak, however. The interest is mostly

confined to December and January metal, and spot is neglected. Electrolytic has been in fair demand at the same price as Straits to ½c. under.

Straits tin for future delivery: Oct. 14th, 39.50@40.00c.; 15th, 39.00@39.50c.; 16th, 39.00@39.50c.; 18th, 38.50@39.00c.; 19th, 39.25@39.75c.; 20th, 41.00@41.25c.

Arrivals of tin in long tons: Oct. 11th, Australia, 150; 13th, Hongkong, 100; 14th, London, 25; 16th, Straits, 35; 18th, London, 125.

Silver

Since our last report the London market has declined daily to a low level of 50½d. on the 19th, but reacted to 51⅜d. on the 20th. On this latter date, rupee exchange rose somewhat, and purchases of silver for account of the Indian Bazaars were reported. The New York price has closely followed the London parity, and moderate buying for China account has continued, although the inquiry from this quarter has broadened at the present writing. The trend of the market is uncertain.

Mexican Dollars—Oct. 14th, 65¼; 15th, 62¾; 16th, 62; 18th, 60½; 19th, 58¼; 20th, 59⅜.

Gold

Gold in London on Oct. 14th, 117s. 6d.; 15th, 118s.; 18th, 118s. 10d.; 19th, 120s. 3d.; 20th, 120s. 3d.

Foreign Exchange

The British coal strike has weakened sterling, exerting an influence in two ways—first, by making coal shipments from the United States to Europe necessary, and second by decreasing British exports to this country.

On Tuesday, Oct. 19, francs were 6.435c.; lire, 3.79c.; and marks, 1.43c. Marks continue to ease off with the continued use of the currency-printing press in Germany. New York funds in Montreal, 10½ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33.1c.; 98@99 per cent, 32.90c. The market is dull and weak. Importers find it hard to make sales.

Antimony—Spot metal, 6½@7c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 6¾@7c. W. C. C. brand, 8½@9c. Chinese needle antimony, lump, firm at 6½@7c. per lb. Standard powdered needle antimony[1] (200 mesh), 10c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $400@$450 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum** Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$95@$100 per oz.

Platinum—Firm at $95@$105 per oz.

Quicksilver—Market quiet; $70 per 75-lb. flask. San Francisco wires $68@$70. Market weak.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 75@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore[1]—60@70c. per unit, seaport; chemical ore (MnO_2) $70@$80 per gross ton, lump; $80@$90 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 65@70c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.50@$5, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25@$1.50 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 16—Zinc blende, per ton, high, $51.30; basis 60 per cent zinc, premium, $41; Prime Western buying $40@$37.50, settling $50@$40; fines and slimes, $37.50@$35; calamine, basis 40 per cent zinc, $35@$30. Average settling prices: Blende, $45.11; calamine, $38.93; all zinc ores, $44.94.

Lead, high, $115.60; basis 80 per cent lead; buying, $65; settling, up to $112.50; average settling prices, all grades of lead, $92.19 per ton.

Shipments for the week: Blende, 12,698; calamine, 356; lead, 1,962 tons. Value, all ores the week, $767,690.

The last settlement of lead ore bought on $112.50 basis was made this week, but deliveries are still being made on $110 basis, with reported contracts extending deliveries to Dec. 1 on $110 basis.

The last deliveries on $50 basis for zinc were made this week, with considerable ore outstanding bought on $47.50@$42.50 basis.

The mines are closing down tonight for two weeks, or for an indefinite period, both statements have been issued from semi-reliable sources. There is a sold tonnage in bins around 40,000 tons, with 25,000 tons unsold. Closing the mines is deemed expedient to permit purchasers to load out the purchased ore. The restriction is believed will be as thorough as the midsummer closing. Followed by a proposed lighter restriction it is possible shipments may catch up with purchases by Dec. 1.

Platteville, Wis., Oct. 16 — Blende, basis 60 per cent zinc, $45 per ton for high grade. Lead ore, basis 80 per cent lead, $75 per ton. Shipments for the week: Blende, 1,078; calamine, 15 tons. Shipments for the year: Blende, 54,779; calamine, 2,474; lead, 4,398; sulphur ore, 1,284 tons. Shipped during the week to separating plants, 2,455 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines. Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$18 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $30@$35, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content. In Ceylon, some of the largest producers have closed their mines until prices advance to meet increased production costs, and stocks at Colombo were lowered only 3,000 tons in the first five months of 1920.

Gravel—No analysis guarantee, f.o.b. Roseview, Ill., $25 per ton; gravel suitable for acid, chemical or enameling purposes, $60.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. Freshly ground calcined, suitable for flooring trade, $75@$85 per ton, f.o.b. Eastern points.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. There is no price schedule for spot for domestic uses. Tennessee production sold up months ahead.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike. Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered. 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $170@$175 freight allowed; last half, $170; English, $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $82.50@$85, f.o.b. furnace.

Ferromolybdenum[1]—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten[1]—Domestic, 70 to 80 per cent W, 80@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 26½c. per lb.; wire, 20c.

Lead Sheets—Full lead sheets, 11c.; cut lead sheets, 12½c. in quantity, mill lots.

Nickel Silver — Unchanged at 38½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 25½c.; sheathing, 24½c.; rods, § to 3 in., 22½c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Clay—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Oct. 19, 1920

Although some independents are disposed to lower their prices from time to time as they need business, others seem disposed to hold prices and curtail output, while predictions are made that production will be forcibly curtailed this winter by reappearance of transportation difficulties.

Pig Iron—Basic iron, which lagged in the advance because consumers were not covering ahead to the extent that obtained in foundry iron, is naturally leading in the decline, as there is occasional demand to induce sellers to name competitive prices. Although $45, Valley, as against the previous market of $48.50, was the lowest noted a week ago, since then a Pittsburgh district consumer has bought 1,500 tons from a middleman at $40 and has been quoted $42 by three producers. Some odd lots of foundry have been sold at last quotations. We quote: Bessemer, $48.50; basic, $42; foundry, $47, f.o.b. Valley furnaces, freight to Pittsburgh being $1.96.

Steel—Mills seem to be endeavoring to hold to $60 for billets and $65 for sheet bars, but on a 5,000-ton lot of billets $55 or less was done.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16.50@$17; foundry, $18.

The Antimony Price Recession

As the United States Is Dependent Upon Foreign Supplies, a Price Drop Is of Little Domestic Consequence—Large Available Stocks and Pre-War Demand Indicate Maintenance of Low Quotations

THE antimony market is exceedingly dull, and supplies are fairly large; in fact, the purchase of surplus stocks of the metal from England, consisting of antimonial lead composition metal, or shrapnel material, is having a depressing effect upon the market. Prices are already below the pre-war figure of about 7½c., and in common with most other metals, a price tendency downward is recorded. However, the price of antimony gives little concern to the country at large, as there is no appreciable primary domestic production and the consumption is small.

Undeveloped natural antimony resources are available and were profitably worked during the war, when the price of antimony remained over 25c. per lb., but in normal times, or periods in which the price does not rule over 7 or 8c., the domestic prospects and mines can be worked only at prohibitive costs. From an economic standpoint this forced curtailment of domestic production is really an asset, as it leaves untouched a reserve that can readily be utilized in times of necessity when foreign supplies are unavailable.

Numerous Uses of Antimony, but a Small Demand

The relatively small but numerous pre-war uses of antimony, and the cheap foreign supplies, with their large resources, were greatly stimulated during the war by the consumption of antimony in shrapnel ammunition. But as this use has disappeared, the reversion to peace-time employment has again sharply limited the use of the metal.

Type metal, an alloy of antimony, lead, and tin, which has the property of expanding on solidification, is, from the standpoint of utility, the most important alloy of antimony. Britannia metal, an alloy of antimony, tin, copper and zinc, is used in cheap tableware; acid-resisting valves can be made from a lead-antimony alloy. Minor uses of antimony alloys are in battery plates, toys, brasses, and aluminum alloys.

The oxides of antimony are finding increasing application. The white oxide (Sb_2O_3) is used in the manufacture of opaque white enamel and sanitary ware, an application to which tin oxide is also put, and with which it must compete. The trioxide, Sb_2O_5, is used as a coloring agent in glass manufacture, it being more fusible than the tetraoxide. Antimony oxides and antimony sulphides are also used as paint pigments, and the coloring of rubber red is frequently accomplished with the aid of the sulphide. Safety matches, medicines, and ceramic industries consume minor amounts of antimony compounds.

Foreign Sources Important

China and Japan have been the chief supplying agencies of antimony in its various forms, but Mexico, France, and Bolivia are other countries with an important production that helps supply the world. China is by far the most important antimony-producing country, but its position was formerly minimized by the control which Great Britain had over the antimony-smelting industry. Brands of British antimony such as Cookson's and Halett's, made from foreign ores, enjoyed world-wide favor, and through well-developed antimony-smelting facilities in the British Isles, England was enabled practically to dominate the world's antimony market. Chinese, Mexican, Australian, and Continental ore was formerly smelted and refined in England, and the close co-operation of British trading interests exerted a strong influence in obtaining the raw material necessary for the furnaces and markets for the product. The war naturally changed this situation. Exports of Chinese ore and metal were in the hands of English and Continental firms, but this grip was broken by the war, and one result was the organization of the Wah Chang Trading Co. and the establishment of a direct selling agency in New York for the Chinese antimonial products. Through this step the Chinese metal has grown in favor and has become firmly established in the domestic market. The fact that China has large antimony reserves and adequate marketing facilities is assurance that the most important source for antimony for many years to come lies in the Far East.

Domestic Production Negligible

The great antimony-consuming countries of the world—that is, the United States, France, Germany, and Great Britain—are, with the exception of France, normally dependent upon foreign supplies of the metal. The producing countries are slight consumers.

The table gives the essential features of the domestic antimony industry for the war period. It is to be noted that domestic antimony production from ores jumped during the war, only to vanish in 1919. Under the present economic situation it would require a price of at least 20c. to make domestic antimony production profitable.

PRINCIPAL FEATURES OF THE UNITED STATES ANTIMONY INDUSTRY
(In Short Tons)

	U. S. Production From Ores	Antimony Content in Byproduct Antimonial Lead	Smelter Production From Foreign and Domestic Ores	—Imports— Ore	Metal, (Regulus)	—Exports— Matte, Regulus, Metal	Average Price, Cents
1913	.....	2,508	.....	2,007	6,249	.....	7.52
1914	.....	2,693	.....	1,254	6,555	800	8 76
1915	2,100	3,425	.....	1,544	7,354	1,573	30 28
1916	1,770	3,496	.....	4,622	7,064	1,509	25.37
1917	390	2,759	2,440	5,832	11,286	494	20 69
1918	50	2,566	2,617	1,425	14,011	705	12 58
1919	....	1,943	.....	409	7,159	214	8 20

It is altogether likely, now that the prospect of stabler conditions in Mexico seems realized, that our southern neighbor may increase her antimony production. In 1912 and 1913, 3,296 and 2,345 long tons of crude metal and regulus were shipped to England, but none came to the United States. Both English and American capital are engaged in developing Mexican antimony resources, and the necessary smelting facilities are available locally. The most important mines are owned by Cookson's, of England.

The world's production of antimony easily responded to the war demands. Whereas pre-war production was about 20,000 metric tons per year, during the war a peak production (1916) of 75,000 metric tons was attained. The ability of the world to meet any extraordinary demand for antimony is clearly apparent from the war record.

Latest Rand Gold Production

During September, the gold production of the Rand, in South Africa, amounted to 682,173 oz., a decrease in output from the August figure, 702,083 oz. A table summarizing production since 1917 follows:

RAND GOLD OUTPUT 1917-1920
(Fine Ounces)

	1920	1919	1918	1917
January	670,503	676,059	714,182	782,634
February	625,330	636,728	659,750	721,321
March	707,036	712,379	696,281	787,094
April	686,979	694,944	717,099	742,778
May	699,041	724,995	741,217	729,385
June	715,957	702,329	727,696	759,724
July	736,099	725,497	736,199	757,890
August	702,083	706,669	740,210	756,658
September	682,173	698,558	708,206	738,231
October		723,722	679,764	751,290
November		677,970	658,701	722,839
December		650,191	641,245	722,419

MINING STOCKS

Week Ended October 16, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	*65	*65	*65	
Ahmeek	Boston	56	55½	55½	Sept. '20, Q .50
Alaska-B.C.	N. Y. Curb	1⅛	1	1⅛	
Alliouez	Boston	24½	23½	23½	Mar. '19, 1.00
Anaconda	N. Y.	51½	49½	50	Aug. '20, Q 1.00
Ariz. Com'l	Boston	9	8½	8½	Oct. '18, .50
Big Ledge	N. Y. Curb	1/16		⅛	
Bingham Mines	Boston	9½	9¼	9¼	Sept. '19, Q .25
Calumet & Ariz.	Boston	56	55½	55½	Sept. '20, Q 1.00
Calumet & Hecla	Boston	270	250	253	June '20, Q 5.00
Canada Copper	N. Y. Curb			⅛	
Centennial	Boston	9¾	9⅛	9¼	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	39¾	37⅞	38½	Sept. '20, Q 1.00
Chief Consol.	Boston Curb	4	3½	4	Feb. '20, Q .10
Chile Copper	N. Y.	13¾	13⅛	13⅜	
Chino	N. Y.	26	24	24½	Sept. '20, Q .37½
Columbus Rexall	Salt Lake	*37½	*36½	*36½	
Con. Ariz.	N. Y. Curb			⅛	Dec. '18, Q .05
Con. Copper M.	N. Y. Curb			*61	
Copper Range	Boston	34½	33	33½	Sept. '20, Q .50
Crystal Copper	Boston Curb	*34	*28	*33	
Davis-Daly	Boston	7½	7	7	Mar. '20, Q .25
East Butte	Boston	10⅛	10	10	Dec. '19, A .50
First Nat'l	Boston Curb	*82	*80	*80	Feb. '19, SA .15
Frankl'n	Boston			2 1/16	
Gadsden Copper	N. Y. Curb			*70	
Granby Consol.	N. Y.	33	32	32	May '19, Q 1.25
Greene Cananea	N. Y.	27⅞	27⅓	27⅜	Aug. '20, Q .50
Hancock	Boston	4	3	4	
Houghton	Boston Curb			*40	
Howe Sound	N. Y. Curb			3½	Oct. '20, Q .05
Inspiration Con.	N. Y.	44⅛	43	43	Oct. '20, Q 1.00
Iron Cap	Boston Curb			8½	Sept. '20, K .25
Isle Royale	Boston	25	25	25	Sept. '19, SA .50
Kennecott	N. Y.	23⅜	22⅛	22⅞	Sept. '20, Q .50
Keweenaw	Boston			1¼	
Lake Copper	Boston			3	
La Salle	Boston			2½	
Magma Chief	N. Y. Curb			*21	
Magma Copper	N. Y. Curb			17	Jan. '19, Q .50
Majestic	Boston Curb	*14	*14	*14	
Mason Valley	Boston			1½	
Mass. Con.	Boston	2⅜	2⅛	2⅜	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	5⅜	4 13/16	4 13/16	
Miami	N. Y.	19⅜	18⅛	19	Aug. '20, Q .50
Michigan	Boston			3½	
Mohawk	Boston	57	55⅞	57	Aug. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	5⅜	5⅛	5⅛	
Nevada Con.	N. Y.	11⅞	10⅝	10⅝	Sept. '20, Q .25
New Arcadian	Boston			2½	
New Baltic	Boston Curb			3	
New Cornelia	Boston	19	18	19	Aug. '20, .25
Nixon Nev.	N. Y. Curb			*9	
North Butte	Boston	14½	14	14	Oct. '18, Q .25
North Lake	Boston	*25	*25	*25	
Ohio Copper	N. Y. Curb			1/16	
Oilbway	Boston			1¼	
Old Dominion	Boston	23	22½	23	Dec. '18, Q 1.00
Osceola	Boston	35	31	32	June '20, Q .50
Phelps Dodge	Open Mar.	†190	†170		Oct. '20, Q 2.50
Quincy	Boston	44	42	43	Sept. '20, Q 1.00
Ray Con.	N. Y.	14⅜	14	14⅜	June '20, Q .25
Ray Hercules	Boston Curb	*75	*50	*50	
St. Mary's M. L.	Boston	35⅜	35	35	June '20, K 2.00
Seneca	Boston	15	14½	15	
Shannon	Boston	1⅛	1	1	Nov. '17, Q .25
Shattuck Ariz.	N. Y.	8⅛	8	8	Jan. '20 Q .25
South Lake	Boston			2	
South Utah	Boston	*10	*10	*10	
Superior Copper	Boston	4½	4	4½	Apr. '17, I 1.00
Superior & Boston	Boston	3½	2½	3½	
Tenn. C. & C.	N. Y.	9⅜	9⅛	9⅛	May '18, I 1.00
Tuolumne	Boston	*55	*50	*54	May '13, .10
United Verde Ex.	Boston Curb	30⅜	29	29½	Aug. '20, Q .50
Utah Con.	Boston	6¼	6	6 1/16	Sept. '18, .25
Utah Copper	N. Y.	60⅜	56½	57⅛	Sept. '20, Q 1.50
Utah M. & T.	Boston	1⅜	1 1/16	1 1/16	Dec. '17, .30
Victoria	Boston	1⅛	1⅛	1⅛	
Winona	Boston	*40	*35	*35	
Wolverine	Boston	12½	12½	12½	Jan. '20, Q .50
LEAD					
Hecla	N. Y. Curb	5	4½	5	Sept '20, QX .15
St. Joseph Lead	N. Y.	14⅛	13⅛	14	Sept '20, QX .50
Stewart	Boston Curb			*13	Dec. '15, .05
Utah Apex	Boston	2⅛	2	2⅛	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	11⅛	11⅛	11⅛	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	45	45	45	Aug. '20, Q 1.50
Butte C. & Z.	N. Y.	6⅛	6⅛	6⅛	June 18, I .50
Butte & Superior	N. Y.	17⅛	16⅜	16⅜	Sept. '17, I 1.25
Con. Interst. Cal.	N. Y.	9⅛	9	9	June '20, Q .50
New Jersey Z.	N. Y. Curb	175	172	173	Aug. '20, Q 4.00
Success	N. Y. Curb	*4½	*4	*4	July '16, .03
Yellow Pine	Los Angeles			*95	June '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	2	1⅛	1⅛	
Alaska Juneau	N. Y.	2⅛	2	2	
Carson Hill	N. Y. Curb	22⅞	22⅞	22⅞	
Cresson Consol. G.	N. Y. Curb	1⅛	⅞	1⅛	June '20, Q .10
Dome Ex.	Toronto	*40	*39½	*40	
Dome Mines	N. Y.	11½	11⅛	11⅛	Sept. '20, Q .25
Golden Cycle	Coln. Sprgs.	‡		*73	Sept. '20, Q .02
Goldfield Con.	N. Y. Curb	*9½	*8	*9	Dec. '19, .05
Hedley	Boston			4½	June '19, .10
Hollinger Con.	Toronto	5.85	5.74	5.74	Oct. '20, BM .05
Homestake	N. Y.			47	Sept. '19, .50
Kirkland Lake	Toronto	*46½	*45	*46	
Lake Shore	Toronto	1.02	1.02	1.02	Oct. '20, K .02
McIntyre-Porcupine	Toronto	2.04	2.02	2.02	Sept. '20, K .05
Porcupine Crown	Toronto	*26	*23	*24	July '17, .03
Portland	Colo. Sprgs.	‡		*60	Oct. '20, Q .01½
Reorgan. Booth	N. Y. Curb	5½	4	4	May '19, .05
Silver Pick	N. Y. Curb	*6	*4	*6	
Teck Hughes	Toronto			*8½	
Tom Reed	Los Angeles	1.50	1.25	1.46	Dec. '19, .02
United Eastern	N. Y. Curb	2⅛	2 1/16	2 1/16	Oct. '20, Q .15
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q .01
West Dome Consol.	Toronto			*6½	
White Caps Min.	N. Y. Curb	*8	*7	*8	
Yukon Gold	Boston Curb			1⅛	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*22	*17	*21	Apr. '20, M .03
Beaver Con.	Toronto	*39½	*39	*39½	May '20, K .03
Coniagas	Toronto	†2.50	†2.40	2.55	Aug. '20, Q .12½
Crown Reserve	Toronto			*27	Jan. '17, .05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Oct. '20, K .12½
La Rose	Toronto	*32	*32	*32	Apr. '18, .02
McKinley-Dar.	Toronto	*54	*50	*50	Oct. '20, Q .03
Mining Corp.	Toronto	1.70	1.59	1.70	Sept. '20, Q .12½
Nipissing	N. Y. Curb			9	Oct. '20, QX .50
Ontario Silver	N. Y.	5	4⅛	5	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12, .10
Peterson Lake	Toronto			*14½	Jan. '17, .01½
Temiskaming	Toronto	*34½	*34	*34	Jan. '20, K .04
Trethewey	Toronto	*25	*24	*24½	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2	*1	*1	
Barnes-King	Butte	‡		1.11	Aug. '20, Q .05
Bost. & Mont.	Boston			*63	
Cashboy	N. Y. Curb	*8	*7	*8	
El Salvador	N. Y. Curb	1	⅛	1	
Jim Butler	N. Y. Curb	*16	*15	*16	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*6	*5	*5	June '16, .05
Louisiana Con.	N. Y. Curb	1/16	1/16	1/16	
MacNamara M.	N. Y. Curb			⅛	May '10, .02½
N.Y. Hond. Rosar.	Open Mar.	†12	†10½		Oct. '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	1 1/16	1 1/16	
Tonopah Ex.	N. Y. Curb	1⅜	1 1/16	1 1/16	Oct. '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1	1	Oct. '20, SA .05
West End Con.	N. Y. Curb	1 1/16	1⅛	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*17	*16	*16	July, '20, M .01
Consol. M. & S.	Montreal	25	24⅛	24½	Oct. '20, Q .62½
Daly Mining	Salt Lake			2.50	July '20, Q .10
Daly-West	Boston	4½	4⅛	4¼	Oct. '20, Q .25
Eagle & Blue Bell	Boston Curb	2 1/16	2 1/16	2 1/16	Apr. '20, Q .10
Electric Point	Spokane			*12	May '20, SA .03
Fed. M. & S.	N. Y.			13	Jan. '09, 1.50
Fed. M. & S. pf.	N. Y.	33½	33	33	Sept. '20, Q 1.75
Florence Silver	Spokane			*25	Apr. '19, .01½
Grand Central	Salt Lake			*37½	June '20, K .03
Iron Blossom	N. Y. Curb	⅛	⅛	⅛	Apr. '20, Q .02½
Judge M. & S.	Salt Lake			3.97½	Sept. '20, Q .12½
Marsh Mines	N. Y. Curb	*15	*9	*13	
Prince Consol.	N. Y. Curb	⅛	1/16	⅛	Nov. '17, .02½
Rambler-Cariboo	Spokane			*9	Feb. '19, .01
Rex Con.	N. Y. Curb	*6	*6	*6	
South Hecla	Salt Lake	*89	*88	*88	Sept. '19, K .15
Stand. S. L.	N. Y. Curb	1/16	1/16	1/16	Oct. '17, .05
Tamarack-Custer	Spokane	2.30	2.25	2.30	Dec. '19, K .03
Tintic Standard	Salt Lake	2.95	2.77½	2.95	June '20, Q .10
Wilbert	N. Y. Curb	*5	*4	*4½	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	18½	17⅛	17⅜	Mar. '19, .50
Internat'l Nick.pf.	N. Y.	83	80	83	Aug. '20, Q 1.50
QUICKSILVER					
New Idria	Boston			5	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb			*10	
VANADIUM					
Vanadium Corp.	N. Y.	66⅛	62½	64½	Oct. '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	103	95⅛	96⅛	Oct. '20, Q 1.50
Asbestos Corp. pf.	Montreal	107	102	102	Oct. '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	60⅛	58⅛	59⅜	Sept. '20, Q 1.00
Am. S. & R. pf.	N. Y.	92⅜	92	92	Sept. '20, Q 1.75
Am. Sm. pf. A	N. Y.	77	76	77	Oct. '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	54	52⅜	53	Oct. '20, Q 1.50
U.S.S.R.& M. pf.	Boston	44	43⅛	43⅛	Oct. '20, Q .87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimonthly. K, Irregular. I, Initial. X, includes extra

INDUSTRIAL NEWS

Auger Rotator of New Design

In drilling soft, broken, or loose ground, it has been found that the ordinary compressed air hammer drill strikes too hard a blow for satisfactory progress. Its penetration is so great at each stroke that it is unable to throw the mud and cuttings from the hole, resulting in speedy clogging of the bit. To overcome this difficulty the so-called auger drill has been developed. In this type the stroke is relatively short and the blow light and rapid. At the same time the strength and speed of rotation have been increased, to provide for keeping the hole true and round, and to aid in ejecting the sludge. Solid spiral steel and a "fishtail" bit are often used with auger drills, the twisted steel serving as a conveyor for the cuttings.

An improved Sullivan Auger Rotator, recently placed in service, possesses certain distinctive features, which are securing added effectiveness in drilling work of the kind described above. The Sullivan "DR-37" Auger Rotator weighs 35½ lb., being shorter and lighter than other types.

The strength and rapidity of rotation have been materially increased. In all the Sullivan rotators the rotation is accomplished by means of straight and spiral flutes milled in the front portion of the piston bar, which are engaged by lugs on a removable bronze nut. The piston grooves also engage lugs on the interior of the encircling ratchet, which imparts the turning movement to the chuck, and thus to the steel. In the ordinary rotator the piston and steel are turned on the up or back stroke; but in the new model Sullivan auger the reverse is true, the steel being turned by a four-pawl ratchet on the forward stroke as the blow of the piston is delivered, thus rendering the rotation of the steel stronger and more positive.

The action of the standard rotator valve combines with the forward stroke rotation to keep vibration and jar on the operator down to a low factor. In this new model an automatic, pulsation-type lubricator has been embodied, thus furnishing the working parts of the tool with a sufficient quantity of oil at all times.

Increased drilling speed, effective cleaning of the drill hole, and smooth operation are factors noticed favorably by drillmen in using these tools. Holes up to ten feet in depth are drilled readily in iron-ore formations. The rate of progress is maintained with unusual evenness as the depth increases, instead of falling off, as is characteristic of older types. For occasional use in hard ore the "DR-37" is equipped to use hollow steel, and a push button in the lower valve-buffer turns the air down the steel for cleaning.

Trucking Ore on Big Cottonwood Canyon Grades

Five Packard trucks owned and operated by the Cardiff Mining & Milling Co., Salt Lake City, Utah, are handling an unusually "steep" job with great success. They are hauling lead ore from the lower ore bins of the Cardiff company three miles from Big Cottonwood Canyon, Salt Lake County, Utah, to Murray, Utah, a distance of fifteen miles.

The first four miles of the haul are comparatively level, as one of the views shows, but the remainder of the route has a total rise in elevation of approximately 1,700 ft. through a narrow and rugged canyon. Two of our photographs give a good idea of this portion of the way, and some indication of the grade overcome.

The trucks make the trip twice in a twelve-hour day. Part of the time they have been in operation twenty-four hours a day. On the down trip the average load for each of the trucks is from six to eight tons, an over-load of from 10 to 30 per cent. On the return trip each truck carries from 1,000 to 7,000 lb. of up-freight for the mine.

Bad roads made the haul even more difficult at first. This was solved by the use of shale obtained from the bottom of the canyon. After the shale was placed on the road, the trucks on their daily trips packed it down until the road became virtually a boulevard. This was

FIG. 1. PACKARD TRUCKS AND THE BIG COTTONWOOD CANYON GRADES THEY CONQUER, WINTER AND SUMMER

a material aid in reducing the operating expenses of the trucks.

The truck service is uninterrupted during the summer months and until the snow begins to fall, about Nov. 1. After the first season the trucks were replaced with teams for the winter months; but last winter the trucks managed to operate with the help of teams used in plowing the snow off the road.

Industrial Cost Association Interests Mining Men

The Industrial Cost Association, which met in New York City on Sept. 27, lists among its active members important mining and general industrial organizations. The purpose of the association is the standardization of accounting and cost practices and terminology, to promote the adoption of standard governing principles and active co-operation and interchange of experience between representatives of manufacturers; also to act as a clearing house in distributing all such information.

M. F. Simmons, of the General Electric Co., Schenectady, N. Y., is president of the association, C. H. Smith, of the Westinghouse Air Brake Co., is first vice-president, Roland H. Zinn, of the Tanners' Council, is second vice-president, and A. A. Alles, Jr., secretary of the Fawcus Machine Company, Pittsburgh, Pa., is secretary-treasurer, 2818 Smallman St., Pittsburgh, Pa.

Steel Foundrymen Organize To Perfect Higher Standards in Casting Practice

Announcement has been made of the appointment of R. A. Bull, of Pittsburgh, Pa., as consulting metallurgist for a number of prominent steel foundries grouped for the purpose of developing and perfecting higher standards in the production of steel castings. Mr. Bull will devote his entire time to preliminary research work immediately, and has resigned his position as vice-president of the Duquesne Steel Foundry Co. to secure the necessary freedom.

Among the companies undertaking the work noted are the Electric Steel Co., Chicago, Ill.; Fort Pitt Steel Castings Co., McKeesport, Pa.; Isaac G. Johnson Co., Spuyten Duyvel, N. Y.; Lebanon Steel Foundry Co., Lebanon, Pa.; Michigan Steel Castings Co., Detroit, Mich.; and Sivyer Steel Castings Co., Milwaukee, Wis.

Mr. Bull is a member of numerous technical associations and has frequently contributed to the technical press. Since 1911 he has been a director of the American Foundrymen's Association and during 1916 and 1917 served two terms as its president. His connection with the foundry industry covers a period of over twenty years, during which he has held important positions in foundries at St. Louis, Chicago, New York, and Pittsburgh.

FIG. 2. FLEET OF PACKARD TRUCKS ON AN EASY GRADE

TRADE CATALOGS

Elevator Controllers — The Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has issued a new two-color booklet, "Elevator Controllers," of twenty-four pages, describing the new line of elevator control apparatus recently developed by that firm. This booklet, which is known as Publication 840, illustrates the new controllers and emphasizes their simplicity, quiet operation, and smooth acceleration. The last few pages are devoted to auxiliary apparatus.

New Jersey Concentrating Co., 66 York St., Jersey City, N. J., weighing, sampling, grinding ores, and custom concentrating, sends us an illustrated four-page folder designed to emphasize the completeness of the company's installation and the wide geographic range of its custom business with big and little producers of tungsten, chrome, manganese, zirconium, and other ores. (Telephone 4173 Montgomery.)

Chain Drives—The Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill., announces as ready for distribution its publication No. 345 "Link-Belt Silent Chain Drives for Cement Mill Equipment." Officials of cement mills will find this an interesting and valuable book, and may procure a copy by writing to the above address or any of the company's branch offices.

The same company's publication No. 257 is a 78-page book on the use of roller chains for power transmission, and its tables will appeal as a handbook for the power transmission engineer. A copy will be sent on application.

The Taylor-Wharton Iron & Steel Co. has recently sent us a souvenir booklet which was issued in commemoration of the 125th anniversary of the making of iron and the 25th anniversary of the making of manganese steel at its plant at Highbridge, N. J. The edition is well illustrated with photographs of the officials, employees, plants, and manufactured products. A complete history of the development of the company, which was originally organized in 1742, and its accomplishments are given. On Oct. 13, 1917, a celebration was held at Highbridge, N. J., upon the occasion of the above anniversary. At this time notable addresses were made by Knox Taylor, president of the company, Prof. Henry M. Howe, John R. Hardin and others. It is a most creditable fact that the organization includes several men who have remained in the service of the company for many years.

Condensers—The Link-Belt Co., 910 South Michigan Ave., Chicago, Ill., recently published an attractive illustrated twenty-four-page book (No. 352), covering its traveling water screens. This publication will be sent to anyone interested in the effective and economical screening of condensing water

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Volume 110 New York, October 30, 1920 *Number* 18

Copper and Cotton

THE spectacular slump in the price of copper during the last few weeks illustrates the close relation of the mining industry to other great industries, and its dependence upon general economic conditions. The copper slump was another of those almost perpendicular crashes which have taken place in quick succession—in cotton, sugar, wheat, and corn. It is like a row of dominoes: it is altogether a fine point as to which falls first, but that they fall in the end is inevitable. Some of the industries affected have taken the slump as an unexpected shock, with surprise and indignation. The cotton growers, for example, visited Washington and interviewed Secretary Houston, demanding that the Government "do something" to hold up the price of cotton. Similarly, the wheat growers charge somewhere conspiracy which has resulted in lowering the price of wheat below what is claimed to be the cost of growing; and they also demand that the Government "do something." But neither these plaintive cries for help nor the violence of the night riders of the South will have any effect on the great economic laws which are moving in the direction that has been foretold by every economist and financier since the war—and is as clear and as unavoidable as the law of gravity. As schoolboys we know that

"What goes up must come down
On the head or on the ground."

The blind ones are getting this drop "on the head"; but in these days of enlightenment it is probable that the majority of business has sidestepped it, and is letting it fall "on the ground."

There will doubtless be no pilgrimage to Washington of copper miners, beseeching the Government to "do something" to boost the price of copper. They have not had their fair share of the fat profits which the growers of cotton and wheat have had in the aftermath of fever-prosperity which succeeded the armistice, and against which it was understood that the temperature of the patient would fall below normal before health would supervene; but they are not likely to charge conspiracy, being, we believe, somewhat wiser, as a class, as to what is transpiring in the world than the planter of cotton or of corn.

This general process of deflation, of returning to normal values, of which these sudden slumps are symptoms, is what the common citizen has been praying for to come soon. As miners and otherwise just plain citizens, we have heard with secret joy (although not indecorously exhibited) of the cuts in the price of cotton, wheat, automobiles, and the rest. We see relief from the strain of exorbitant prices, and hope for the teacher, the Government employee, and all the group submerged by that H. C. L., which, if continued, would go far toward extinguishing culture and education, in the wild stampede for "grub." It depends, of course, upon whose ox is gored. We do not welcome it in copper or in zinc. But if we have to be operated on with the rest, the sooner it is over and we begin to be convalescent, the better: so bring on the anæsthetic!

We hope that in copper the operation is over. Certainly copper is selling at less than it costs to produce, a situation which can hardly be long drawn out. We hope—and believe—that we have touched bottom; but we have no precedent to guide us in hazarding a confident prediction, because the governing factors are such as have never before existed in the history of the world.

Choosing a Director for the Bureau of Mines

UNDER the above head *Chemical & Metallurgical Engineering* discusses in a leading editorial the problem of the forthcoming choice of the Bureau of Mines director. We quote from this editorial as follows:

"All will agree that the greatest care should be exercised in making the choice. The position calls for certain qualifications that are quite obvious. Primarily, we suggest that it seems appropriate that the director of the Bureau of Mines should be a mining engineer—one experienced in the theory and practice of mining, skilled in administration and organization, sympathetic with the related subjects of chemistry and metallurgy and having a broad view of the mining industry and its relation to the welfare of the country. In addition to these qualifications the incumbent should be in a position to make that sacrifice which a Government salary entails, and yet he must not be so secure in his independence as to have lost ambition and initiative."

Cheapening the Mining Engineer

THOUGH the training of disabled ex-service men by the Government is a praiseworthy action, such training for the higher professions should be conducted with due regard to the established educational standards. We are not sure that this is being done. We recently had a visit from a fine young chap, who was suffering from disability from wounds received while with a machine gun battalion in France. He had been offered by the Federal Board for Vocational Education the chance of being educated to a profession by means of a two-year course of instruction, and was hesitating between a course in oil engineering and one in salesmanship. It transpired that he had not had any education beyond the grade schools. Under the circumstances, we were unable to encourage him to go in for oil engineering (a large part of which is, or should be, geology), as it is impossible to turn out a competent mining or oil engineer or geologist from an unprepared youth in that period; and we advised him that, being imperfectly prepared, he would be at a disadvantage compared with

thoroughly trained men. Therefore, we counseled the choice of the salesmanship course.

Our Washington news chronicles the fact that free courses in mining engineering are being given to disabled ex-service men in thirty-seven schools in the United States. The range of schools is not reassuring. Can one enumerate thirty-seven American schools capable of turning out competent mining engineers? We make this query not as a denial, but asking for further information. We do know that in several schools mining engineering and mining geology have been compressed into one summer course. The desire to enlighten the people at large, along the University extension idea, has triumphed over the laudable caution and standards of the educator, and a flood of men have been loosed on the investing public who, with a little of that knowledge which is the most dangerous thing in the world, have masqueraded as engineers or geologists.

We call on the universities and higher schools to look to their principles and ideals. It is a matter of congratulation that the American Institute of Mining and Metallurgical Engineers has in the last few years established proper standards for membership; and the newly organized Society of Economic Geologists will do the same for the science of geological engineering.

Vacations for Wage Earners

MORE and more is the social condition of the working man being improved. Neither is this altogether a result of the labor shortage, as some scoffers have inferred, for the movement is one which has been going on for some years. On the other hand, it is not pure philanthropy, for contentment and happiness are recognized to result in more efficient performance of duty, and a reduction of the labor turnover redounds to the profit of the employer. In the mining industry, particularly, conditions are vastly better than a few years ago. One reason, it must be admitted, is that conditions, at least in some camps, were too unspeakable to continue, and another is that things had to be made more attractive than in similar employment in urban communities in order to hold men in out-of-the-way places.

A recent step in the right direction has been the granting of vacations with pay to those who work by the hour or day as well as to those who work on salary. So far we have heard of no mining companies taking this step, although it is likely that some have done so. The plan has recently been adopted by the Western Electric Co., as mentioned in our Sept. 11 issue. Other companies which have instituted a similar system are the Chain Belt Co., of Milwaukee; the Willys Overland Co., the Utica Drop Forge Co., the Studebaker Co., and the Ritter Dental Mfg. Co., of Rochester. In the case of the Western Electric Co. it is said that heretofore factory workers have not received paid vacations because of the fact that they received pay on an hourly basis, with extra rewards for overtime, whereas the salaried men got no rewards for overtime. In most cases, this would not be true, for the average overtime of the salaried worker is balanced by absence and tardiness for which no deduction is made.

Granting a paid vacation of two weeks of the year to wage earners who have worked steadily will help to eradicate class distinction and will tend to remove the idea that they do not belong to the privileged class. It will also in many cases make for greater efficiency. A man or a woman who has worked hard for a year needs a rest without the thought that it is costing him or her money in addition to what is spent. The plan will work best among the steady men, generally Americans, who will use the time to visit the home folks, to lay in a supply of wood, or to go on a hunting or fishing trip.

The Vagaries of Orebodies

WE HAVE HEARD of certain Utopias where successful mines are situated within the proximity of prosperous farms, where attractive topography is combined with agreeable climatic conditions, and other equally desirous surroundings furnish the mine manager with an abundance of the needs and pleasures of life. But such enviable combinations are few and far between, and fortunate indeed is he who can include mine, farm, and game preserve in the domain over which he rules.

We recall a visit some years ago to a section of one of the Western mining districts. The trip was made by buckboard, ten miles across the sagebrush, with the sun particularly active, and the dust shrouding the wagon in dense clouds. After an hour's going the foothills were reached, and the upward climb along the sides of the mountains offered a grateful relief from the monotony of the sage flat. Here was an ever-changing vista; the wooded slopes presented a pleasing picture, and the small valley-like depressions were covered with an abundance of vegetation.

The first stop was made at a small spring, which bubbled from the rock clear as crystal. In the party was an Eastern capitalist. This was his first visit to the West, and, although familiar with the financial features of mines and mining, his knowledge of "ground" required upholstering. After taking in his surroundings his first exclamation was, "What an elegant place for a mine!" Subsequently successful mining was done in that section, but several miles from the "elegant" location and in a country almost devoid of vegetation.

Ore deposits in their occurrence are no respecters of persons. They are where they are, and those seeking them for exploitation should be prepared to supply any deficiencies which might be needed to secure a product suitable for treatment. Whether those deficiencies be water, fuel, labor, or other requisites, the economical procuring of them forms a part of the engineer's task in opening and operating the mine.

Prospecting, although somewhat lax during the last few years, still continues in many corners of the globe, and is followed by exploration, and, if circumstances warrant, by development. That climatic conditions are severe and that other handicaps are present do not prevent the constant search for orebodies or the procuring of metals. This has been true and will remain so.

In the article "Desert Prospecting," which appears in this issue, Mr. Leroy A. Palmer points out many of the conditions that may be expected by those engaging in that branch of investigative work. There are undoubtedly drawbacks that discourage prospecting in the "desert provinces," although several decided advantages, such as the lack of vegetation and soil covering, are favorable factors in these localities. Neither the prospector nor the mining engineer can have everything.

One Reason Mining Languishes in Colorado

IT IS A FACT that mining is not as prosperous as it once was in Colorado. This is due to the exhaustion of some mines, the pressure of economic conditions, the relatively few discoveries in recent years, and the fact that mining activity seems to be recurrent in irregular cycles. In the aggregate, the amount of mining that goes along in a steady stream unnoticed is relatively large. The newly discovered district is the center of attraction; the steadily producing mine is apt to be overlooked. The backbone of the industry is, however, these steadily producing mines.

To maintain the volume of mining, new mines must necessarily be developed and brought to production to take the place of those which are approaching exhaustion. Fresh capital and intelligent and honest promotion are important factors in bringing prospects through the various stages to the producing mine. Nothing can do so much in giving a state or a mining locality a bad reputation as unwise or dishonest promotion. Legitimate enterprises suffer. Capital is made more difficult to secure, and the whole industry must endure the consequences, both directly and indirectly. A particularly vicious example of questionable promotion practices has come to our attention in a four-page advertisement of the Redcliff Mining & Milling Co., appearing in the Sept. 25, 1920, issue of the *Daily Mining and Financial Record*, of Denver. We quote two brief extracts:

> Your Fortune is in Reading this Advertisement.
>
> The biggest proposition ever offered to Womankind and Mankind in the History of the mining World.
>
> Stock is $1 per share and never again will you have the opportunity of buying it for any less after this association is completed. Your fortune is before you; your brains and your judgment is your action. The time is now—today—this minute. Be sure you read every word.

Whatever of merit there may be in this particular offering, it is our opinion, after reading the whole advertisement, that no intelligent human being would care to put his money into it. The extravagance of the claims, the inconsistencies of statement, the unrestrained use of ink and type are an insult to the community in which such an advertisement is circulated and a reflection upon the industry of a state which has occupied a unique position in the mining industry. It is time for those who have the interests of Colorado at heart to put the stamp of disapproval upon such practices. The publication of such matter constitutes one of the reasons why mining languishes in Colorado.

We note that there appears in the advertisement an extracted report written by Forbes Rickard under date of April 5, 1911, on the property in question. In the advertisement the report is erroneously signed Robert Rickard, instead of the correct signature, Forbes Rickard. We have ascertained that Mr. Rickard visited the property on his own behalf and out of kindness gave one of the interested parties, a miner, a copy of his report. It was used without his permission in the advertisement; nor did he give the parties permission to use his name as a reference, which is done in the latter part of the advertisement.

The report in question is conservative and in refreshing contrast to the rest of the advertisement. Written over nine years ago, it undoubtedly gave a fair estimate of the possibilities of the property in question, as they existed at that time, but its author could not foresee present economic conditions. Nevertheless, it serves as a warning to the person who has the patience to wade through the advertisement. Mr. Rickard is an innocent party to the whole affair, being drawn into it without his knowledge or consent.

The Divining Rod Again

THIS is the busy season for the bandit gold and the divining rod business in the Middle West. According to the *New York Sun*, a Kansas City dispatch reports great activity "near Indian Springs," in Kansas, the home of grasshoppers, cyclones, and W. J. Bryan. It seems that

"Fifty years ago a robber band fled thither from a daring, Wyandotte County robbery and buried its glittering pelf."

Pretty good as a starter to one of our bedtime story series:

Act 2 The Wiggler

Upon the scene there arrives one Bartels, with two others, in possession of a magic divining rod, a "gold indicator," which, however, appeared to the profane eyes of Miller, the owner of the farm whereon the treasure was located, as simply "the butt end of a buggy whip with a wire spring on the end." More necromancy. "It was explained that if the spring wiggled while the instrument was held over any spot it was useless to dig there, for no gold would be found; if it didn't wiggle, that was the place to delve for wealth. Therefore, the only requirement for finding gold apparently was an iron nerve and a steady hand on the part of the prospector.

"Taken to the top of a hill the spring wiggled frantically. In the ravine below, it refused to "indicate." The three men began to dig strenuously. At four feet they found an Indian arrow head. The dirt fairly flew. And then at sixteen feet they found—the skeleton of a horse."

That was all. The amateur miners did not get deeper. Like the green Leadville miner, their "hole had come to a point," and the limit of depth possible to engineering skill had been reached. "It was Saturday night, time was up, and the expedition returned disconsolate." What magic inhibition prevented them from working after this Saturday night, the story does not say; doubtless they were poor spirits who had to return to their ghostly vigils when the clock struck twelve. The terms of the contract which they had made with the owner refers to this mystery, among other interesting clauses:

"For the digging rights, $25. Only one hole to be dug One-half the treasure to go to Mrs. Miller. *No fair digging after Saturday.* Oil, gas, coal, or lead found incidentally to be Mrs. Miller's."

Oh, the rare optimism of this "incidentally"! Would that we were boys again, or owned a divining rod, $25, and three free days, and could dig for bandit gold, and, "incidentally," oil, gas, coal, and lead—yes, and diamonds and pearls. We should have put these into the contract.

This divining-rod business should be organized. A $25,000,000 corporation would not be too much, even though a start can be made with $25 and a buggy whip. We look to see the scattered industry united and properly equipped.

Desert Prospecting

Conditions Characteristic of the Arid Regions—Topographic Features Frequently Deceptive—Principles To Be Observed in Investigations of Dry Placers—The Occurrence of Water

By Leroy A. Palmer
Written for *Engineering and Mining Journal*

IN A RECENT ISSUE of *Engineering and Mining Journal*[1] I gave a description of an outfit which I had used with success for desert travel and made suggestions as to conduct in camp and on the trail. Those whose work is of such a nature that they are interested in an article of the kind mentioned may also find interest in a brief discussion of various geologic and topographic conditions which are characteristic in a large degree of the arid regions. The features which I purpose to discuss are not limited strictly to "the land of little rain," but I have found them best developed under its influences, so that they may fairly be considered to be characteristic of it.

Disintegration Through Temperature Changes

In the disintegration of the rocks of the desert provinces, physical agencies play a more active part than chemical, and attention has been directed to the lack of moisture, both as precipitation and in the air, the principal chemical reagent in the alteration of rock. A very important feature in disintegration, however, is the action of heat and cold.

As is well known, there is a considerable difference in temperature between day and night in the American desert. Desert nights are proverbially cool, and when one gets away from the valleys and into the mountains there are very few, even of those following the scorching days of summer, in which a blanket does not form a useful part of the bed clothing.

This diurnal range in temperature is fairly uniform throughout the year, the difference between night and day in winter being much the same as in summer. It is by no means unusual for the desert dweller to break the ice in the bucket to get water to wash on a winter's morning, shed his coat for greater comfort before noon, only to button it about him the more closely before the sun has dropped out of sight in the evening.

Because of the light soil cover, or the entire lack thereof, the rocks are more directly affected by temperature fluctuations than they would be if heavily mantled with soil and protected by forest growth. Rocks are poor conductors of heat, a fact which makes itself apparent to anyone who goes underground. Poor conductors expand and contract readily under the influence of heat and cold. A classic demonstration of this principle is the comparison between silver and mercury. The conductivity of mercury is 1.3 in a scale in which silver is standard at 100. The coefficient of cubic expansion of mercury is 0.0001001 to 0.0000318 for silver, or in the ratio of 3.15 to 1. In accordance with this principle, the alternate heating and cooling to which the rocks are subjected by the daily changes in temperature is accompanied by a considerable expansion and contraction. Though this action often results in a considerable "shelling off" of thin outer layers, it is natural that the heaving which accompanies such expanding and shrinking should take place along the joint and bedding planes, as being the lines of least resistance, thus tending to open them still wider. Such moisture as is precipitated on the rocks largely follows these openings, and in winter the frost working into them causes a heaving and a splitting along fairly regular lines. Some of the results of this action will be discussed later.

[1]Jan. 31, 1920.

Erosion by the Elements Active

Ordinarily disintegration and erosion are so closely associated that it is natural to think of one as essentially accompanied by the other, but in the desert they do not always work in conjunction with each other. In the later consideration of alluvial aprons we shall note that the disintegration of the rocks of mountains is frequently accompanied by the building up of their

FIG. 1. CANYON IN ALLUVIAL APRON

slopes instead of their denudation by the activities of erosive agencies, so that from the standpoint of volume there is little change in the mountain mass.

Water as an agent of erosion is active in the desert, as is evidenced by many a deep canyon with steep cut, almost perpendicular sides. This erosion is not the result of a slow wearing down of a perennial stream, but is rather the action of intermittent rushing torrents. The mean annual rainfall is low, but the higher slopes receive a considerable precipitation, one year with another, and this precipitation is likely to be concentrated in a few heavy storms instead of scattered through the year or through a long rainy season.

It is frequently the case in a mountain watershed that some one canyon or valley, often the trunk channel, has tributary to it a catchment area far out of proportion to its normal carrying capacity. The steep canyon sides, bare rocks, and exceedingly limited vegetation tend to a high percentage of run-off within a short time, so that when these torrential rains come, the precipitation over a large watershed is rapidly concentrated in a narrow canyon or small valley, and a raging torrent is formed where a few hours before was parched sand and blistering boulders.

A person who has not seen one of these desert floods can hardly conceive of their treachery and tremendous

force. It would almost seem that a jealous Providence sends them on occasions to warn Man of his insignificance and the instability of his works. As a tenderfoot I worked on the construction of the Los Angeles & Salt Lake R.R. while it was being built across the Nevada desert, and I could not understand the necessity of putting in bridges 200 ft. and more in length opposite insignificant looking side canyons whose channels did not give the appearance of ever having carried more than sufficient water to wet one's feet. I saw that same railroad after a flood—eighty miles of it wiped out of

FIG. 2. PSEUDO-FAULT

existence, ninety-pound steel twisted into loops, a whole freight train swept off the track and slammed against the side of a mountain—Man's deepest thought and highest skill set at naught by Nature's forces.

Wind is an active erosive agent in the desert. The arid regions are generally windy throughout the year. Were it not for the winds of summer they would scarcely be habitable during that season, and the winds of winter and spring are frequently of great severity, there being little in the way of trees or other vegetation to act as a protection for the surface. When the wind becomes violent it sweeps up quantities of sand and fine gravel and drives then with it in the terrific sandstorms for which the desert is noted and whose violence can scarcely be exaggerated.

These sand- and gravel-carrying winds exert an active erosive force, which is frequently manifested in the weird and picturesque forms into which the rocks are carved. The Old Woman Mountains, in the eastern part of the Mohave Desert, in California, get their name from one of these odd shapes, which resembles a woman carrying a child in her arms. The entire range presents a skyline of serrated peaks and castellated crags as a result of this æolian action.

Alluvial Aprons Have Appearance of Conglomerates

Among the most prominent features of desert geology, notable topographic features as well, are the alluvial aprons or outwash slopes of the mountains. These outwash slopes are found in a greater or less degree of development bordering practically all of the wider valleys. They extend from the low part of the valley in a uniform slope onto the flanks of the mountains which border it, and sometimes actually reach to the summits of the outlying peaks. Their composition exhibits the sorting of water and wind, the higher parts of the slope being composed of coarse rock fragments which grow finer as one descends, so that the foot of the slope in the low part of the valley is fine sand.

In a region of heavy rainfall, as the rocks disintegrate a considerable portion of the soil so formed is immediately washed from the slopes by the rains, finds its way into the watercourses and finally carried into the larger streams and removed from the region.

In the desert the result is different. As I have indicated, under conditions of aridity physical forces play a more active part in the disintegration of rocks than chemical forces, with the result that the pieces into which the rock is broken are coarser. Then there is not the rainfall to remove the broken pieces with the same rapidity as elsewhere. Hence they accumulate about the slopes, filling first the shallow gullies of moderate grade and then the steeper ones, continuing in this way and drifting with the high winds characteristic of the desert until they have built up a slope that is comparatively uniform.

The sand and gravel of these alluvial aprons assume a compact structure so as to make, or at least approach, a conglomerate. This is particularly so if calcium carbonate or some other cementing material is available in the rocks of the upper slopes, so that it may be taken into solution and form a binder for the unconsolidated material through which it percolates. In such cases the canyon streams, debouching from their narrower confines into the broader valleys, trench deeply into these outwash slopes, which stand well in their consolidated state, and the result is a canyon-like watercourse, frequently very narrow, with high, steep-cut walls, as shown in Fig. 1.

Deceptive Topography

In the discussion of the subject of disintegration it has been stated that, under certain conditions, rocks have a tendency to rupture along joint or bedding planes instead of yielding to a slow breaking down into soil. This leads to the development of topographic features which may readily receive an erroneous geologic interpretation if conclusions be drawn on casual

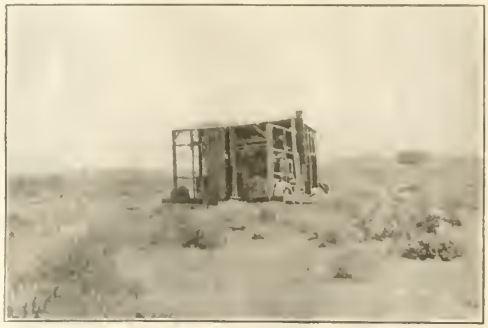

FIG. 3. DRY WASHING MILL, GRANITE MOUNTAINS

observation. Chief among these I would class certain forms which might be mistaken for faults and others which might appear to be the result of glacial action. These will be considered briefly, although the subject is one which is of interest from the academic rather than the economic standpoint.

The pseudo-faults, if I may be permitted to coin such a word, appear as bold escarpments which are the result of the action of such disintegrating forces as those mentioned, acting along joint or shrinkage planes so as to split the rocks along lines approximately vertical.

This is particularly noticeable in the cases of some lava flows coming under my observation which have assumed a columnar structure on cooling. These columns have been split off, whole ones at a time, by frost working along the planes of cooling, so that an abrupt cliff which might readily be mistaken for a fault scarp remains.

Another occurrence, which is of even less importance from the economic standpoint, is a form of topography which bears every resemblance to that resulting from glacial action. I have never found evidence of real glaciation in the desert, but in the Mohave Desert I have seen such topographic manifestations of nearly all of these phenomena as might well be called "text-book illustrations." But, like the escarpments, whose appearance is likely to convey an incorrect impression of faulting, these evidences of glaciation will not stand up under critical scanning.

Economic Features

Nearly all of the minerals that are found anywhere occur in the desert, but it is a region in which prospecting has been far more limited than in the better-watered localities. The reason for this is obvious. It is human nature to follow the line of least resistance, and where one man has the hardihood to face the desert a dozen men choose a country in which conditions are not so rigorous.

Certain minerals, notably of the salines, are characteristic of the arid regions and are found in but few other places in this country, but their origin and occurrence form by far too broad a subject to come within the scope of this article. A consideration of some of the desert forms of deposits common to other localities as well should be of interest.

Desert Prospecting Has Numerous Advantages

As has been indicated, prospecting in the desert is simplified by the fact that dense vegetation is wholly lacking and soil covering is not heavy, occurring usually in scattering patches of limited extent. As a consequence, the correlation of different formations and the tracing of veins is rendered easier than in a locality with heavy soil and luxurious vegetation. This is exemplified in many ways. For example, the relations between outcrops and prospect workings are more readily recognized.

Float does not migrate to the extent that it does in a country in which the mountainsides are traversed by numerous streams and rivulets, which may assist in carrying a piece a long distance from the point where it was broken. Consequently, outcrops may be sought generally within a reasonable distance of float, and topography forms a fairly reliable guide as to the relative positions of the two.

Dry Placers Require Special Consideration

One of the interesting forms of desert deposits is the dry placer, so called because it occurs under conditions that require working by some means other than the application of water in one of the methods usually prescribed for placer mining. These deposits are usually found under the same topographic conditions as placers in other localities, occurring in a gulch or canyon where the gold has been carried after erosion from veins or stringers on a mountainside and within the catchment area. I have found them, however, in quite unlooked-for places, one such occurrence being near Williams Well about twenty miles northerly from Barstow, Cal.

This deposit is in a flat of very gentle topography, so gentle, in fact, that in some places it is difficult to tell just where the low places are. The region is underlain by an intrusive granitic rock, and, being nearly flat, has accumulated a considerable covering of soil, especially in the gulches or such depressions as formerly existed, so that these have been filled to such an extent that it is not always easy to distinguish them from the points that were higher originally. The intrusive is traversed by quartz veins carrying considerable iron and associated with basic dikes. The gold is rough, which, in connection with the topography, indicates its near-by origin, as the flat is in reality a plateau, and drainage is away from it rather than to it. The gold has accumulated in the shallow depressions, and some pieces of fair size were found. It lies close to the surface and is associated with float hematite, which impregnates the soil, the size of hematite pieces being some criterion of the size and amount of gold found. An interesting feature that I noted in examining this deposit was that the gold was almost invariably discovered where a small yellow flower grew.

FIG. 4. COLTON WELL, PROVIDENCE MOUNTAINS

Of course the explanation is simple enough. The liberation of the gold from its inclosing matrix is accompanied by the disintegration of one of the associated rocks or minerals, which weathered to a soil favorable to the growth of this particular flower. In this case the mineral was probably the hematite, as it was found closely associated with both the gold and the flower.

Some time ago an attempt was made to work a wide shallow gulch on a large scale with the dry washing mill shown in Fig. 3, but the project failed for the same reason that many another mining venture has gone wrong. The promoters neglected to explore their ground carefully beforehand, and soon exhausted that portion that was amenable to handling by the process installed. As the illustration shows, the mill was on wheels, or rather rollers, so that it could be kept close to the excavating, performed with plow and scraper. It was moved by winding a cable from a deadman to a winch in the mill. This process of handling and treating returned a good profit during the limited time that it was in use.

The usual and generally accepted rule that placers grow richer as bedrock is approached does not necessarily hold true in the desert. It can readily be seen that the natural result for a deposit in the bed of a running stream in which the gravel is permeated with water and subjected to its continuous action would be that the gold, being heavier than the gravel, sinks and tends to concentrate on the bedrock, but this is not

the case with desert deposits. Such water action as they receive is intermittent and frequently in the form of sudden floods, which rise quickly and subside before the water really has time to sink through the stream gravels to bedrock. Consequently, its influence extends only to shallow depth, and the richest placer may be found within a few feet or even a few inches of the surface, whereas the bedrock is practically barren. This is particularly the case with deposits such as that found at Williams Well, where concentration does not occur in well-defined stream channels but in depressions in a comparatively level surface and near the lode in which the gold originated. In desert deposits, and notably those of the kind just mentioned, enrichment is not so much the result of the concentration of the valuable portion as of the removal of the valueless. To borrow a comparison from the gravity concentration of ores, I may liken the concentration of the gold in the bed of a running stream to that which takes place in a jig in which the heavy mineral settles against the action of a current of water, whereas the shallow desert placer is comparable to the vanner, in which the heavy mineral clings against a current that washes the lighter away.

Water Scarce but Usually Available

Water is by no means as scarce in the desert as popular conception assumes. There are occasional springs and tanks—both open and "stand" tanks—so that one who knows the country need not, as a rule, go very many miles for an amount sufficient for the needs of a prospecting party.

Water from underground sources is frequently available without much work. One who is simply passing through a country on a prospecting trip will not find it advisable to stop in one locality such time as might be necessary to develop a supply, but if he is establishing a small camp for prospecting development he can frequently satisfy his needs without going a great distance or expending too much labor. In most such cases location and development of water are not so much a matter of technical skill as applied common sense. As water locators, some desert animals, coyotes especially, are far ahead of the witch with the forked stick. I have seen more than one water hole developed where a coyote had shown the way. Seepages along joint planes or fractures frequently are followed with good results, or fracture zones may be found productive even if no water appears on the surface. Fig. 4 is a well used to water several hundred head of cattle and was made by sinking about fifteen feet on a fractured zone in granodiorite and then crosscutting a few feet to expose the zone to its full width.

Alluvial basins and canyon bottoms usually hold water in considerable quantity, and where they are crossed by ribs of rock the water is forced toward the surface. Under these conditions digging will usually develop water at no great depth, but care should be taken to locate the well such a distance above the barrier that rock will not be struck within the influence of evaporation from the soil, which is somewhere about eight to ten feet under average conditions. If this is not done, the result will be a dry hole, but if the limit of evaporation is passed with the hole still in alluvium, and within the influence of the rock barrier, a supply should be found at reasonable depth, the amount varying, of course, with the geological and other conditions affecting the location of the hole.

Importance of Rhodesian Chromite

For some years previous to the war, Rhodesia was the chief producer of chromite, though its output was almost equalled by New Caledonia, according to *The Ironmonger*, the combined yield of these two countries amounting to nearly 90 per cent of the world's production. During 1918, however, the Rhodesian output declined, owing principally to lack of ocean freight facilities and to competitive production in the United States, Canada, and India. Thus the total shipments in 1918 were only 37,875 tons, as against 59,321 tons in 1917 and 87,406 tons in 1916.

The total output of chromium ore in southern Rhodesia up to and including 1918 amounted to 581,558 short tons, valued at £1,718,241. This total value exceeds that of any other mineral produced in southern Rhodesia except gold. Chromite occurs at many localities in Rhodesia. Of these the best known are those of Selukwe, Makico, and Lomagundi, but productive mining has hitherto been confined to the Selukwe property, which has been worked since 1905. The deposits at Selukwe consist of numerous lenticular masses of chromium ore in a matrix of talc-schist and serpentine. The ore is won very cheaply by open-cut mining, and the cost of production is merely nominal, amounting only to a few shillings per ton. The ore as marketed contains from 42 to 51 per cent of chromic oxide, 8 to 15 per cent of magnesia, and 14½ to 16½ per cent of alumina. The best ore contains on the average about 50 per cent of chromic oxide. The material is sent by rail to Beira and shipped to Europe as crude ore. Shipment was suspended for a time after the outbreak of the war in August, 1914, but was resumed in December, and the output for 1914 showed a substantial reduction compared with 1913. The output rose again in 1915, 1916, and 1917, despite the fact that exportation was hindered by lack of shipping facilities.

The price per short ton realized for the ore during 1917 was £4 9s. 7d., an increase of 14s. 7d. per ton compared with the price during 1916. This increase in value stimulated prospecting, which resulted in the discovery of a large deposit in the Lomagundi district. Lack of shipping facilities, however, caused a serious fall in production during 1918, and the output for that year was confined entirely to the Selukwe mines.

Sand-Lime Brick Production Increased in 1919

The sand-lime brick produced in the United States in 1919, according to an estimate made by the U. S. Geological Survey, amounted to 145,000,000 brick, valued at $1,725,000, an increase of 47,000,000 brick and of $841,000 over 1918. The maximum output of sand-lime brick—227,344,000 brick—was made in 1916, but the maximum value was that of 1919.

The output of common brick was 142,755,000, valued at $1,688,000, an increase of 45,937,000 brick and of $822,000 compared with 1918. The rest of the output was face brick, which showed an increase of 664,000 brick and of $19,000 compared with 1918. The average price of common brick per thousand in 1919 was $11.82, compared with $8.94 in 1918, $7.54 in 1917, and $6.43 in 1916. The average price of face brick in 1919 per thousand was $16.48, compared with $11.35 in 1918, $9.36 in 1917, and $9.64 in 1916.

Present Value of Deferred Profits

In Which the Mining Engineer's Spouse Confounds the Stock Salesman and Points Out a Few Neglected But Important Considerations in the Sale of Mining Stock

By Mrs. Ernest Lee Waite*
Written for *Engineering and Mining Journal*

THE wife of a mining engineer is, *ex-officio*, a potential authority on deferred profits. Furthermore, present value is to her a matter more vital and urgent than it can possibly be to any other class of mining investor. Therefore no apology or further explanation is necessary for what may seem to be an instrusion upon a special field of technical finance or financial technicality.

Suppose that a representative of a reputable broker calls and submits an offer of shares of the "Pasado Mañana Silver Mines, Ltd." He is well trained in his business, and presents a masterly argument to show how this British corporation is controlled and managed by technical experts; and that the profits from treating the present ore reserves will produce dividends equivalent to 10 per cent per annum on the investment for fifteen years and an additional amount to provide a sinking fund, which, reinvested at 4 per cent, will replace the original investment at the end of the fifteen years.

"That sounds interesting," says Mrs. Engineer; "in effect, you offer me an extra profit of 6 per cent per annum for the entire period of fifteen years, above the conservative rate of 4 per cent per annum. But if I leave all my money in a savings bank or in good bonds, I can get 4 per cent interest and compound it semi-annually. Do you mean that if I buy these shares I can save the same amount of money and also have the extra 6 per cent per annum as pin money during the entire fifteen years?"

"Practically so," replies the salesman, who feels that the signing on the dotted line is but a matter of moments. "It is like this: It will take five years to equip the property with hoisting machinery and treatment plant. After that period of deferment the life of the present ore reserves is calculated as exactly ten years, during which time uniform dividends will be distributed at the end of each half year. As a matter of convenience the issue of Class A preference shares, with a par value of £10 each, has been determined as with a total par value exactly equal to the calculated total net profit available from the present ore reserves. During the ten years dividends are to be distributed, to the holders of this first issue of preference shares, at the rate of 10s. per share at the end of each second quarter. Putting this in terms of American money, for each dollar of nominal capital there will be distributed twenty payments of what you Yankees would call a 'jitney' each, eh? Quite so. Now, to determine the present value, at which figure we offer you the shares on account of your husband's profession, we employ the formula given on page 46 of this excellent book."[1]

"Oh, I see," murmurs the proposed investor; "I am quite familiar with that volume. It is excellent, as you say, in many ways. I often use it in calculating values when my husband and I are preparing his report. That is what we call the 'selling formula.' But when we are working things out in the interest of a possible buyer, we arrive at a present value by another route. In that case, it is desirable to allow compounding at the full remunerative rate during the deferred period. In fact, not only desirable but almost imperative; since the risk feature of the investment is compounded during the time that the mine is earning nothing. In ante-bellum days such a point might have been debatable; but now, with the disorganization of all the elements of costs and realization, the seller of a mine is indeed lucky to cash in at a present value calculated by almost any formula."

"But, madam, consider the speculative value of increased reserves that may be developed during both the deferred and the calculated operating period."

"That is a factor which I have not overlooked," is the calm response. "Such speculative value is one of the major elements that influence trading in mining shares. It is almost invariably discounted and rediscounted. In a private transaction in shares such as you offer, it might be called a trade discount to the profession; and therefore it has no place in the calculation of the price at which the shares are to be offered. Coming back to your formula: If we substitute the known interest and time factors as you have stated them, we have, for the present value of the £1 per year,

$$P = \frac{\frac{\left(1+\frac{.04}{2}\right)^{10\times 2}-1}{.04}}{1+.10\,\frac{\left(1+\frac{.04}{2}\right)^{(10+5)\times 2}-1}{.04}}$$

"The solving of this equation, to learn the supposed value of each £10 share, is a mere detail for some intelligent hireling. But the essence of it all is that the formula is devised to give the maximum plausible valuation. It is plausible when examined in a superficial way, but upon close analysis its falsity may be demonstrated. For instance, when the deferred period is taken as zero, the numerator and the denominator show common terms which may be factored so as to produce an equation identical with that of formula 9*a* on page 37 of this same excellent book; giving us

$$P = \frac{1}{\frac{.04}{\left(1+\frac{.04}{2}\right)^{10\times 2}-1}+.10}$$

as the value, at the beginning of the operating period, of the ten-year annuity of £1 per annum in semiannual instalments of 10s. each. I should like to ask you whether this will give the correct value per share at the date when the mine begins its era of actual earning."

The salesman notes the algebraic simplicity and feels

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†Address guaranteed—to be fictitious.—EDITOR.
[1]"The Valuation of Mineral Property," by T. A. O'Donahue; published by Crosby, Lockwood & Son, London, 1910.

that it is safe to reply affirmatively. Upon consulting a table of annuities he states that the value, presumably computed by an identical formula, would be £7 1s. 8d.; equivalent to $34.47½ at normal exchange. He also states that the present value, at the beginning of the deferred period, as calculated by the formula first given, works out as £4 16s. 1d., or £4.805, and equivalent to $23.38 at normal exchange; being less than half of the par value of £10, or $48.66½ at normal exchange.

"That is extremely enlightening," remarks the modern Portia, "but in getting your £4.805 you shed what you British might call the 'bloody insurance' on the accumulated interest credit during the deferred period. Following the same principle as shown on page 45 of this really useful book, we get these items that I am jotting down:

Principal	£4.805
Interest at the rate of 10 per cent on £4.805 equals £0.4805, and £0.4805 per annum for five years, compounded semiannually at 4 per cent per annum amounts to	2.631
The amount of the principal at the end of the deferred period is therefore	£7.436

You see, it is very simple for me to figure this out; as I use the factor 10.94972 for ten semiannual periods at 2 per cent, as given in the handy interest table on page 70 of the same book, multiplying it by £0.240½ as the interest credit for six months. I say interest *credit* because it is not interest actually paid out, but merely a promise. If the original invested capital requires the remunerative rate of interest in the way of additional profit bargained for as insurance on account of the element of risk, as explained on page 7 of the book, then is it fair to evade the maintenance of insurance on the accumulated interest credit? I say it is not. Just see the difference between the valuation with a deferred period of zero and the calculated amount of the principal at the end of a deferred period of five years. As the deferred period is increased, so the discrepancy becomes greater."

"Ah, yes, madam," replies the expert, "but that is readily explained by the fact that in each case the unit of original capital, upon which the remunerative rate is applied, is a different amount."

"Quite true," assents the other, "that is where part of the deception comes in. To correct it, for each class and kind of mining investment there would have to be a special sliding scale of remunerative rates, applying a different one for each variation in the deferred period. Further, the *actual* remunerative rate on the equity of accumulated principal keeps dwindling lower and lower as the operating period approaches.

"When you offer me an investment on the basis of netting me an extra 6 per cent per annum over and above what I can accumulate at a conservative 4 per cent rate, you certainly rouse my gambling spirit. Now, anybody with a gambler's instinct also has a desire to spend money. I *do* want the extra 6 per cent, but I want to spend it as I go. I should have to sell a little of the stock from time to time, or else put it up as collateral and pay current loan rates and submit to ordinary bank discount or worse. Am I right?"

"Bless my soul, my dear madam," is the earnest response; "I should advise you, by no means dispose of the shares at any early date. This is a most extraordinary mine, and it will be an easy matter to find parties who will accept the shares as security. In fact, our house will introduce you to a private banker who is most accommodating. Let me see, did you say 100 or 200 shares?"

"Ha! Ha! Mr. Broker-man, I did not say any amount; but here is what I am willing to do: I know all about your mine, as my husband tried to option it several years ago. We are quite satisfied as to the ore reserves, but the profit will of course depend upon future conditions in the Republic of Tortillas. The remunerative rate of 10 per cent and the sinking fund rate of 4 per cent are about right as dating from the end of the deferred period; but an accumulative rate of only 4 per cent during the deferred period is entirely out of harmony with banking customs for borrowers. You go back to your office and figure out the compound bank discount operation to show the proceeds of £7 1s. 8d. times 200, discounted semiannually for five years at the average bank rate during the past five years. Multiply your answer by the current sterling exchange rate to get the price in dollars. I will then fill out my check for that amount and instruct my bankers to deliver it to you in exchange for a certificate for 200 shares of the Pasado Mañana Silver Mines, Ltd. Good afternoon."

New Designations of Bureau of Mines Stations

The Bureau of Mines has renamed its mining experiment stations, designating them by their line of work or with reference to the district in which located. Hereafter the stations will be designated as follows:

Name	Location	Work
Petroleum	Bartlesville, Okla.	Oil.
Pacific	Berkeley, Cal.	Chemicals; magnesite; miscellaneous.
Ceramic	Columbus, Ohio	Ceramics.
Alaska	Fairbanks, Alaska	Development of resources of Alaska.
North Central	Minneapolis, Minn.	Utilization of low-grade iron ores.
Pittsburgh	Pittsburgh, Pa.	Mining, largely coal; electrometallurgy.
Rare and Precious Metals	Reno, Nev.	Rare and precious metals.
Northwestern	Seattle, Wash.	Ceramics; coal washing; electrometallurgy.
Inter-Mountain	Salt Lake City, Utah	Low-grade lead and zinc ores.
Southwestern	Tucson, Ariz.	Low-grade copper ores.
Central District	Urbana, Ill.	Coal.
Southern	Birmingham, Ala.	Iron and steel; coal; coke; byproducts; non-metallics.
Mississippi Valley	St. Louis, Mo.	Lead and zinc.

German Iron Mines in France Sold

The iron mines near Villerupt, in the north of the Briey basin, which belonged to the Rheinische Stahlwerke and the Krupp Works, have been bought through the intermediary of the Société Métallurgique de la Loire by the Steinfort Steelworks of Luxemburg, according to the *Mining Journal*. The Steinfort Steelworks, formerly the property of the German firm of Felten & Guilleaume, passed into the hands of the Société Métallurgique de la Loire some months ago. They have five blast furnaces, one open-hearth furnace, and electric steel works, and a steel and rolling mill, as well as a foundry, are to be built. A company has been formed with a capital of eight million francs for the exploitation of the iron mines, whose annual output before the war was from 600,000 to 700,000 tons.

The Mining and Metallurgical Industry of Norway

Brief Review of Resources and Past and Present Production — Iron Still the Most Important Metal, With Copper and Molybdenum of Secondary Interest — Development Dependent Upon Increased Application of Electric Power

By Matthew R. Blish
Scandinavian Representative of the Liberty National Bank of New York
Written for *Engineering and Mining Journal*

THREE distinct ore fields occur in Norway. One is in the southern part of the country, containing copper, iron, nickel, silver, zinc, and molybdenum. This field is an extension of the great ore belt of central Sweden, and, although much smaller in extent, contains somewhat the same character of ores. The second field is in the central northern part of the country around Trondhjem, and contains iron pyrites, copper, chrome, and zinc. The third large field is in the Far North, and here are found iron and copper. Table I shows the production of the various ores from 1896 to 1917. Limestone, upon which the electrochemical industry is based, is found in five different places, namely the Christiania field, the Bergen tract, the coast district in Romsdal amt, the Trondhjem field, and the deposits in Nordlands amt. Besides these, granite, labradorite, soapstone, slate, apatite, and feldspar occur.

Several Mines Hundreds of Years Old

Some of the mines of Norway have been worked for many generations. Probably the first attempt to extract minerals from the ground was made at the old iron mines in the southern part of the country, about the middle of the sixteenth century, at which time the production of charcoal iron began. Next in age come the silver mines at Kongsberg, which were opened in 1623 during the reign of King Christian IV. At one time these silver deposits were among the richest in Europe. The copper mine at Roros has been in uninterrupted operation since 1646, or about 275 years. Before the world's large mining centers came to be of such great importance, and our present rapid transportation, these mines were of far greater value to the economic life of Norway than they are at present.

The production of iron pyrites held first place for many years, and in fact it was not until 1915 that it was surpassed by iron ore. The ores in the southern and northern iron fields are of quite different characteristics, and each must be considered by itself. The southern ores contain about 54 per cent of iron, are non-magnetic, necessitating hand picking, and some deposits show a large content of titanium, which renders the ore unfit for reduction to iron. The phosphorus and sulphur content are low. These ore have been used for centuries by the old Norwegian iron works, which began at the end of the sixteenth century to smelt down the ore by the use of charcoal.

The production of pig iron continued intermittently through the years which followed, reaching a high point of 9,900 tons per year in 1845. About this time the lumber trade became a competitor of the iron works for the products of the forests, and the use of charcoal for smelting became too costly to allow the Norwegian pig iron to compete with the iron which was now beginning to be produced in other countries by the use of coke. The production of pig iron fell to 1,000 tons in 1880, and continuing this descent reached the figure of 400 tons in 1905, produced by only one plant near Tvestrand, whereas at the end of the eighteenth century there were no less than eighteen companies with twenty-two furnaces.

TABLE I. TABLE OF MINING OPERATIONS

Average Yearly Production in Metric Tons

	Silver Ore	Copper Ore	Nickel Ore	Iron Ore	Zinc Ore
1896	527	29,910	...	2,000	...
1901–05	868	38,134	4,512	51,452	948
1906–10	2,170	36,940	8,492	102,311	1,869
1912	4,027	60,018	30,697	408,092	40
1913	5,411	70,349	49,990	544,686	897
1914	7,372	57,951	48,529	652,273	243
1915	8,431	56,097	77,018	714,917	1,829
1916	7,515	28,670	79,903	417,899	1,017
1917	7,147	39,298	69,639	302,739	269

Average Yearly Production Value in 1,000 Krone

	Silver and Silver Ore	Copper Ore	Nickel Ore	Iron Ore	Zinc Ore	Other Ores
1896	400	1,136	...	14		101
1901–05	474	1,727	89	356	12	104
1906–10	517	1,897	127	1,045	45	87
1912	665	2,584	305	5,400	1	59 (a)
1913	630	2,844	497	7,350	19	37
1914	910	2,697	487	8,460	5	140
1915	1,040	7,844	1,010	11,800	64	1,142 (a)
1916	620	3,280	310	9,390	33	2,170 (b)
1917	980	4,905	2,250	8,380	10	4,971 (c)

(a) Of which 1,040 was molybdenite. (b) Of which 1,550 was molybdenite. (c) Of which 4,125 was molybdenite.

The total production up to 1905 was about 1¼ million tons. During the next five-year period the production of pig iron dropped off to almost nothing, averaging only fifty tons per year from 1906 to 1910. The years 1911 and 1912 saw some improvement, the production in the latter year being 300 tons. When, in 1913, the first electric furnace for smelting ore was put into operation, the production of pig iron by charcoal alone fell to practically nothing, and at present amounts to only a few tons per year.

TABLE II ELECTRIC PIG-IRON PRODUCTION

Years	1913	1914	1915	1916	1917
Tons	346	6,909	8,742	6,233	6,295

Production of electric pig iron from 1913 to 1917 may be seen in Table II. So far all electric iron has been produced from southern ores, but the electric smelting of northern ores is a possibility of the near future, if the plans of certain Christiania business men and engineers materialize.

Northern Iron Deposits Only Recently Developed

Whether or not the existence of iron in northern Norway was known prior to 1900, it was not until 1911 that the large deposits were opened. These ores are magnetic, contain only about 37 per cent of iron, and are higher in phosphorus and sulphur than the southern ores. On account of the low iron content, the practice of concentrating the ore is common, and it is also exported in the form of briquets. By far the largest part of Norway's iron wealth lies in the north. It has been estimated by Professor Vogt, of the Trondhjem

Technical High School, that the total iron-ore deposits amount to 150 to 175 million tons, containing about 100 million tons of iron. The Sydvaranger Iron Ore Co., whose mines are in Finmarken, near the Finnish border, contributed 600,000 of a total export of 715,000 tons in 1915, which was the record year in iron-ore production.

Although the exports of ore since 1911, when Sydvaranger began to produce, have been many times greater than before, the first ore was shipped abroad from the southern mines in the early 60's. The ratio of the ore exported to the ore mined has fluctuated greatly through the years, principally on account of a variation in the demand from foreign countries. These ratios are also an indication of the manner in which the iron and steel industry, owing to a lack of coal, has failed to take advantage of the iron resources which have been available. During the 60's about 30 per cent of the ore mined was exported; during the 70's about 50 per cent; during the 80's about 80 per cent; during the 90's about 30 per cent, during the period 1901 to 1905 about 94 per cent, and from 1906 to 1913 about 96 per cent. Exports from 1912 to 1919 inclusive are shown in Table III. Exports for 1920 are running at a rate of about 120,000 tons.

TABLE III EXPORTS OF IRON ORE AND BRIQUETS, TONS

	1912	1913	1914	1915	1916	1917	1918	1919
Iron ore..	230,123	373,071	311,443	164,506	187,805	150,960	61,443	25,680
Iron-ore briquets.	174,867	195,692	156,352	261,386	216,896	46,875	35,253	7,567

Application of Water Power Necessary

England and Germany have always bought most of Norway's iron ore. There is no indication that Norway's iron and steel industry will develop to any great extent until some substitute has been found for coke in the smelting process, or, in other words, until the almost unlimited waterpower of the country has been made available for this work. Sweden has carried this process to a much higher degree, but attempts to smelt Norwegian ore have so far not been attended with great success. As mentioned previously, a plan is now under way for the establishment of a company to reduce the ore from one of the Northern mines by an electric process. Its projectors are waiting, before proceeding, to get the backing of the Storting to a guarantee for a loan. At present the high price of coal and labor has caused the shut-down of most of the iron mines and smelters. No pig iron has been exported since October of last year.

Copper Industry Suffering From High Costs

The most important copper-bearing ore is chalcopyrite, containing, in one mine in the southern district, 24.5 per cent copper, but averaging for the entire country only about 5 per cent. Iron pyrites, which is mined principally for its sulphur content, contains about 1½ per cent copper. Some copper has also been extracted by a nickel-refining company from nickel ore. These three ores constitute the only sources of copper in Norway. Practically no copper ore is exported as such, and there are no imports of copper ore. Up to the present only a small percentage of this ore is smelted electrically, practically all being reduced by the use of coke. One company, the Sulitjelma Mine, is experimenting now on an electrical method.

As shown in Table V, the exports of copper fell off during the war, beginning with 1916, and in 1919 amounted to only 394 metric tons. The reason for this decrease in the last year is, of course, the slump in the copper market. Copper cannot be produced here with the high coal and labor costs and sold on the present market.

TABLE IV YEARLY AVERAGES OF COPPER PRODUCTION AND CONSUMPTION

Yearly Average in	Copper Production, Tons	Copper Consumption Tons
1891 = 1895	792	1,200
1896 = 1900	1,100	1,328
1901 = 1905	1,260	1,365
1906 = 1910	1,610	1,700
1911 = 1915	2,420	4,420

Table IV gives the production and consumption of copper for several years before the war. Production kept pace with consumption fairly well up to 1911. During the period 1911 to 1915, while production fell short of consumption by 2,000 tons, the exports averaged for this period about 2,100 tons. In other words, the copper production was sold to Sweden, Germany, and England, to be converted into finished copper and brass goods, and reimported into Norway. The demand for copper wire and other copper articles has increased about 3½ times over that before the war, and this demand has been covered in considerable part from the United States. The imports of copper and copper wares in 1913 amounted to about 2,000 tons, and in 1919 to about 7,000 tons. At present nearly all of the copper mines are closed down, and the electrical industry is buying its copper from foreign countries in a finished state ready for use.

The nickel-refining industry obtains practically all of its nickel ore from deposits in the southern field. At present the nickel ore is concentrated by three mining companies, and sold to the Christiansands Nickel Refining Works for refining into metallic nickel. Before the war some nickel-copper ore was imported also. None of the nickel ore is exported as such.

TABLE V. EXPORTS OF METALS FROM NORWAY

	1912	1913	1914	1915	1916	1917	1918	1919
Nickel	385	594	696	761	723	442	60	
Copper	1,551	2,644	2,558	2,691	1,430	1,900	1,254	394
Zinc (*a*)	8,914	10,538	16,517	22,617	28,150	18,395	3,390	3,950
Lead (*b*)	118	30	200		86	70	5	115
Aluminum (*c*)	1,140	2,177	2,942	2,883	4,488	7,601	6,835	3,120
Ferrosilicon	6,022	6,323	6,144	9,308	25,256	29,450	16,861	2,458
Ferrochrome (*d*)			2,796		2,875	3,550	(*e*)	(*e*)

(*a*) Refined mostly from foreign spelter. (*b*) Contains also old scrap lead (*c*) Refined entirely from foreign ore. (*d*) Produced partly from foreign ore (*e*) Figures unavailable.

Refining is carried on by an electrolytic process, invented and developed by the company's chief engineer, Victor Hybinette. The nickel content of the ore is 1 to 2 per cent. Table V shows the exports of nickel from 1912 to 1919. During the war a considerable part of these exports went to Germany. In 1918 the company suffered a loss from fire at its plant, and, owing to readjustments and the drop in the nickel market at the close of the war, no exports were made during 1919. Refining, however, is now proceeding satisfactorily, although no export has been made in 1920. No nickel is imported as such, but certain nickel wares come from abroad, principally from Sweden, Germany, and the United States. Owing to the comparatively small nickel deposits in Norway, it is doubtful whether export to the United States can ever profitably be carried on.

The zinc deposits in Norway are very small and are confined to the fields in the neighborhood of Christiania, Bergen, and in the Trondhjem amt. The average prewar production of zinc ore was only about 1,000 tons, containing approximately 30 per cent zinc, and many of the mines have been unproductive for the last five years.

A small amount of lead is found in certain of these ores. Practically no zinc ore is exported.

Table V shows that there was exported from Norway in war years a considerable quantity of refined zinc, which was, however, refined almost entirely from foreign spelter, mainly from Germany. The pre-war imports of spelter amounted to from 12,000 to 15,000 tons per year. Practically all of the zinc refined from this spelter was exported again, for the home consumption of zinc is small, probably not over 500 tons annually, which is used for galvanizing nails and similar purposes. Since the war most of the spelter has come from Australia. In 1919 the import amounted to 31,000 tons, and although the export of refined zinc did not show an increase in keeping with this large import, this may be explained by the fact that almost no spelter came into the country during 1918. Volatilization of the spelter by electric heating is the process of refining.

Practically the only interest which the Norwegian zinc industry has for the United States is the possibility of sending spelter or zinc ore to Norway for electrolytic refining, and the sale of the finished product on the European market. Although this is looking into the future, it may be considered as a possibility.

As previously stated, the silver deposits in Norway were at one time among the richest in Europe. During many years' operation they have been worked out to such an extent that the government is considering the introduction of a small proportion of nickel into its coins to conserve the remaining silver. This mining industry, of course, has no interest for the United States, except that it may be necessary for Norway to import some silver in years to come.

Previous to the war the ferro-alloy industry consisted of the production of ferrosilicon, which was being made in 1909 by three companies. This alloy is produced from quartz, and scrap iron or iron ore. It is the most widely used of all ferro-alloys at the present time, and as quartz is found in many places and in great abundance in Norway, it is natural that this alloy should be most extensively manufactured.

Next in importance and in quantity of manufacture is ferrochrome. The chrome deposits in Norway are found in the Trondhjem and Nordlands amts. Up to 1916, when 2,757 tons of chrome ore was mined, the production was small. In 1917 a total of 3,975 tons was taken from the earth. These ores contain from 14 to 38 per cent chrome oxide. The native ores were not, however, used to a great extent in Norway for the production of ferrochrome while it was possible to secure the rich African chrome ores. This was impossible during the latter part of the war, but now these ores are being used almost entirely.

Another important ferro-alloy is ferromolybdenum. The molybdenum occurrences in Norway are claimed to be among the most important in Europe, but so far they have been worked to only a small extent. They contain about 80 per cent molybdenite. Ferromolybdenum was used during the war by Germany, but has not so far been used extensively by England and the United States, where ferrotungsten is preferred. The invention of Dr. Arnold, of England, has caused considerable stir here, with the hope that his method of steel manufacture by the use of ferromolybdenum may prove so successful that the mining of molybdenum and the production of the ferro-alloy will be stimulated thereby. It will be years before this hope is realized, and in the meantime the use of ferromolybdenum is not extensive.

Other metals are found in Norway, such as wolfram and titanium, and at the beginning of the war, when the demand for ferro-alloys began to assume enormous proportions, experiments were conducted for the production of such ferro-alloys as ferromanganese, ferromangan silicon, ferronickel, ferrotitanium, and ferrowolfram. With the exception of ferronickel, a small amount of which was exported in 1913, statistics do not show exports of these other alloys. It is now planned to make ferromanganese from ores imported from the Caucasus. The ferro-alloy industry, under the stimulus of war demands, grew considerably, but it still depended mainly on ferrosilicon for its chief support. In 1917, the year of greatest export, the value of this alloy sold abroad was $4,250,000. Experts have stated that success in the ferro-alloy industry lies in the ability to adapt the production to suit the demands and the markets. The industry is based entirely upon the use of electric current, but a small amount of coal or coke for reduction purposes must always be used, and this must come from abroad.

Ferrochrome and ferrosilicon are the only two alloys exported at present, and they are going mainly to England. The United States has no inducement to buy Norwegian alloys now, because they can be obtained at home more cheaply. There is also a duty of 15 per cent on the import of such materials into the United States, and, in addition, the ferro-alloy industry, which was built up during the war, will probably be maintained for a few years at least, even though the production is expensive.

Copper Industry of Japan

Copper deposits are found over a large part of central Japan. The ores, which occur in Tertiary volcanics, consist of chalcopyrite and pyrite running 2½ to 3½ per cent copper, and are commonly concentrated before smelting. The gangue is usually quartzose. Lenticular deposits of cupriferous pyrite in Paleozoic schists and sediments occur on the west and the south side of Japan. These mines yield smelting ore carrying about 3½ to 4 per cent, but contain little silica. Pyritic smelting is extensively practiced. Over one-half the copper production comes from four chief mines: Ashio and Kosaka, of the Tertiary type; and Hitachi and Beshi, of the Paleozoic schist type.

The state reserves to itself the right of original ownership in all ores, including copper. The right to work them is granted to individuals or companies of Japanese nationality. Copper mining, smelting, and refining companies seem to be entirely Japanese in ownership and policy. The number of mines is considerable, but their ownership is concentrated in a few hands, and the smelting and refining industry is still more concentrated. Japanese producers sell their own copper, all foreign selling agencies being strictly Japanese. The mines in Japan are not generally worked as joint-stock enterprises, but are mostly family properties inherited by the present owners.

Because of labor conditions, abundant fuel near the mines, and free water transportation, Japanese copper production has increased rapidly in recent years. High prices and the adoption of modern methods of mining and smelting have been important contributing factors.[1]

[1] F. W. Paine in "Political Commercial Geology," McGraw-Hill Book Co., 1920.

The Mining of Paint

The Yellow Ocher Deposits of the Cartersville District, Georgia, Constitute an Important Source of the Pigment Necessary in Its Manufacture

By Marshall Haney
Written for *Engineering and Mining Journal*

In 1877 E. H. Woodward opened the first ocher mine near the town of Cartersville, Ga., the ore being hauled in wagons to this point, where it was prepared for market. A. P. Silva opened a mine in the same locality in 1878. In the process of drying the ocher he used a crude brick furnace about thirty feet long and four feet wide, with a sheet-iron bottom and a fire box near one end, and this crude device gave good satisfaction. The hauling of the crude ore to Cartersville for preparation was continued for many years. Messrs. Earle and Oram started the first systematic mining and preparation of the ore in 1891, using modern machinery. During the period between 1891 and 1900 many mines were opened and in operation, and the output for 1900 was valued at $73,000.

OCHER WASHER IN THE CARTERSVILLE DISTRICT

Location of the Cartersville District

The Cartersville district, which has produced a large proportion of the ocher mined in the United States, derives its name from the town of Cartersville, the county seat of Bartow County, and is about fifty miles northwest of Atlanta, Ga. The ore-bearing area includes about seventy square miles in the southeastern portion of Bartow County. This region is equally divided between the Paleozoic formation on the west and the older crystalline and metamorphic rocks of the Piedmont Plateau and Appalachian Mountains on the east. The separation line of these two groups of formations marks the position of the Cartersville fault, the most important structural feature of the region.

This district is a portion of the southern Appalachian region partly in the Appalachian Mountains and Piedmont Plateau provinces and partly in the valley province. The region has been subjected to intensive compression in a northwest-southeast direction. The formations (Paleozoic) to the west have been folded and faulted and those to the east have been mashed and squeezed. Another result is shown in the upward and westward thrust of the older rocks to the east on the younger rocks of the west, producing the Cartersville fault. At many points the rocks have been greatly altered by chemical and physical action.

Ocher Occurs in Shattered Quartzite

The most important formation is the Weisner quartzite, which shows evidence of great compression over the district, and this produced conditions favorable for the deposition of ocher. The ocher is confined entirely to the Weisner (Cambrian) quartzite and occurs in a continuous belt from near Emerson to Rowland Springs, a distance of nine miles. It is found in the shattered zone of the quartzite. No clue to the vertical extension of the ore is furnished by any of the extensive workings in the district, although it is generally believed that the ocher occurs at considerable depth.

There is little difference in the appearance of the ore in this district excepting for a slight variation in color. This varies from a dark to a light bright yellow, and is caused by the clay admixture with the ocher, which in turn depends on the character of the rock which the ocher replaces. The colors of ochers generally depend upon chemical composition. Prospectors are guided in locating the ore by fragments and masses of quartzite impregnated with ocher and of a yellow color, and in many places there is little or no showing at the surface and its presence is indicated by natural or artificial cuts and openings. An important surface indication which aids in tracing the ocher deposit is the presence of barite, which occurs in many places in the residual decay covering the quartzite.

The ocher deposits form along irregular branching veins which cut the rock in many directions, and at irregular intervals the veins narrow and widen and thin and thicken. For this reason the workings are very irregular, and in some places the chambers are ten or twelve feet in diameter and connected by an irregular narrow passage with another chamber of varying dimensions. Where the ocher bodies are inclosed by quartzite it is frequently necessary to blast, although this is not required where the ore is inclosed in clays.

The pure portion of the ocher bodies is soft and is easily mined with pick and shovel. Much of the mining is open-cut where the overburden is too thin for underground work. On the developed properties the method of mining consists of adits driven into the ridge, with shorter drifts and tunnels worked from the main ones

at suitable points. By so doing a number of levels, one above the other, have been worked. Timber is necessary to prevent caving, and the workings are extensive enough to use electric lights and tramways. The tram cars are hauled by mules or by means of cables.

The principal impurities of ocher are clay, sand, and manganese dioxide. The preparation for the market consists of washing, drying, pulverizing, and packing. After the ore has been mined it is carried on a tramway from the mines to a washer similar in construction to the washers used for washing manganese and brown iron ores. The fine portions of the ore remain suspended in the water covering the revolving shaft of the washer and are floated out by the water escaping through the openings near the top of the washer into a flume, which empties into a series of vats a short distance away, where the ocher settles. Most of the water is removed by decantation and the rest by evaporation.

FLUMES FOR CONVEYING ORE FROM WASHER TO DRYING VATS

Most of the treating plants handle from twenty-five to thirty tons per day. The vats are arranged in series and steam pipes are run at close intervals along the sides and bottom for steam heating. By this method only one or two days are required to dry the ore completely. The rack, air, and sun method requires about eighteen days to complete the drying. After the ore is dried it is pulverized and packed in barrels or bags of uniform size for shipment.

Activities of Ontario's Cobalt-Nickel Refineries

From Jan. 1 to July 1, 1920, according to the Ontario Department of Mines, 1,445 tons of ore, 581 tons of concentrates, and 1,185 tons of residues were treated in the southern Ontario refineries at Thorold, Deloro, and Welland, for a recovery of 1,477,490 oz. of silver, in addition to arsenic, metallic nickel, metallic cobalt, and compounds of these last-mentioned metals. The companies operating were the Coniagas Reduction Co., the Deloro Smelting & Refining Co., and Metals Chemical, Ltd., respectively. The last mentioned operated for the first three months of the year only, after which the plant was taken over by Ontario Smelters & Refiners, Ltd. Alterations in plant and process were made, which prevented production during the second quarter of the year. This new company also owns the plant at Chippawa formerly operated by the Standard Smelting & Refining Co. Copper sulphate was recovered from residues by one of the companies. It should be pointed out that the output of metallic nickel and nickel oxide from silver ores is small compared with that from nickel-copper refining. Only 203,713 lb. of metallic nickel and 15,384 lb. of oxide were marketed.

Talc Mining in South Africa

The mining of talc in South Africa appears to be a development of the war period, according to Trade Commissioner R. A. Lundquist, as little appears to have been done in this field prior to 1913. Even then early mining was for gold, with talc as a byproduct. The production for the past few years is as follows: 1913, 1 ton; 1915, 44 tons; 1916, 132 tons; 1917, 785 tons; 1918, 670 tons; and 1919, 757 tons. In addition to the above raw talc production, the mines themselves have turned out a considerable amount of manufactured talc goods, totaling 412 tons in 1917.

The more important districts in which talc is found are the Barberton district, the Krugersdorf district of the Transvaal, in Zululand, and in southern Rhodesia. The more important of the above is the Barberton district, though it is said that fine foliated talc is found in southern Rhodesia. The area over which talc is known in the Barberton district is about ten miles long and averages about a mile in width, and the deposit occurs in the form of nearly vertical bands up to fifteen feet in thickness. It is said that the talc reserves in the Barberton district are enormous and if properly developed should yield a large tonnage available for export.

At present there are only three producing talc mines in the Union. These are the Verdite mine, Jamestown, Barberton, Transvaal; the Scotia talc mines, Joe's Luck, Barberton, Transvaal; and the mines of R. R. Berrett, Greytown, Natal. The first two mines are the principal producers, and operate in the district between Jamestown and the Sheba Valley.

The Verdite mine and the Scotia talc mines each have a plant capable of dealing with 200 tons per month, though it is understood that recently the latter mine has developed its plant capacity to a point where it can turn out as much as 1,000 tons per month.

The talc is locally prepared according to the French system, using a disintegrator of the "cyclone" type, with a fan separator.

The local demand for talc is not great, and both the Verdite mine and the Scotia talc mines have large surplus outputs available for export. For crushed massive talc the present quotation is £6 5s. per ton of 2,000 lb., f.o.b. Delagoa Bay, for orders of not less than 200 tons. For uncrushed blue massive bulk talc the price quoted is £3 5s. per ton, f.o.b. Delagoa Bay, for orders of not less than 200 tons.

Not So Very Long Ago

Extracts From Early Mining Promotion "Literature" Often Have Familiar Sound —Sheepherder Discovers Bonanza by Well-Known Camp-Fire Process —Rocky Mountains And High Altitudes Best Places for Ore Deposits

By Kirby Thomas
Written for *Engineering and Mining Journal*

AN EARLY DAY keeper of the records who was attached to the Astor Library, now merged with the great New York Public Library, has left some interesting monuments to his zeal for history and to his industry. These are to be found in the form of a series of bulky indexed volumes which include many documents of human and business interest, together with a large number of mining reports and prospectuses of mining companies, which were thrust upon the dear public of a generation or more ago—even as today. These records are even now frequently consulted for the historical information that they suggest and for definite data otherwise difficult to obtain. In the light they throw on the different standards and ideas which have developed with the closer identification of engineering with mining they make curious reading. There is, however, a familiar note in some of the promotion reports, as will be observed from the extracts that follow.

This reservoir of the early history of mining, with its recital of names famous in the beginning of the industry but now almost forgotten, and its stories of hopes, which were mostly deferred, as we now know, seems worthy of being tapped for the interest, instruction, and amusement of the present-day seekers after the "golden fleece." Perhaps those so inclined may draw some self-comforting moral from these personal documents of those who have gone before, not so very long ago.

The Old Formula

Extracts and excerpts from these records are here given, with some necessarily brief comments and elucidations:

A pamphlet, apparently published about 1858, relates the story of the Mina de Tajo, a Mexican undertaking. On the front page is a quotation in large type from an alleged, but not specified, Spanish record, which declares that the mine "*es muy rica, riquisima—abandonada por las aguas*" (very rich, very very rich—abandoned on account of the water). Following this is the serious relation of an incident, familiar to those who read much about mines and mining. A lost sheepherder built a fire to keep off the mountain chill, and in the morning found in the ashes buttons of silver melted out of the hearth-stones, which, in this case, as in others which have gone before and followed after, were rich and docile silver ore. This incident is supposed to have happened about 1727.

Anthropologists may consider this recital a plagiarism of their musty notes of the early beginnings of happenings to the human race, and on the other hand some modern engineers, who have made bold to embody variations of this incident in their reports, may not admit priority. The herder made an open cut on the hillside, near the place where the ore came from; hence the name Tajo, meaning, in Spanish, a cut or trench. The history of the mine, supported by official records and human testimony, is consecutively detailed down to 1850, when, according to the record, one Boniface Rojas, "a noted scoundrel," got control of the mine and looted the rich ore reserves, which fact, perhaps a new idea at the time, is given as a good and sufficient reason why the company which inspired the prospectus was able to secure the property so advantageously. Ward's "History of Mexico" is quoted in substantiation, and, of course, also Alexander Humboldt.

The ore is reported to have had a value of from $56 to $1,500 a ton. On the expected basis of an output of "*630 cargas*" yearly, a profit of $914,000 annually was promised. One H. J. Van Ripper, "citizen of the United States and eighteen months resident of Rosario, and engineer of the mine," made formal affidavit that "the width and power of the vein in no place, to my knowledge, has been discovered." The principal backer of this undertaking seems to have been one Don Jose Gordon, whose name suggests hybridization. Presumably the mine referred to is the same as the Tajo mine of later-day fame, as it is described as being seventy miles from Mazatlan.

Best Silver Mines Found in High Altitudes

In 1865 J. P. Whitney, of Boston, issued a pamphlet entitled "The Silver Mining Regions of Colorado." In his opening paragraph he justifies himself by declaring that he has "the authority of the most eminent geologists and metallurgists for the assertion that the Rocky Mountains are the legitimate localities for true gold- and silver-bearing ores." Further, he says that there is "undisputed proof of the volcanic origin of the ores" and also that "true plutonic ores are in such profusion and in such inexhaustible quantity as to almost challenge one's belief." Continuing—"main lodes have been vomited forth from the mysterious depths of the earth, etc. . . . The mines are identical with those of Mexico, of which they are a continuance. . . . It is a well known and established fact that the best silver mines are invariably found in high altitudes."

In conclusion, the author asserts that he met a soldier near the mine, who had "a two-pound nugget of silver cut with difficulty from a ledge." He describes the first ingot of silver ever produced in Colorado. It was from the smelter of Lyon & Johnson and was made Aug. 26, 1865, from "Clear Creek district ores." Explaining the state of the metallurgical art of the day, he discusses the "Lyon smelting process," the "Crosby & Thompson method of desulphurization" the "Behr & Keith process" and the "Mason process." It is interesting to note that none of these names are today current in metallurgical circles.

Whitney's pamphlet ends with a very cheering picture concerning the attractiveness of investments in mining.

a sentiment which is not entirely foreign to the modern promotion literature.

The author of the prospectus of the DeLery Gold Mining Co., issued in 1866, was either an amateur or was over-conscientious. The opening paragraphs of this appeal set forth that "the business of mining the precious metals is confessedly one of great risks. All prudent men regard its allurements with suspicion. None but the bold will fearlessly venture money in a direct search for gold and silver. The history of Mexico and the Pacific Coast furnishes abundant proof that these apprehensions are well founded." After these alarums the writer proceeds to offer the "guaranteed stock" of the company, "capital $1,000,000, guaranteed stock $500,000."

It would be interesting to know how the stock was "guaranteed," but this information was not vouchsafed. The company was founded to operate the gold placers in the Seigneurie Rigaud Vaudreuil, on the Chaudiere River, in Quebec. It is blandly asserted that "merely initial exploration has revealed some forty miles of gold-bearing quartz ledges." Surely this fact should have been sufficient without the "guarantee." The company's office was at 72 Cedar St., New York.

Ores of Colorado and Mexico Identical

The Mineral Point Tunnel Co., 1878, seems to have been a sort of grandparent for the large progeny of similar undertakings which later disturbed the majestic scenery of the San Juan Mountains of Colorado. The sponsors "propose to call attention of the investors to only such facts as upon more extensive examination can be fully and satisfactorily maintained." Following this very reasonable premise is a quotation from "the great French mining engineer, Simoreis," to the effect that "the silver mines of Colorado give undisputed evidence of great natural wealth. The ores are true silver ores and the mines are identical with those of Mexico, of which they are a continuation."

This same convenient authority declares that "it is a well-known fact that the best silver mines are invariably found in high altitudes." Continuing, he says: "This property is located in the backbone of the silver-mining district, and it is the focal point at which centers and crosses great mother veins." The company had a capital of $1,000,000. The shares, par value $25, were offered at only $10.

Several pages are given to testimonials as to the character and ability of F. J. Pratt, who is apparently the chief figure in this early incident. The proposition is unqualifiedly endorsed by several governors, by half a dozen postmasters, by three mineral surveyors, and, of course, "an old and experienced miner" is quoted, and also "a prominent law firm from Lake City." E. Steinbach, "Dep. U. S. Min. Sur. and Mem. Amer. Inst. Min. Eng.," makes a fairly good report on the property, but spoils its verisimilitude by a fantastic map and section which shows all of the veins "focalizing" on the tunnel courses.

The "Corinna Silver Mining Co." of Bangor, Me., apologetically announced in 1880 that it "had not intended to issue any prospectus until the property had been thoroughly examined and reported upon by a mining expert." The company's property, it is interesting to know, was at Corinna, in Maine, and it was discovered by one Abel Adams, "who had some experience in California mining." The "main" shaft, 60 ft. deep, and two other shafts, 12 and 14 ft. deep respectively, are reported to have shown "rich antimonial silver ore, which resembles closely Nevada ores." It is stated that "in the vicinity of the vein are large quantities of gossan and melted rock, which are said to be an unfailing indication of a large body of ore below."

In a pamphlet, dated 1877, Ross Conway Stone makes a defence of the mining industry in this hardy fashion: "Gold and silver mining have stood the test of these disjointed times, and despite commercial crises continue to increase in strength. . . . It is fashionable to call gold and silver mining a gamble and ephemeral—the rule is to the contrary." He advises the "East" to secure "its own mines instead of *stocks*, manipulated by San Francisco magnates." These sentiments are reminiscent of the panic of '73 and recall the reputed methods of the Comstock financial operators of the time. Mr. Stone has not neglected to include a familiar list of "dividend" mines and of "bonanza" properties.

Many Endorsements for Red Elephant

The Red Elephant Mines Co., 1864, had the distinction of endorsement in reports made by "Prof. Rossiter W. Raymond, Prof. E. E. Berthoud, General Francis L. Vinton, E. Le Neve Foster, M. E., and W. A. Campbell, Esq. The company had a capital of $5,000,000, shares $10 par, office 30 Broad St., New York. Harvey Durand was president. In the prospectus it is claimed that the company owned the four most developed mines of the Clear Creek district, Colorado, namely the Free American, White, White Extension, and Boulder. It is also claimed that the average content of the ore was from 140 to 175 oz. of silver; further, that "there is every certainty of the orebodies not only going to depth but steadily improving with depth in quantity and quality" —a fine figment not yet extinct in mining literature. Mr. Foster says: "The proposition is one of the best in Clear Creek, and can be recommended to parties desiring to invest in mining operations."

Dr. Rossiter Raymond is quoted as follows: "The opinion I formed was highly favorable to the property. It has persistent fissures, carrying extensive shoots of exceptionally rich ore." It is to be noted that Dr. Raymond in this early day stood by his guns, so to speak, with reference to the spelling of "ore shoot"—possibly his genius may have originated the nice distinction between "shoot" and "chute."

The prospectus contains telegraphic reports (some enterprise at the time) from Charles S. Richardson and J. Alden Smith, both state geologists, strongly endorsing the property. The latter says: "The property is capable of producing from $50,000 to $75,000 per month, and of increased production when more ground is opened up." With such indorsements and reports a modern Boston promoter would certainly be able to bring about a serious stringency in the money market. The prospectus is further adorned by some lithographed pictures of scenery and maps in block colors.

The Sir Roderick Dhu Gold Mining Co., in the Black Hills, had some good neighbors, a fact which was not overlooked in the printed report of the superintendent, F. A. Babcock, made to John McGuiness, Esq., president, New York, in 1879. It is noted that the Homestake property was selling on the market on the basis of $4,000,000, and the Deadwood and the Father De Smet for more than $2,000,000 each. "Why should these be more valuable than the Sir Roderick Dhu, which has

abundance of ore and the requisite mill facilities for manipulating it?" Superintendent Babcock naïvely asks. He quotes Louis Janin's classic report on the Homestake as an inferential endorsement of his own mine. He estimates $6 ore and mining and milling costs of $2.35 a ton, and promises monthly earnings of $19,500, or 23 per cent annually on the capital of $2,000,000, "providing the company has sufficient working capital." He asserts that the mine is "capable of magnificent development." He points out the moral of the Comstock operations as an example of the fallacy of not developing mines ahead of the immediate requirement.

A Bird's Eye View of the Black Hills

The "Bird's Eye View of the Black Hills Gold Mining," edited by Harry L. Norton, and published in 1879, by the New York Mining Exchange, 60 Broadway, records that there were 5,000 mining locations in the Black Hills and fifty-two stamp mills (1,720 stamps). The stamps were from 550 to 800 lb. each. The output for 1878 is given as $6,000,000, and the total investment in mining is $2,500,000.

The Black Hills Placer Mining Co., 37 Wall St., New York, Major General Alexander Shaler, president, published "for private distribution," in 1879, a report by Marcus Walker, indorsed by John Rigby, "M. E.," in which a monthly profit of $100,000 is estimated, which was certainly modest, considering that the property was claimed to have "2,300,000,000 cu.yd., which by estimate will net more than $1 a yard."

The endorsers of the Columbia Silver Mining Co., 10 Pine St., New York, said to be mining at Austin, Nev., were certainly as eminent as one might desire. Professor Silliman, of Yale College, is quoted under date of 1866 as saying that these mines carry "the richest and best silver ore known." Professor Fisher, of Yale, is given as authority for the assertion that "these mines are far richer and more extensive than those of Mexico, or any others yet developed." Bishop Simpson, of the Methodist Church, is responsible for the statement that these mines "are richer the more they are worked, and no one has been able to estimate their depth or extent." The company had a capital of $3,000,000, shares par $100.

Rossiter W. Raymond was secretary and Chauncey M. Depew was president of the MacDonald Silver Mining Co., which in 1866 published a report by Aldeberg & Raymond, mining engineers, on the company's property in Lander County, Nev.

A prospectus of the Bassick mine, in Colorado, published in 1879, contains very complete reports by Henry Cummings, who was later famous in connection with the Hornsilver mine, in Utah, and by James D. Hague, "M.E.," and Professor John S. Newberry. Mr. Cummings congratulates the new owners of the Bassick, Messrs. Frank G. Brown, of New York, and Dennis Ryan, of Frisco, Utah, and ingenuously says, "You should be emulated in your method of employing the most skillful, experienced and reliable expert to examine the mines you purchase. . . . If all persons desirous of purchasing mines would pursue a like method and also adopt your policy of paying for a mine 50 per cent of the estimated value of the ore reserves that can be actually measured mining would be unattended by the hazard generally attributed to it."

It is to be hoped that the policy which Mr. Cummings approved will not be taken too seriously by the capitalists of today, otherwise mines are likely to go without buyers for some time. Mr. Cummings makes very scant observations on the nature and origin of the unusual ore occurrence at this mine, simply suggesting that the boulders fell into the chimney and stating that they were coated by solutions from below "which were so hot as to char remnants of wood found with the ore." He declares that "the character of the orebody is without parallel, and it is the largest telluride mine yet discovered." He estimates the ore reserve as 2,000,000 tons, value $58.40 a ton. Shipment to Denver cost $20 a ton freight, and 10 per cent of the gold and 15 per cent of the silver were deducted by the ore buyer for losses in treatment.

Mr. Cummings also figures in a very interesting publication made by the Hornsilver mine at Frisco, Utah, in 1879. In Mr. Cummings' report the public is assured that the "ore is associated with trachyte of volcanic origin." The ore reserves are calculated in detail, the results showing 527,000 tons, containing an average of 71.52 oz. of silver and 42.26 per cent lead. The net value of the reserve claimed is $27,976,552. The company had a capital of $10,000,000, in shares of $25 each. A separate report made in 1878 by William E. Hooker estimates the grade of the ore at $34.46 and the net ore reserve at $17,955,000. The prospectus includes some remarkable plates and drawings, made by the late Leo Rosenberg, of New York.

Alaska Gold's Operations

A publication more recent than the preceding, yet old enough to give some interesting cost data for comparison, is that of the Alaska Gold Mining Co., for 1897. The property had in operation 120 stamps (1,020 lb. each). The crushing result was 3.75 tons in twenty-four hours for each stamp. The costs per ton were: Milling, $0.3217; mining, $0.9532; chlorination, $0.2106; total, including general and overhead, $1.5602. The yield per ton was $2.1242. The total ore mined for the year was 158,000 tons.

The report notes that labor was plentiful. The roll included 105 whites and 33 Indians. The wage scale was as follows: Miners, $2.50 per day, labor, $2 per day, drillers, $2.50 per day, with bonus, including in each case board and lodging. The mill men were paid $90 a month and the hoisters and concentrators $65 to $75 a month, also with board and lodging. The Indians were paid $2 a day and "no board."

The international aspect of this company is indicated on the title page, which designates as the company's bankers "The Bank of California, San Francisco; Messrs. William Rothchild & Sons, London; London agents, the Exploration Co., Ltd.; Paris agents, Compagnie Française de Mines d'Or et d'Exploration." Honorable William Alvord was president and Captain Thomas Mein, consulting engineer.

These are a few selections from the archives. They may carry interesting recollections to some of the readers of *Engineering and Mining Journal* and afford a crude standard by which to measure the progress in the profession of mining engineering, and perhaps some philosophical minds may be able to deduce from these data whether or not the human race is progressing.

Selenium is recovered as a byproduct in the electrolytic copper refineries operated by the Raritan Copper Works, United States Metals Refining Co., Nichols Copper Co., and American Smelting and Refining Co. Practically none is imported.

Mining Engineers of Note

Philip North Moore

PHILIP NORTH MOORE carries his seventy-one years lightly, and younger men may well envy his buoyancy of spirit, his pleasantry of manner, and his keen enjoyment of his work. Graduating from the Columbia School of Mines in 1872, Mr. Moore spent the five years following on the state geological surveys of Michigan, Missouri, and Kentucky. He then entered into consulting practice in Leadville, Col., and later became treasurer and managing director of the Slate Creek Iron Co., in Kentucky. Since that time he has maintained his headquarters in St. Louis. Successively, he has been manager of the Courey Placer Mining Co. and the German Bar Mining Co., of Virginia City, Mont.; president of the Rose Run Iron Co., Kentucky; president of the Tecumseh Iron Co., Alabama, and of the Admiralty Zinc Co., of Oklahoma. From 1917 to 1919 he was a member of the Engineering Council, and from 1918 to 1919 a member of the engineering division of the National Research Council. Mr. Moore's standard in life has been to build a character rather than prominence, on quality rather than quantity. He was wont to observe that he had never reported on a mining property in which he was interested, and never managed a property in which he was not interested. It was the St. Louis conception of his character which led his friends to break away from the "state" ticket of the American Institute of Mining and Metallurgical Engineers, and nominate him as an independent and opposition candidate for the presidency of that body in 1917; and after a warm but good-natured campaign, out of which both sides got a lot of fun, he was elected. His administration was marked by a great deal of achievement and some unconventionality from Mr. Moore, who has a habit of stating the unvarnished truth as he sees it with the minimum of circumlocution, which may on occasion prove temporarily disconcerting. He does not lack the ability to express his thoughts, however, and this ability has been taken advantage of by pulling him forward often as spokesman for the American Institute of Mining Engineers and Engineering Council.

PHILIP NORTH MOORE

Mr. Moore's present job is as a member of the War Minerals Relief Commission, whose function it is to pass on claims under the War Minerals Relief Act, and allot to successful claimants their share in the $8,000,000 relief fund appropriated by Congress. There are now two engineer members of the commission, Mr. Moore and Mr. Pomeroy—the chairman of the commission being "Honest John" Shafroth, former Senator, and Governor of Colorado. It is a job where the engineer's knowledge and judgment is the main consideration, and from the way the work has been carried on we may extend the sobriquet of its chief to the other members, and say "Honest Phil" and "Honest Horace." We do not think any of the most disappointed ones among the claimants who have to be sent away empty handed would file objection to these designations, although some of them might remark that there are times when they are not looking for just that kind of rigid adherence to the rights of the Government and the public welfare. We will not go so far as to say that "Honest Phil" has it in mind that some of that $8,000,000 may be turned back into the public treasury. This would be a heresy that would be contrary to all instances of the doling out of Government pap. At any rate, the pressure will be to have the decisions of the commission, if negative, or if "Honest John," "Phil," and "Horace" have not seen their way clear to loosen up, contested ad infinitum in the Court of Claims.

We understand the commissioners are not in favor of the Court of Claims; but if they will consult the case of Jarndyce vs. Jarndyce, as recorded by Dickens, they will find the precedent of once a claimant, always a claimant. If it were not for that, one would be tempted to say that the mining industry had been darned lucky to get such understanding and sympathetic (*yet* conscientious) administrators as the War Minerals Relief Commission; and that anybody who would not abide by their decision was either a poor sport or the hungry attorneys were pulling his leg. It is a fact that a few claimants that were not entitled to anything have slipped in under technicalities, and received awards.

BY THE WAY

Majority Rule

"This moornin'," said Cap'n Dick, "I wuz talkin' to one o' they college chaps 'oo's learnin' practical minin' trammin' gob on tha h'eight 'underd level, an', dam-me, 'e's come forth with tha mos' h'interestin' discussion o' they Rooshian chaps 'oo call theirsel's Bullsheviki. 'Cordin' to w'ot 'e sez, this 'ere name, Bullsheviki, in Rooshian, means majority. Which reminds me o' poor h'ol' Nicky Trebilcock. One evenin', a nummer o' years h'ago, I sat 'longside Nicky at a meetin' to h'arrange for tha Miner's Union picnic. Nicky, 'e wuz 'ard o' 'earin', an' w'en Jim Penglaze h'asked for tha h'opinion o' tha majority as to w'ere tha picnic was to be 'eld, Nicky 'as to turn to me to h'ask w'ot Jimmy 'ad to say. Several h'others then come forth with suggestions for h'approval o' tha majority, an' all this time Nicky wuz cranin' o' 'is nuddick an' 'is 'and be'ind 'is ear. Sam Treloar, chairman 'o tha refreshment committee, h'announced that, majority bein' willin', 'e would 'ave a special keg o' beer for 'Arry Rowe's brass ban'. By this time Nicky 'ad growed h'excited, an' seemed turrible h'upset. Turnin' to me, 'e sez, 'They bloody h'Irish do seem to be 'avin' all tha h'influence raoun' 'ere lately. Never 'ave I 'eard tell o' this chap *Jarrity* afor', but, dam-me, 'e do seem to 'ave tha 'ell o' a lot to say about this 'ere picnic."

Consult a Physician

We love approval, but it does not interest us long; we are too profoundly aware of our excellencies. Adverse criticism, however, interests us at once: there is always the thrill of the anticipation that we may have unconsciously made an error, and a real pleasure in discovering the mistake or in revising mistaken policies or trends. We love and respect our highly critical friends, and they show the most genuine kindness in pointing out where we can improve. Once in awhile, however, we run across a kicker, who takes the trouble to write us or phone us and kick, without being quite sure what he is kicking about—at least without the mental power of getting down to anything specific. For such a case we can only infer domestic unhappiness or a disordered liver; yet we are too delicate to attempt to prescribe individually. Speaking in general and out of a vast experience, we do not know of any universal remedy for the former; for the latter, we recommend turning for relief to a physician, and not an editor.

The Early Miners

"One of the most marked and best characteristics of the old miners was their kindness," runs a passage in Hittel's "History of California." "An affecting incident illustrative of this occurred in 1848. It was at a little camp, the name of which is not given and perhaps is not important. The day was apparently a hot one and not very far advanced toward the cool of the evening, when a youth of sixteen came limping along, footsore, weary, hungry, and penniless. There were at least thirty sturdy and robust miners at work in the ravine; and it may be well believed they were cheerful, probably now and then joined in a chorus or laughed at a good joke. The lad, as he saw and heard them, sat down upon the bank and watched them in silence—his face telling the sad story of his fortunes. Though he said nothing, he was not unobserved. At length one of the miners, a stalwart fellow, pointing up to the poor boy on the bank, exclaimed to his companions, 'Boys, I'll work an hour for that chap, if you will.' All answered in the affirmative; and picks and shovels were plied with even more activity than before. At the end of an hour a hundred dollars' worth of gold dust was poured into the youth's handkerchief. As this was done, the miners, who had crowded around the grateful boy, made out a list of tools and necessaries and said to him, 'You go now and buy these things and come back. We'll have a good claim staked out for you. Then you've got to paddle for yourself.'"

Half and Half

When the railroad was built last fall to the Rosiclare and Fairview mines in the Elizabethtown fluorspar district of Illinois, both the companies wanted the station named after their own town. The railroad company did the best it could to please them and named the station Rosiview. It was located midway between the town and mines.

The Hydro-Electric Baptists

Dr. George Otis Smith, the director of the U. S. Geological Survey, recently addressed the men's society of one of the Presbyterian churches in Washington on the subject of the super-power survey. Dr. Smith is a Baptist. Dr. Charles Wood, the pastor of the church, at the conclusion of Dr. Smith's address, asked how it would be possible to electrify the men's society into greater activity and inquired of Dr. Smith how the Baptists did it. "They use water power," Dr. Smith replied.

Worthy Pupils

The *Denver Post* has a high regard for the Government's oil specialists. This is indicated by the following quotation from a recent issue of that newspaper:

> Two thousand members of the Independent Oil Men's Association are in Denver for the twelfth annual convention of that organization. Of those in attendance one thousand nine hundred and sixty-two are millionaires. The other thirty-eight are salaried employees of the Bureau of Mines who showed them where and how to make their millions.

We predict that a good part of these millionaires will forget all about it the very second that the tax collector comes snooping along.

Correspondence Solicited

The Bureau of Mines has received a request for information as to the process of making soap out of soapstone. Since the Bureau has no soapstone specialist at this time, Assistant Director Holbrook suggests that possibly some reader of this page may be able to supply the requested data. The first idea that occurs to us, although we admit that it may not be worth much, is that it would be appropriate, if nothing else, to begin by erecting a washing plant. This may help our readers to set their train of thought in motion. Replies received will be forwarded to Mr. Holbrook or printed on this page, as desired. We hope to get a lot of good suggestions, for it has steadily been getting more difficult to fill up this page ever since the Eighteenth Amendment went into effect.

CONSULTATION

Gold Mining Tax Exemption

"Under the existing revenue laws of the Treasury Department is a gold mine exempt from the excess-profits tax? An explanation of the working of the excess-profits tax as it relates to gold mining will be appreciated."

The Revenue Act of 1918 states in Sec. 304 (C), "In the case of any corporation engaged in the mining of gold, the portion of the net income derived from the mining of gold shall be exempt from the tax imposed by this title (Title III, War Profits and Excess-Profits Tax), and the tax on the remaining portion of the net income shall be the proportion of a tax computed without the benefit of this subdivision which such remaining portion of the net income bears to the entire net income."

The text of the section is sufficiently clear and warrants little additional explanation. The tax on the "remaining portion of the income" is based upon the proportion which the net income derived from other than gold-mining activities bears to the total net income, and as calculated upon the tax which would have been imposed had *all* profits been obtained from other than an exempted business.

The following illustration, which considers a corporation engaged in the mining of gold and other metals, is a representative instance and brings out the working of the law. It is assumed that a mining company engaged in the production of gold and other metals has a net income of $300,000, of which $100,000 is attributable to gold mining, on an invested capital of $1,000,000. Without going into the details of the derivation, suffice it to say, that the excess-profits tax which this corporation would have to pay if engaged in some other form of activity would amount to $63,400. However, the $100,000 income from gold mining entitles the company to a tax exemption on this sum. Hence the excess-profits tax imposed would be computed on the remaining portion of net income, or $200,000, and the tax thereon would be proportionate to the tax computed on the entire net income without the benefit of exemption. In other words, $200,000 : $300,000 :: x : $63,400, where x is the tax on the $200,000 of remaining income and $63,400 the normal excess-profits tax on a corporation engaged in an enterprise other than gold mining. The tax would therefore be $42,266.67.

In these trying days for the gold miner it may be "rubbing it in" to discuss such a matter as an excess-profits tax, yet the problem is one in which all metal mines are interested, not only those producing gold principally, but also the ones in which gold production is merely incidental to the recovery of some other metal, such as copper.

Tellurium Production

"Can you tell me how much tellurium was produced in this country during 1919?"

The *Engineering and Mining Journal* has not been able to compile figures on the annual production of tellurium, and it is to be noted that the U. S. Geological Survey has also failed to publish any such information, because only one producer, the Raritan Copper Works, reported production or sales of the metal to the Survey. The demand for tellurium is small.

Optical Fluorite

"Will you kindly inform me what are the specifications of fluorspar for optical uses and give me other information explaining the particular application for this material?"

Optical fluorite is a rare variety of the common mineral fluorspar, which, as its name implies, possesses physical properties which make it particularly desirable for certain kinds of optical work. Such fluorite must be clear, colorless, free from all defects, and contain pieces of suitable material at least one-fourth of an inch in diameter. Common defects found in specimens of optical fluorite consist of internal cracks, cleavage planes, bubbles, and the inclusion of foreign matter, such as particles of dirt or other minerals. By moistening the specimen with kerosene it is possible to detect the presence of faintly developed or incipient cleavage planes that might not otherwise be suspected as being present.

The chief demand for optical fluorite is from telescope and microscope manufacturers, who employ it in the manufacture of special lenses and prisms. The material is cut into the desired form and placed between glass lenses. The fluorite lens has the property of correcting the spherical and chromatic defects of the glass lenses, a characteristic which is due to the low refractive power, single refraction, and weak color dispersion of fluorite. It is reported that these "apochromatic lenses" represent the finest type of microscope objectives made, and that the value of a microscope is greatly increased by the use of such a lens.

According to the U. S. Geological Survey, little optical fluorite is produced in the United States, although certain localities are known to have been productive and have possibilities. In the United States, southern Illinois, in Switzerland, Meiringen, and in Japan, Obira, Bungo, are the world's important producing centers.

It is seldom that pieces of fluorspar are large and clear enough to be of use to the optical industry. Were it more abundant there is little doubt that a greater number of microscopes would be equipped with optical fluorite. Absolutely clear material is of the greatest value, but faint tints of green, yellow, and purple do not render the material useless for this purpose. Prices vary widely according to the particular quality of the specimens offered for sale. From $1 to $10 per lb. is usually paid. The U. S. Geological Survey estimates requirements at several hundred pounds of optical fluorite annually.

To those wishing to market this product, it is suggested that they communicate with the U. S. Bureau of Standards at Washington, D. C., or with one of the large optical companies.

HANDY KNOWLEDGE

Bucket-Dumping Device for Use on an Incline

BY J. B. HARPER

Written for *Engineering and Mining Journal*

A bucket-dumping cradle which was used in sinking a 50-deg. inclined winze on the property of the Jerome Verde Copper Co. and the manner of timbering at the winze station are shown in the accompanying sketch.

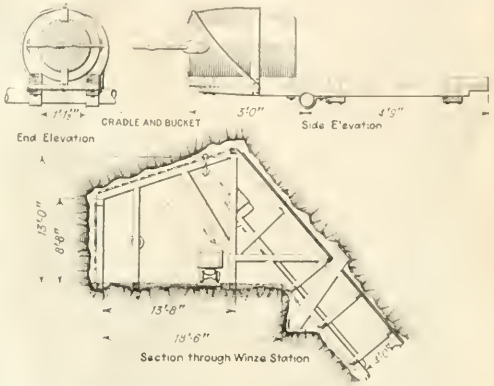
The cradle illustrated consists of two parallel 4 x 6-in. timbers spaced the same distance apart as the skids in the incline and fastened tightly to a piece of 4-in. pipe which rotates in hangers above the collar of the incline. A piece of strap iron arched across these timbers and bolted to them, together with hooks at top and bottom, forms a sort of basket into which the bucket is hoisted. The lower hook passes around the 4-in. pipe and is made slightly shorter to take the greater strain. The position of the cradle on the support is such that the

EMPTYING THE BUCKET INTO A CAR

lower end is heaviest and rests upon iron stirrups bolted to the end of the skids. These stirrups appear in the photograph, which shows the bucket in the dumping position.

A loaded bucket hoisted to the hooks at the end of the cradle overbalances it, and as the cable is slacked off the bucket tips forward and dumps instead of sliding back. As the slack cable is taken up the cradle resumes its normal position and the empty bucket slides back on the skids.

The dimensions of the cradle depend on the size of the bucket to be used. The bucket in the illustration is 2 ft. 9 in. long and 1 ft. 9 in. in diameter, having a capacity of nearly eight cubic feet. It is cylindrical



BUCKET-DUMPING CRADLE FOR USE ON INCLINE

except for the upper and lower edges, which are rounded over on a 3-in. radius to facilitate passage on the skids. This bucket appears to be the maximum size which can be handled by a No. 1-H "Little Tugger" hoist, and was designed for this purpose.

Loose ground made it desirable to cut the winze station as small as possible. The device illustrated requires little headroom. It has been in use for nearly a year, and has proved thoroughly satisfactory.

Determination of Low Percentages Of Lead

Alexander's Method Modified When Lead Is Under 5 Per Cent—Auxiliary Solution of Lead Acetate Employed

BY JOHN H. HASTINGS

Written for *Engineering and Mining Journal*

In using Alexander's methods for the determination of lead, it is somewhat difficult to distinguish an exact end point in titrating when the burette reading is between 10 and 20 c.c., more difficult when between 5 and 10 c.c., and almost impossible under 5 c.c., on account of the slowness of the reaction between the ammonium molybdate and lead solution. Several methods have been proposed as a substitute, but for simplicity and speed none equal the method commonly known as Alexander's.

A modification which I originated and have used for about two years involves the employment of an auxiliary solution of lead acetate, 1 c.c. of which contains 0.005 g. of lead. This solution is added to the lead solution just before titrating to bring the burette reading to 20 c.c. or more. The method is applicable to ores and metal-

lurgical products particularly. Lead may be determined down to 0.1 per cent when 5 g. of material carrying small amounts is taken. It is recommended for use when the lead is under 5 per cent. The method in detail is as follows:

One-half to 5 g. are weighed out into a 250-c.c. Pyrex beaker. If the sample be a sulphide, 10 to 25 c.c. of nitric acid is added; if it be oxidized, 5 to 10 c.c. of hydrochloric acid is used in addition, or else the sample is given a treatment with that amount of hydrochloric acid, with or without the addition of nitric acid after evaporation, depending on whether sulphides are present. If the lead is insoluble the regular treatment with hydrofluoric acid is used.

The lead is separated as a sulphate. The amount of soluble lead sulphate is determined as described in running the standard. This eliminates the necessity of using "lead" acid or alcohol. Any lime present is washed from the lead sulphate.

Fifteen to 20 c.c. of sulphuric acid is added to the solution, which is heated until the sulphuric acid is fuming well, then over a free flame until copious fumes of sulphuric anhydride are evolved. The solution is cooled and diluted with 100 c.c. of cold water. It is then brought to a boil and let stand until all iron sulphate is in solution. After cooling, it is filtered, and the precipitate washed four times with cold water. The precipitate and paper are dropped into a 250-c.c. beaker containing 15 c.c. of a saturated solution of ammonium acetate diluted to 100 c.c., with water. The ammonium acetate is then brought to a boil and boiled a few minutes to dissolve all lead sulphate. Twenty cubic centimeters of the lead acetate solution is then added and the solution titrated hot with a standard solution of ammonium molybdite, using tannic acid solution as an indicator. The end point is a pronounced change to a yellow color. The number of cubic centimeters required in standardizing the lead acetate solution is subtracted from the reading. The per cent of lead is calculated from the remainder.

The various solutions used in the analysis are made up as follows:

The ammonium molybdate solution contains 4.25 g. of the salt per liter of water.

The lead acetate solution contains 9.15 g. of the salt per liter of water, and is cleared by adding a few drops of acetic acid.

The tannic acid solution is a 0.1-per cent solution of tannic acid in water.

The ammonium molybdate solution is standardized by weighing in duplicate 0.1 g. of c.p. sheet lead, which has been thoroughly cleaned, and dissolving in 1 c.c. of nitric acid and 15 c.c. of water and running through as described in the method, except that no lead acetate solution is used.

The lead acetate is standardized by adding 20 c.c. to a 250-c.c. beaker containing 15 c.c. of a saturated solution of ammonium acetate, together with a filter paper and 100 c.c. of boiling water. It is then titrated as described in the method.

The amount of lead taken into solution by the dilute sulphuric acid and wash water is determined as follows: A standard sample of ore running about 5 per cent lead is run according to the method, using a 0.5-g. sample. It is also run using a 2-g. sample, but with no lead acetate solution. The difference in the percentage of lead in the ore shown by the two methods of determination is the amount due to the soluble lead. This figure must be added to each burette reading on the sample after subtracting the number of cubic centimeters of lead acetate used. The correction amounts to from 0.2 to 0.4 c.c. In the methods of standardizing no other blank needs to be considered.

Practice of Opening Kegs of Black Blasting Powder With Wooden Tools Condemned

By S. P. Howell*

The Bureau of Mines has repeatedly called attention to dangerous practices in the transportation and opening of kegs of black blasting powder. It has not been definitely established just how opening a keg with a wooden moil, wooden sprag, or a wooden mallet causes explosions, as it appears to be difficult to strike a spark with wood against metal, but it may be that in breaking the keg, the sharp points of the sheet iron would be driven inside of the keg; that two or more of these points may have been made; and that in rubbing over one another, these points or the edges of the strips may have caused a spark, or it may be that the strips or points may have been driven forcibly against the side of the keg and produced sparks, or it may be that the wooden tool was covered with a gritty substance, thus facilitating sparking, or it may be—and this has been demonstrated at the Explosives Experiment Station of the Bureau of Mines—that the fine particles of black blasting powder remaining in the angular groove of the chime received the impact from the wooden tool and this ignited the particles.

Evidence shows, however, that the method of opening kegs of black blasting powder with wooden tools by punching a hole through the top of the keg is an unsafe one. The usual 25-lb. black blasting powder kegs are provided with a bunghole and a cap for closing it, and in all cases the powder should be poured from the keg through this bunghole.

The excuses for not doing so are usually that the bunghole is so small (diameter of 1⅞ in.) that it requires too much time to get the powder out of the keg through this bunghole, or that the bunghole is so far from the chime (1½ in.) that all of the powder cannot be poured out of the keg. In view of the menace of other methods of opening the kegs, these excuses cannot be given serious consideration. A keg of FFF black blasting powder can be emptied through the bunghole in forty to fifty seconds, leaving less than 100 grams (about 3½ oz.) of explosive in the keg, and it is not difficult to get all but half an ounce of the powder out of the keg by shaking.

The Bureau of Mines therefore recommends that kegs of black blasting powder be not opened with any tool, whether of metal or wood, and that the keg be emptied only through the bunghole provided for the purpose.

Camouflaging a Worn Corrugated Iron Roof

Some old corrugated iron was used in the roof of a new mill in the Joplin district. Although the roof was tight enough for all practical purposes, the effect of the old nail holes was unpleasant. A few hours' work with some J-M elastic roof putty permanently stopped all the holes and gives the effect of a new roof. The same result can be effected by dropping large-headed roofing nails into the holes. Window dressing only, but it gives a visitor a much better opinion of the mill.

*Bureau of Mines, "Monthly Report of Investigations."

THE PETROLEUM INDUSTRY

A Suggested Schedule of Petroleum Priority

Influence of Price, Application, Demands, and Requirements of Liquid Fuels Are Factors Which Should Determine the Base for a Preferential List—Proposal Represents the Application of New Principle in Natural-Resource Thought

BY R. S. McBRIDE
Written for *Engineering and Mining Journal*

IN A PREVIOUS ARTICLE[1] the importance of thinking nationally of our petroleum problems has been pointed out, and the suggestion made that we must soon consider which of the various applications of petroleum will be given preference in supply. Continuing this discussion, it is desired to give here a suggested priority list. This, it is hoped, will at least serve as a stimulation of further discussion and for more thought on our basic economic problems of petroleum distribution. It is not expected that it will do much more than this, for the problems treated are still largely unsolved—perhaps, indeed, partly unsolvable, today.

During recent years we have had a variety of bases for determining priorities. Throughout the Great War priority commonly was granted to a specific individual or firm in order that a particular job on hand might be accomplished expeditiously. Then, too, we had priority classes for fuel, in which the character of the institution served or nature of the work to be done by the fuel user determined his position in the list, as, for example, the relatively high placing of public institutions, hospitals and like establishments, the intermediate ranking of public utilities, and the superior ranking of war industries over those termed "non-essential."

More recently, in the case of coal transportation, another class of priority has been granted by the Interstate Commerce Commission; that is, according to geographical subdivision. This was done that New England and the Northwest would not freeze or be threatened with idle industries during the coming winter season. However, none of these priority systems serves for the present purpose. What is needed is a scale by which we may judge the relative social service performed and thereby establish the economic justification for priority.

Photograph by courtesy of the Bureau of Mines

A FULLY DEVELOPED PETROLEUM AREA

The wells in this region, at Kern River District, California, are placed from 200 to 300 ft. apart. One of the large open reservoirs that are utilized for the temporary storage of oil is shown in the immediate foreground of the picture

It is realized that any effort to this end cannot expect to command general concurrence with every detail; in fact, there will perhaps be as many priority lists established as there are investigators in this field. However, there are certain principles to which practically all agree, and these justify careful consideration, in the hope that at least we may establish some basis to guide the industrial thought for the immediate future.

In the following discussion of such priority it is intended to take rather a middle ground between what can be our every-day practice this year and what might be termed an ideal future practice toward which to work. The suggestions of the following sections are a recommendation toward which it is believed we can immediately turn, with the expectation of realizing the relationships suggested within a few years. Still further development beyond that period will also be needed. However, it is impossible for anyone to say today just

[1] "Liquid Fuels—Wanted: a National Policy," *Engineering and Mining Journal*, Oct. 23, 1920.

how each of the several interests which must be regarded as competitive today will develop or to predetermine their proper rank for periods of the more distant future. This limited applicability over relatively few years should be carefully borne in mind, to avoid a misunderstanding of the rather high position given to some uses of petroleum that cannot be recognized as worthy of such preference permanently.

The Influence of Price in Determining Priority

In the final analysis, the laws of supply and demand, if unrestricted by artificial legislation, fix petroleum prices properly in reference to trade conditions. He who can still afford to pay the price thus fixed can expect to remain in the market as a successful purchaser. He who can least afford to pay the prices thus established will soonest be eliminated. This, perhaps, is the law of the jungle, but it is almost inevitable that it shall rule. A further consideration of some of the aspects of this principle, however, is worth while.

Liquid fuels are for most uses simply competitors of gas, coal, and electricity as sources of heat, light, and power. So long as liquid fuels afford to the purchaser an attraction superior to these other energy supplies, the purchaser will continue to use the liquid fuel if it be available. Price is, to be sure, only one of the elements in determination of the relative suitability of liquid and other fuel supplies. Convenience of use as compared with solid fuel, ease of storage as compared with gas, and other similar factors enter. However, in the last analysis the purchaser buys the one which gives him for the least expenditure of money and effort the desired operating result.

Under these circumstances, as soon as the petroleum becomes decidedly more expensive per unit of service rendered than coal, let us say for heating, the extensive use of liquid fuel for this purpose will promptly cease. It is likely that price will thus establish a sound basis for determining industrial priority, especially if unaffected by governmental restrictions. Indeed, one might say that such a priority list established by ability to pay the price will ultimately be identical with a list established solely on the basis of the economic justification for use of the liquid fuel. Nevertheless, it is worth while to examine these problems from a broader point of view. To this end, let us consider a dozen of the principal applications of petroleum.

A nearly unanimous opinion probably can be expected with respect to the first on the priority list; a general agreement that lubrication is the most important and most nearly irreplaceable application of all petroleum products. One is justified, therefore, in placing this requirement at the head of an economic priority list.

Next in order, one must probably place either illumination or the special chemical requirements for miscellaneous petroleum fractions. Of these two uses the former draws upon rather a different group of oils than the latter. It, therefore, makes little difference which is placed second and which is third on our list. Kerosene, as an illuminant for districts where city gas, electric current, or acetylene are not available for lighting, certainly serves a fundamental social function that is hard to provide for otherwise. Moreover, this use of kerosene calls for only a part of the illuminating oils which can be manufactured from the available petroleum resources that will be handled if demands in other lines are met. There seems some ground, therefore, for placing illumination as number two in the schedule.

Numerous chemical processes require the use of liquid fuels, but these do not draw very heavily upon our petroleum supplies. To the extent that neither gas nor solid fuel seems quite as well adapted to the processes in question, so far are we justified in giving distinct preference to this requirement.

Within the chemical industry there is also a highly specialized requirement of petroleum fractions or products, which are used not for fuels but rather for other purposes. Ink oils, medicinal oils, petrolatum, paint oils, and similar petroleum products are conspicuous examples. These demands represent applications that certainly justify encouragement. And fortunately this encouragement can be given without any particular burden upon other uses, as the quantities needed are small compared with other requirements.

Within the group of chemical applications there is, also, a peculiar class that is rather the result of the existence of products not readily adaptable to other uses. To the extent that these relatively inferior products can be efficiently applied in chemical industry, we should give great encouragement to such use. All of these so-called "chemical" uses are grouped together and placed as third in the economic priority schedule proposed.

The requirements of petroleum fractions for automotive fuels is peculiar in that the fraction commonly needed is not largely in demand for any other purpose. Gasoline is, in fact, almost synonymous with automotive fuel. Practically all gasoline can be given to automotive requirements, and this use placed as number four in a priority list, without giving rise to serious objection.

The only sense in which automotive requirements are in conflict with other demands for petroleum is that fuel-oil fractions are now being used to a considerable extent for the production of gasoline by cracking. In placing automotive requirements as number four, it is not intended to include with them this indirect production of gasoline; this rank of four is confined to the gasoline produced by the older methods of distillation.

It is well known that all the gasoline which can be made by present-day plant practice is quickly absorbed by the markets. The competition or priority with respect to gasoline, if such were undertaken, would, therefore, require a very different type of classification than that which we are now discussing. It would require, in fact, a discrimination between uses of greater and lesser economic justification. In other words, a contrast between essential, desirable, and purely luxury applications. To enter a discussion of that question is, for the present purposes, wholly unnecessary.

After recording the first four entries on a priority list a more difficult problem is met, for at this stage one must decide as between those who require substantially the same fractions of petroleum. There are eight groups of gas-oil and fuel-oil uses that must be so judged and ranked. These applications are: Gas manufacture, gasoline manufacture, internal-combustion (Diesel) engine use, navy fuel, merchant-marine fuel, locomotive fuel, steam power-plant fuel, and fuel for heating plants.

In this group gas manufacture is distinguished from others because it represents a distinct type of fuel-oil application. Other public-utility fuel users would also require special treatment were it not for the fact that their oil requirements fall within the scope of the other groups mentioned. For example, these other public-

utility uses are in Diesel engines, power plant, or heating plant; and for present purposes these need not be distinguished from similar demands by other users.

It is a general principle in our census of manufactures that a measure of industrial development is the increase in value added by manufacture. For this purpose, value of raw materials is compared with value of products and the difference taken by the census as of economic significance. Proceeding upon the same theory here, we can place gas manufacture and gasoline manufacture somewhat ahead of other demands for fuel oil. In these applications the oil is not consumed but rather is converted into a material available for application in a superior class.

If it were possible quickly to substitute coal-gas plants for existing oil-gas and carburetted water-gas installations, there would be no particular need to regard the city gas manufacturer as entitled to serious consideration for high place in a priority list for fuel oils. However, such quick change of gas-making process is not possible. The machinery and materials needed for installation of coal-gas or coke-oven plants cannot be made available for a considerable period. Neither can the funds required for so large a change in investment be secured by utility companies at present. Gas represents an essential of modern city life. For the present and for a considerable number of years to come, therefore, preference must be given to gas manufacture over other fuel-oil requirements *to such extent* as will permit uninterrupted adequate gas supply.

This situation may continue longer than at first seems likely, for natural-gas supplies are now continuously decreasing in quantity, and manufactured gas must inevitably ultimately replace them. Much new construction of coal-gas and coke-oven plants will doubtless, therefore, be directed to extension of gas-making facilities in such districts of the country as were formerly served to a large extent by natural gas. Municipal growth and extension of gas supply into suburban territory also tend to limit gas-works construction to only that which can be regarded as extension of present plants. Thus, for many years to come an important fuel-oil demand for water-gas making must be met.

Gasoline production from fuel-oil fractions, when it can be efficiently practiced, raises the petroleum production from a lesser to a greater usefulness. To the extent that equipment is available for this conversion to gasoline, preference will, doubtless, be given for such use by the petroleum refiners. This will be not only a matter of good business judgment on their part, but also, for the reason cited, an economically justifiable procedure. On the other hand Diesel-engine use is so much more efficient than most gasoline-engine use that there is no ground for encouraging conversion of fuel oil to gasoline for work which the Diesel engine can do. Therefore, as Diesel-engine demand develops, this new factor will enter to offset the present tendency toward cracking to make "gas."

Having disposed of gas making and gasoline manufacture, there remain for consideration only power and fuel uses. Because of the greater efficiency of petroleum use in internal-combustion engines, as contrasted with boilers of any type, we certainly must give preference to this use. As a matter of fact, this, for the immediate present, is not of large commercial significance, because the internal-combustion engine (limiting ourselves here to the non-automotive type) does not demand any large percentage of our fuel-oil supplies. Nevertheless, with increasing costs of liquid fuels, we may look forward to great increases in this more efficient method of fuel-oil utilization; and as these uses develop we probably shall continue to place them at this point in any priority schedule.

The remaining users of fuel oil burn the oil under a boiler or for direct heating purposes. Of these users the naval requirement unquestionably comes first. Following this, most persons would doubtless agree that the merchant-marine demand should be met before other use can be justified. That this merchant-marine demand is going to increase continuously in the next few years cannot be questioned. Not only are the estimates from our Shipping Board good evidence of this, but also there is extensive development of oil-fired shipping by the British. In fact, the "Olympic" and "Aquitania," two great Cunarders, only recently made their maiden voyages as oil-burning vessels.

After these marine uses, we can probably give the locomotive boiler next position. The large advantage of liquid fuel for such mobile power plants is well recognized. To the extent, therefore, that the locomotive cannot be electrified, we can justify oil burning in preference to the use of oil for stationary power or heating-boiler use. This preference is also supported by the critical state of the transportation demands of the country at the present. It is to be anticipated that this preference for locomotive use will not continue long except in certain limited portions of the country where liquid fuels are much more readily available than solid fuels. Oil for locomotives is rapidly becoming practically prohibitive in cost or wholly unavailable.

As a matter of fact, by the time we reach this stage it makes little difference to whom we give priority; for if the higher classes of use are satisfied, no oil is left to distribute. Nevertheless, one may as well continue to theorize through to the end, and discriminate between the steam-power plant and the heating plant. It appears that the former should be given preference over the latter, for a greater increase in efficiency is doubtless generally obtained in power production through oil firing as compared with solid-fuel firing, than can be found in contrasting liquid-fuel and solid-fuel use for heating puposes. Thus, we would place steam-power-plant use ahead of heating-plant application, the latter being the last of the twelve items in the schedule.

As a result of the discussion, one obtains a priority list for liquid fuels as follows:

	Character of Use	Kind of Oil Applied
1	Lubrication	Lubricants (fuel oil)
2	Illumination	Kerosene
3	Chemical byproducts	Miscellaneous
4	Automotive engines	Gasoline
5	Gas manufacture	Fuel oil
6	Gasoline manufacture	Fuel oil
7	Internal-combustion (Diesel) engines	Fuel oil
8	Navy	Fuel oil
9	Merchant marine	Fuel oil
10	Locomotive firing	Fuel oil
11	Steam-power plants	Fuel oil
12	Heating	Fuel oil

It is doubtful if this schedule will meet general acceptance, but it represents the application of a relatively new principle in national-resource thought, and, as such, it should be considered. In any event, whether one agrees with it or not, it represents a starting point for the consideration of a still more important engineering problem, namely: What attention must be given to petroleum substitutes, in order that all these industrial needs for liquid fuels may most effectively be met? This latter question, however, requires separate discussion.

NEWS FROM THE OIL FIELDS

Revision of Standard Petroleum Specifications

By R. S. McBRIDE

The conference on the revision of standard specifications for petroleum products held Oct. 18 in Washington was attended by representatives of all the Government departments interested, state oil inspectors, oil producing and refining interests, and automotive interests.

The specifications particularly under consideration were those for gasoline, kerosene, burning oils, fuel oils, and a wide variety of lubricants. In executive session the committee continued consideration of the proposals for the two days following the public conference and it is expected that the revision of the standards will be completed within a short time and revised standards published covering all of these materials. Nominally the specifications which it adopts relate only to Government purchases of petroleum but in practice a number of states are adopting the specifications, particularly those for gasoline.

Four states have already adopted the motor gasoline specifications of this federal committee and others give evidence that they are likely to do so. Some states are writing the specifications into the state law; others simply provide that the latest specification of the committee shall govern, or place the matter in the hands of a commissioner.

The advantage of state regulation in contrast with federal legislation seems to be wholly with the smaller refiners who like to have different standards which will permit disposal of their poorer products in states where less rigid requirements prevail. It was the consensus of opinion that where state laws do specify gasoline standards, the refiners, particularly the larger operators, are very careful as to the quality of material shipped into that state.

Oil-Land Leases in California

To date over 105 applications for the leases to oil lands under the Federal leasing law in California have been made. The total acreage under these applications is 31,840. A total of royalties amounting to over $6,775,000 has been paid to the Government by California lessees. Of this amount one-fifth, or $1,355,000, will be turned over to the State of California. At present the Federal Land Office is compiling maps showing unappropriated oil lands in areas of known favorable structure and formation. This information is available at the various offices of the Land Office in San Francisco, Visalia and Los Angeles.

Texas State Institutions Require 80,000 Bbl. of Oil Annually

From Our Special Correspondent

The State Board of Control has awarded contracts for supplying the various state institutions with oil. The Nortex Refining Co., of Eldorado, Kan., will supply the institutions of north Texas, and the Humble Oil & Refining Co. those of south Texas. In all, about 80,000 bbl. will be required for the year.

Stephens County is now the largest oil-producing county in Texas. Many new wells are being brought in, and it is probable that the present production of about 90,000 bbl. daily will be increased. South of Breckenridge, in this county, the I. A. Stocker No. 2 well, after being shot, settled down to a flow of 4,000 bbl. daily; the joint well of the Humble Oil & Refining Co. and the Templeman Oil Corp., in the Breckenridge district, was also shot, and its flow increased to 400 bbl. Other companies that have increased their Stephens County production lately are the Gulf Production Co., Fensland, Magnolium Petroleum, Mid-Kansas and Texas companies. Extensive work is now being pushed in the Eliasville district.

Burkburnett and Electra fields continue to furnish many new producing wells. The most important completion lately is the big gas well of the Camp Oil & Gas Co., south of Burkburnett, in the Texhoma district.

Three Sections Prospecting for Oil in Nevada

From Our Special Correspondent

Drilling for oil continues in three widely-separated areas in Nevada and a derrick is now being erected for active operations in still another. Individuals who are connected with the Red River Lumber Co. have acquired a big acreage near Sulphur, on the Western Pacific R.R., and will sink a test well. The Red River Lumber Co. is working a sulphur deposit near by, although it is said to have no connection as a company with the oil-drilling operations.

The well of the California Excelsior Oil Co., in Fishlake valley, 55 miles from Tonopah, is now down over 400 ft. and making progress at the rate of 25 ft. a day, according to K. Davis, a former Texas operator who is in charge of drilling operations. Mr. Davis states that there is a showing of oil in the well and that he is much encouraged.

The greatest activity is in the Fallon section. Six companies are actually drilling in the field and as permits under the new leasing act are now being received it is expected that still others will soon be busy.

September Oil Production in Wyoming Shows Increase

From Our Special Correspondent

During September forty-four wells were completed in Wyoming, twelve of them dry. The total oil production was 785 bbl. greater per day than during the preceding month. Over 400 wells were being drilled on the first of the month. In the Osage field one dry and five producing wells were completed during the month, the largest number for any field in the state. A recent completion is the V. M. Kirk well, which came in from below 1,500 ft. as a gusher. The Quinn Oil Co. is down over 1,400 ft., and in all about 20 rigs are set up in this field.

Well Near Fort Norman, Can., of Scientific Importance

From Our Special Correspondent

It has been recently announced that drilling operations of the Imperial Oil Co. on the Mackenzie River struck oil on Aug. 25 at a depth of 783 ft. The oil flowed out of a six-inch casing for thirty minutes, when the well was capped and shut in. Any estimate as to the amount of oil this well would produce is only a guess, as there was no receiving tankage available and an accurate test could not be made. The discovery is considered an important strike and scientifically of much value. From a commercial point of view, however, it is not of immediate value as it probably will be years before it can be made available in quantities for the use of the Canadian market on account of its remoteness from any refinery outlet.

Two New Gushers Added to Tampico Field

From Our Special Correspondent

Two more big gushers have been added to the list of Mexico's oil producers. The first was brought in by the Cias del Agwi, and the second by the Huasteca Petroleum Corporation. The Agwi well was brought in at a depth of a little over two thousand feet. The gusher is located on the bank of the Tancochin River on Lot 251, Amatlan. Its estimated flow is in the neighborhood of 30,000 bbl. daily. This company has three other big producers as this same lot. The second well, which was a test in the Zacamixtle country, is one of great importance. Several companies have dotted this territory with well locations, as the geological reports recommended this section highly. When salt water was struck in the International well two weeks ago and several other tests were down over 2,500 ft. things looked doubtful, in fact several of the rigs closed down temporarily.

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

Chinese Silver Mines of Six Hundred Years Ago Discovered

Much Silver Was Removed—Still More Accessible by Modern Methods—Obstacles to Successful Exploitation

"In the Kaying section of northern Kuantung," writes S. S. Beath, of Kaying Academy, in *Millard's Review of the Far East*, "there are several mines that have long been abandoned. Recently American mining interests have investigated to learn if they still contain ore of sufficient value to warrant further operations by modern methods.

"Geologically speaking, the mines here are in a limestone formation that was probably at one time intruded by molten rock, thus forming the pockets of ore that were mined. Silver and large quantities of galena were thus formed. The latter ore is still to be found near the surface of the earth. There are also large deposits of manganese, but the high cost of shipping has prevented its export.

"One of the most promising sections lay to the northeast of Kaying in a rather sparsely populated valley. A portion of this valley, perhaps a mile square, had been worked over carefully by the ancient miners and not less than a million tons of slag remains as the result of the smelting process. Most if not all the ore smelted was produced in a small contiguous area and treated at small charcoal smelters.

"The underground workings of these mines are well preserved, though they are probably 600 years old. Shafts chiseled out of the solid rock lead down at about 45 deg. to a series of horizontal passages, then a second series to a lower level, and so on, to a considerable depth. The work must have been dangerous and tedious, as these excavations are only large enough to admit one man. It is probable that the ore was carried out in baskets. No trace exists of any pumping system, though it is reasonable to suppose that crude bamboo pumps were employed to keep the water under control. Baskets and bamboo pumps are still used in Nankin.

"The American miners interested in this exploitation originally expected to find silver ore at relatively shallow depth, assuming that the native miners must have been soon hindered by mine water. The surprisingly extensive and deep native workings have led them to conclude that the best solution of their problem involves the exploitation of possible deeper ores by means of modern mining machinery.

"In the process of investigation a stone tablet was discovered in the vicinity that explained the reason for the closing of the mines. This tablet, dating from a dynasty in power 600 years ago, bears an edict from the magistrate at Kaying forbidding any further working of the mines. The edict responded to a petition by the local clans stating that the operations were interrupting the natural water courses, spoiling the fields, and that the water was being poisoned by the smelting process, resulting in many deaths.

"The same group of engineers are working on perhaps half a dozen other similar projects, many of which are promising. South of here there is an abandoned silver mine of the vein type that is said to be of tremendous size. The work was stopped, according to local tradition, because of 'feng shui' difficulties over a grave belonging to a prominent clan. The ancient miners followed the veins of ore under a large mountain, and when baffled by underground water they dug an immense underground channel that is said to be a considerable feat of engineering. Today local opposition to the 'foreign devils' prevents further exploitation of a most promising mine. Large quantities of unmined ore are almost certainly there. It seems to be the general opinion of these men that the Chinese miners with primitive tools showed great skill in making Mother Earth yield up her treasure.

"Many current reports seem to indicate that China is virgin territory as far as mining is concerned, like Siberia, but in this section at least most of the deposits of common minerals have been discovered and worked. This is true of surface mines, but little is known of the deeply covered mineral resources. The most promise seems to lie in the direction of reopening these ancient mines, and applying modern methods.

Obstacles to Western Development

"There are many difficulties and obstacles to be overcome in this type of work. Official channels are difficult to navigate, and official sanction once secured may fall on deaf ears when one has to deal with local officials and clans. Part of the opposition is due to a conservative attitude toward foreign enterprise, but the greater reason is the so-called 'feng shui' idea, which is well known to all residents in China. This conception, which forbids the disturbance of the vicinity of graves by digging, of course is a great hindrance to mining. There is, doubtless, much unmined silver and other ore in this section, but whether foreign interests will be able to mine it is, at least for the present, rather problematical. If the difficulties were technical, modern methods would make success reasonably certain, but the other difficulties I have mentioned are much harder to deal with successfully."

Prospectors in New Caledonia Propose, but Paris Disposes

A group of prospectors in New Caledonia (French) recently requested the Consul General of that colony to promulgate and enforce a law that should reserve the rights of discovery to the prospector concerned. The Consul General replied, according to *Le Bulletin du Commerce de la Nouvelle-Caledonie*, to the effect that he did not make the laws for France-in-the-Southern-Hemisphere ("la France australe") and that only certain gentlemen living at their antipodes, knowing nothing about Nouvelle-Caledonie and ignoring their existence for the most part, decided all Caledonian questions, and from them there was no appeal. Thus it is that they have inflicted on the mining world a law which both the colony and its prospectors must obey.

"Perhaps," says *Le Bulletin*, "if someone should try to make these gentlemen who manufacture the world's laws listen to reason, rights of discovery would be accorded—but it is doubtful. These mining laws are voted by indigenes or autochthones of Carpentras, Paris, Cognac, or Dragugnan, who do not know what a mine is and do not care. They vote 'for' or 'against' with serene indifference. They will vote a law that ruins a province if the author of the bill is their friend. It is possible that they would adopt a good law for Nouvelle-Caledonie if it were presented by a member of the majority. But that would not be their fault."

Aluminum-Bronze Coinage Chosen by France

In these columns for July 31 it was announced that France had decided to replace or supplement her silver small-change supply with metallic tokens or "counters" issued for the chambers of commerce in denominations of 2 fr., 1 fr., and 0.50 fr. *Journal du Four Electrique et des Industries Electrochimiques* has recently stated that after a number of tests France has decided to use the aluminum-bronze of Henri Ste.-Claire-Deville for these chamber of commerce counters. The greater hardness of this alloy will necessitate special machinery for the minting of this issue. Some years ago it was suggested that the French copper coins be replaced by others struck from this bronze.

Four hundred members of the American Society of Mechanical Engineers have organized a section on Materials Handling. This section will hold special meetings on particular subjects coming within the scope of its field.

MEN YOU SHOULD KNOW ABOUT

F. W. DeWolf, State Geologist of Illinois, was in Washington, D. C., last week.

Harold W. Stotesbury recently examined a mine in Hailey, Idaho, for the Tonopah Mining Co.

Philip S. Smith has returned to Washington after a summer of field work in Alaska for the U. S. Geological Survey.

W. C. Alden has returned to his desk in the U. S. Geological Survey after a study of the glacial deposits and Tertiary bench gravels in Montana.

D. F. Hewett has returned to Washington after examining the Crimora manganese mine, Augusta County, Va., for the U. S. Geological Survey.

L. C. Graton, consulting geologist, of Cambridge, Mass., left for Peru early in October. He expects to be absent from the United States for six months or longer.

Tom Hamilton, mining engineer, expected to leave Bolivia for Buenos Aires, Argentine Republic, on Aug. 17, and hoped to reach the latter city by Sept. 6.

George E. Collins, mining engineer of Denver, Col., was in New York recently on professional business. Mr. Collins expected to leave for Denver on Oct. 23.

E. L. Hawes, mining engineer with the Ingersoll-Rand Co., is going to the Johannesburg office of that company in the Union of South Africa, and not to South America.

George H. Garrey, consulting engineer and geologist of the Tonopah Belmont company, has returned to Tonopah, Nev., after spending several months in the East.

Dr. Willet G. Miller, provincial geologist for Ontario, and Thomas W. Gibson, Deputy Minister of Mines, are making an official visit to the mining districts of northern Ontario.

W. H. Knowles, field representative of American Mining Congress, was in Helena, Mont., early in October, in connection with the organization of a Montana chapter of the congress.

J. D. Millen, recently general manager of Mount Bischoff Tin, Tasmania, is now a senator in the Commonwealth Parliament. He was succeeded as general manager by C. W. Gudgeon.

Carl O. Lindberg, mining engineer, of Los Angeles, Cal., is in New York on his way to Bolivia, sailing early in November. He expects to return to the United States about Jan. 15, 1921.

William J. Loring was in Carson City, Nev., early in October in connection with the suit in the Federal court brought by David Taylor against the Nevada Humboldt Tungsten Mines Co.

George D. Van Arsdale, consulting chemist to Phelps Dodge Corporation, will move to Los Angeles, Cal., where he will open an office as consulting engineer in hydrometallurgy, flotation and similar fields.

C. W. Knight, assistant provincial geologist, Ontario Bureau of Mines, is in charge of the geological examination of the Bourkes area along the L. & N. O. Ry. His present addresss is Bourkes, Ont.

Paul Paine, consulting petroleum engineer, of Tulsa, Okla., and formerly with Gypsy Oil Co., is a special lecturer at Massachusetts Institute of Technology, where he is giving a course on oil and gas production.

Bulkeley Wells, of Denver, and George M. Taylor, of Colorado Springs, Col., have been appointed to the committee of Colorado Metal Mining Association to co-operate with those seeking to readjust relations with the management of Colorado School of Mines.

F. H. Curry, formerly with Inspiration Consolidated Copper Co., Miami, Ariz., sailed from New York City on Oct. 22 for Cape Town, South Africa, on his way to the Belgian Congo, where he will be mill superintendent for L'Union Minière du Haut-Katanga.

Elmer H. Finch and Max W. Ball, geologists formerly with the U. S. Geological Survey and now of the Matador subsidiary of Royal Dutch-Shell Oil Co., recently accompanied president W. Van Der Gracht of Roxanna Oil Co. (Cal.) to the oil fields of Grand County, Utah.

H. A. C. Jenison, of the U. S. Geological Survey, was looking over the Engels, Walker and other mines on the Plumas copper belt of California recently. Mr. Jenison visited the Calaveras Copper, Penn Mining and the Mammoth mines before he returned to Washington, D. C.

Bert W. Dyer, of U. S. Mine Rescue Car No. 5, Butte, Mont., graduate of University of Utah, and Assistant Mine Safety Engineer of Bureau of Mines since 1918, has been appointed Mine Inspector for Alaska. He will have headquarters at Fairbanks on the Tanana, and will work in co-operation with the Alaska Mining Experiment Station.

G. F. Loughlin, geologist in charge of the division of mineral resources, U. S. Geological Survey, was in Butte, Mont., recently on his way to the Pacific coast, and visited the geological department of the Leonard mine. He will visit the Survey offices at Salt Lake City, Denver, and San Francisco, before returning to Washington, D. C.

E. W. Shaw, geologist and mining engineer, formerly with the U. S. Geological Survey, who has been doing geologic mapping with a number of other geologists in Bolivia, was in Charagua on Aug. 16, and expects to return to the United States in December. His address until Oct. 1 was care of Bolivian-Argentine Exploration Corporation, Bartolome Mitre 478, Buenos Aires.

SOCIETY MEETINGS ANNOUNCED

The New York section of The Mining and Metallurgical Society of America met at the Columbia University Club, New York City, on Oct. 27 to hear an address by Van. H. Manning, research director of the American Petroleum Institute, who spoke on "The Petroleum Industry."

The Nevada Chapter of American Association of Engineers, which recently completed its organization, will announce its program at a meeting to be held Nov. 9, at the rooms of the Chamber of Commerce, Reno, Nev. The officers of the chapter are H. M. Loy, president; H. F. Holly, vice-president; L. V. Campbell, secretary.

The meeting of the Columbia Section of A. I. M. E., to be held at Kellogg, Idaho, has been postponed from Oct. 29 and 30 to Nov. 19 and 20. This change has been made in the hope that it will thus become possible for the president, Herbert Hoover, to attend the meeting, as he plans to do. Besides an address by Mr. Hoover, the program will offer papers by Rush J. White and Thomas L. Owens, assistant manager of Federal Mining & Smelting Co. L. W. Armstrong, of Spokane, Wash., is secretary of the section, and Rush J. White is chairman of the local committee of arrangements.

OBITUARY

Gustave de la Marre, chief engineer of Cie. des Mines de Roche-la-Molière & Firminy, and graduate of St.-Etienne in 1894, died in his forty-ninth year on Sept. 30, after a brief illness. M. de la Marre had been with the Firminy mines ever since his graduation, and passed from the rank of mining engineer to chief by successive steps. He had long filled the duties of the last position before being formally installed therein.

G. D. E. Mortimer, mining engineer, and president and general manager of Bolivian Mines Co., Inc., Casilla No. 12, La Paz, Bolivia, died in that city on May 4, last. Mr. Mortimer was a native of Clifton, Ohio, and was educated at the Episcopal Academy of Philadelphia, Pa., and Lehigh University. He showed great ability as a mining engineer, notably as organizer and administrator, being greatly helped by his sunny and lovable disposition. Before going to La Paz Mr. Mortimer had had charge of the Inca Oro at Sorata, Bolivia. Yet earlier he had been in charge of mining properties in California, Arizona, Nevada and Kerr Lake mine, Cobalt, Ontario. Letters may be addressed to his company at 1202 West End Trust Building, Philadelphia, or in care of Rev. S. D. McConnell, Easton, Md.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

The Utah Consolidated—Utah-Apex Lawsuit

Court Decides in Favor of Utah-Apex Five Out of Six Cases Brought by Utah Consolidated Mining Co. To Stop Former From Mining Ore in Yampa Limestone — Plaintiff Failed To Prove Formation a Broad Lode

BY E. B. JENNINGS

[*The decision in the apex litigation between the Utah-Apex Mining Co. and the Utah Consolidated Mining Co., both operating in Bingham Canyon, Utah, was handed down by Judge Tillman H. Johnson, of the U. S. Circuit Court of Appeals, on Oct. 20 after the case had been under advisement by him since Jan. 31 last, when the arguments ended. Judge Johnson decided five of the six cases in favor of Utah-Apex in suits brought by Utah Consolidated to enjoin the Utah-Apex company from mining ore under Utah-Apex territory in the Yampa limestone. The court found against the Utah Consolidated because that company did not show by preponderance of evidence that the Yampa limestone was a broad lode. The decision in the Leadville case, brought by the Utah-Apex, holds that the barren Highland Boy limestone between the Highland Boy orebodies and the Leadville orebody breaks the continuity of the lode and that the Highland Boy limestone cannot be considered the lode.*

In the case brought by the Utah-Apex company holding that the Dana Leadville fissure is the apex by extralateral rights of orebodies being mined by the Highland Boy, the court held that the Utah-Apex did not prove by a preponderance of evidence that the Dana fissure above and the Leadville fissure below were one and the same fissure, and decided this case against the Utah-Apex.—EDITOR.]

THE lawsuits between the Utah Consolidated and Utah-Apex mining companies, which, after pending for nearly two years, finally came to trial in November, 1919, constituted one of the most important litigations in the West. The suits were tried before Judge Tillman H. Johnson, of the U. S. Circuit Court of Appeals, in Salt Lake City. By consent of the two companies the action of the Utah-Apex against the Utah Consolidated, which was known as the Leadville or Highland Boy case, was tried first. This occupied three weeks.

The second suit, known as the Yampa case, occupied a like time. In the Yampa case, the Utah Consolidated company asked for $3,000,000 for illegal extraction of ore from the Yampa limestone, which apexed on the Utah Consolidated property. In replying to this action the Utah-Apex Mining Co. filed suit for $1,750,000 for ore mined from the Dana or Leadville vein. Both suits developed into debates on the question of which was the lode, the flat-dipping limestone beds or the nearly vertical veins which cut them. In the Yampa case, the ore in question had been mined on the Petro vein, in or near its intersection with the Yampa limestone. In the Dana suit, the ore mined by the Utah Consolidated was in the Highland Boy limestone at its intersection with the Dana or Leadville vein. The Utah Consolidated company obtained surface rights from the Utah Metal & Tunnel Co. to gain a clear title to the apex rights of the Highland Boy limestone. There was some question as to the exact point of apexing of the Dana vein on the Charles A. Dana claim owned by the Utah-Apex, but this was cleared up by some surface work done by the Utah-Apex to prove this. This left the decision to be based entirely on the opinions of the expert geologists and engineers.

Work was started by both companies almost two years before the suits came to trial. Prominent attorneys and geologists from all over the country were retained by both companies. Among these were Judge Curtiss H. Lindley, of San Francisco; Judge John A. Marshall, of Salt Lake City; Dr. Waldemar Lindgren, Dr. A. C. Lawson, Albert Burch, and O. P. Peterson, who were retained by the Utah-Apex. The Utah Consolidated engaged John Grey, of Spokane, and A. C. Ellis, of Salt Lake City, as attorneys. Horace V. Winchell, former president of the A.I.M.E.; Dr. J. F. Kemp, Dr. C. K. Leith, Reno H. Sales, A. N. Winchell, Perry G. Harrison, and R. N. Hunt represented the geologic staff of the Utah Consolidated.

The models used in court by the Utah Consolidated were made by F. C. Calloway, and consisted of a wire reproduction in miniature of the surface and underground workings of both mines and a block model of the limestone beds of the Utah Consolidated and Utah-Apex properties. The maps used by the Utah Consolidated were constructed by the company's engineering staff. The Utah-Apex exhibits were nearly duplicates of those shown by the Utah Consolidated, the models having been made by E. C. Uren, of Nevada City, Cal., and the maps made under the direction of Frank Anderson, a mining engineer of Salt Lake City, and S. G. Emidio, of the Utah-Apex. The cost of all the exhibits was about $100,000.

DANA CASE OPENED

The testimony in the Leadville case was opened by Utah Consolidated, the defendant. R. N. Hunt explained in detail the conditions existing in and near the Leadville vein and the Highland Boy limestone, as shown by the geologic maps. Mr. Hunt did not attempt to elucidate the theory of the mineralization, but confined his testimony to actual conditions that he had observed. The direct and cross examination of Mr. Hunt occupied about three days.

A. N. Winchell described the rocks and ores of the district, of which he had made an exhaustive petrographic study. Mr. Winchell explained in detail the methods used in making a microscopic examination of rocks. He stated that he had found that the ore was to a large extent in the limestone formations and rarely in the interlying quartzites. Mr. Winchell had made a study of nearly eight hundred specimens taken from the formations of the district.

Prof. C. K. Leith described the deposition of ore in the limestone beddings. The presence of ore was due, he said, to several factors, namely, the proximity of the porphyry and the consequent alteration of the limestone, the porphyry dikes in the limestone, and the bending and thickening of the limestone lodes. The fact that a great part of the ore is along and parallel to the bedding showed that this bedding was the distinctive feature of the occurrence of the ore on the Utah Consolidated property. Mr. Leith stated that the fissures and beddings were closely related but that the porphyry intrusions were the mineralizing factors.

1. SURFACE PLANT OF UTAH-APEX MINING CO. AT BINGHAM CANYON, UTAH. 2. UTAH CONSOLIDATED MINING CO.'S SURFACE OUTCROPS OF DANA FISSURE. 5-6. A LINE DRAWN BETWEEN THESE POINTS WILL REPRESENT THE COURSE

Dr. J. F. Kemp discussed the possibility of correlating the Jordan and Commercial limes, which are the principal mineralized portions of the U. S. mine, with the Yampa and Highland Boy lime beds of the Utah Consolidated on the opposite side of the Utah Copper porphyry mass. He showed that this correlation was possible.

Horace V. Winchell explained that the mineralization of the lime beds was due to the solutions from the cooling porphyry masses, but that it was impossible to tell by what definite fissure or crack these solutions came up to the overlying lime beds. In defining a lode, Mr. Winchell said: "A lode or vein is mineralized rock or rocks which contain such indications of valuable minerals as to justify development with the expectation of finding ore. As soon as quartzite over a considerable distance becomes mineralized, then it becomes a lode. Just as soon as either the other rocks can produce and do produce ore, or contain indications which lead the experienced miner or prospector of judgment to develop it in the expectation of finding ore, then it becomes a lode." The Highland Boy and overlying limestones were so mineralized, and were claimed to be lodes.

Reno H. Sales, geologist of the Anaconda Copper Mining Co., defined the conditions in the stopes of the Highland Boy lime and in and near the Leadville fissure. He described the fissures passing through the stopes in the limestone but did not directly connect these fissures with the mineralization of the Highland Boy limestone. Mr. Sales completed the testimony for the Utah Consolidated in this case.

The first witness for the Utah-Apex, Frank Anderson, told of sampling the limestone and adjoining quartzite, the results of the sampling showing that in the places sampled the quartzite disclosed more mineralization than the limestone. In cross examination, Mr. Anderson stated that he had never heard of a broad limestone bed being sampled to prove it a lode.

J. A. Norden, assistant superintendent of the Utah-Apex company, described the upper levels of the Apex mine along the Parnell bedding and the Dana fissure. He stated that the greater part of the ore in these workings had been taken from the quartzite. These workings are several hundred feet above the ore in question in the Highland Boy limestone.

Colonel Ellsworth Dagget, of Salt Lake City, formerly mining engineer at the old Winnamuck mine, recalled that his experience in the early days in Bingham had been that the ore to a large extent was found in the fault fissures. He showed several specimens of ore taken from the mines in Bingham from the fault fissures.

Orrin P. Peterson, geologist for the Utah-Apex company, described the Dana fissure in the upper levels of the Apex mine. He said that the mineralizing solutions from the Dana fissure had gone out for several hundred feet into the limestones and quartzite, but, because the quartzites were more crushed than the limestones, the former were more susceptible to the solutions.

Albert Burch, of Berkeley, Cal., told of making an extensive examination of both mines. In making this examination he found that the country rock consisted of three types, namely limestone, quartzite, and porphyry. Within these three classes of country rock are two types of veins, the broad lode veins and the distinct fissure veins. In the Highland Boy lode the fissures are so close, Mr. Burch said, that it is impossible to distinguish between them. The tongues or dikes of porphyry running off into the country rock were very important in its mineralization and also in limiting the extent of the orebodies in the limestone. In regard to the Dana or Leadville vein, whose principal mineralization is lead ore, this lead ore could not have been deposited from the same vein as was the copper ore in the Highland Boy limestone, but was deposited through the Dana Leadville system of veins. This Dana Leadville vein passes up through the quartzites and limestones above.

FACE PLANT. 3. PLANT OF UTAH METAL & TUNNEL CO. 4. APPROXIMATE LOCATION OF CHARLES A. DANA CLAIM AND OF THE YAMPA LIMESTONE OUTCROP. 7. APPROXIMATE LOCATION OF HIGHLAND BOY LIMESTONE OUTCROP

Dr. A. C. Lawson, of the University of California, in his testimony described the several types of veins, lodes, and orebodies. A simple vein has two distinct and well-defined walls, whereas a lode may be made up of several veins close enough together to be mined at one operation. In correlating the Dana and Leadville fissures, Dr. Lawson showed the similarity of the two fissures, inasmuch as they had the same dip and strike, the same direction of movement, and the same type of mineralization. As there is no complete connection from the surface to the Highland Boy limestone on the Dana fissure, and as it is faulted by the base of the Yampa limestone, it is impossible to make a complete correlation. There was no doubt in Dr. Lawson's mind that the Leadville and the Dana were one and the same fissure.

Dr. Lindgren gave a long introductory talk on the geology of the Bingham district at the beginning of his testimony. He did not consider that the correlation of the Jordan and Commercial limes with the Yampa and Highland Boy had been conclusively proved. Dr. Lindgren limited the Highland Boy lode in the Highland Boy limestone by the foot wall and the Alice W. dike, a small porphyry dike extending along the strike of the bedding. Outside of these limits, the limestone was not mineralized until the Dana Leadville fissure was reached, this being several hundred feet to the west. He described the Dana Leadville vein and his reasons for considering it the same vein or system of veins from the surface to the 1,800 level of the Apex, which is the lowest level in either mine. He considered the Dana Leadville system to be of later origin than the Highland Boy lime, and thought that the two were in no way related. Dr. Lindgren's testimony ended the expert testimony of the first suit, and the Yampa case followed immediately.

Testimony in Yampa Case Heard

In the Yampa case it was necessary to introduce a new set of maps and models, which were explained in detail by Perry G. Harrison. In this suit it developed that the Utah-Apex had mined ore on the Petro fissure and the Yampa lime at their intersection. The Petro fissure was followed down from the surface through the Yampa lime and extends below this into the underlying quartzite. There are continuous stopes from above the 1,000-ft. level to the 1,500-ft. level along this fissure and in or near the Yampa lime. As the old Yampa mine, now a part of the Utah Consolidated, is to a great extent inaccessible, it was necessary to rely on old maps and information furnished by former employees of the Yampa Most of the ore taken from the Yampa mine and the Utah Consolidated's workings in the same bedding has been copper ore, whereas the ore mined on the Petro fissure in the lime has been lead ore.

Mr. Winchell's testimony for the Utah Consolidated consisted of his description of the Petro fissure from the upper levels to the lowest level of the Apex and its effect on the mineralization of the Yampa lime. In this case both companies used the same witnesses as before, and the testimony was practically the same, being a statement of geologic facts and theory of the mineralization.

A third suit was presented the last day of the trial by the Utah-Apex. This was the Dana extralateral case, which was to cover the extralateral rights of the Charles A. Dana claim. No testimony other than the presentation of a map showing the extralateral rights was given.

The Utah Consolidated is one of the oldest mines in the Bingham district, having been a producer for over twenty years. In size it is the second largest, furnishing employment to about 600 men. The company has extensive holdings in the district, including the old Yampa mine, which was recently purchased from the Tintic Mining & Development Co. Its workings are in a comparatively small area in the High-

land Boy and Yampa limestones. R. H. Channing, of New York, is president; Fred Cowans, general manager, and A. S. Winther, superintendent.

The Utah-Apex Mining Co. was erganized a short time after the Utah Consolidated, and ineludes the old Petro, York, and Phoenix mines. The workings of the Apex are in the lime beds and veins stratigraphically above and to the north of the Utah Consolidated, and the lower and recent workings go below the haulage level and follow the fissures from above into the Yampa limestone and intervening quartzites. Recent work which has been done connecting the two mines shows the proximity of the workings and difficulty of distinguishing between the property of each. R. E. Haffenreffer, Jr., of Boston, is president, and V. S. Rood is general manager. The Utah-Apex is the largest lead mine in the state, and employs about five hundred men.

Canada Copper's New Concentrator Placed in Operation

The new 2,000-ton concentrator of the Canada Copper Corporation at Allenby, B. C., was finally placed in operation on Oct. 18. The new primary crushing plant is said to be giving excellent service at full rated capacity. No other report of results has been received to date.

St. Louis Section of Institute Holds Autumn Meeting

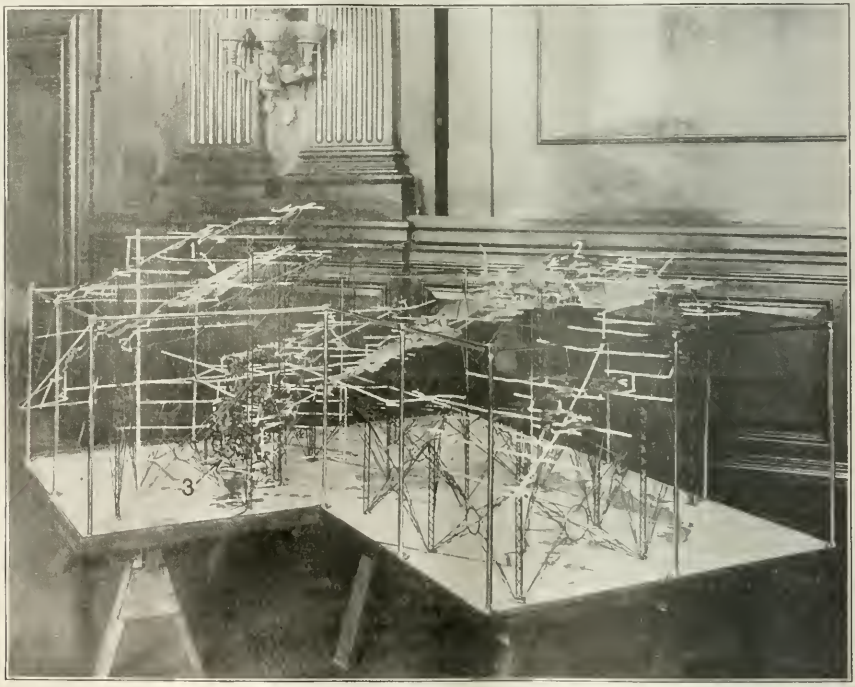
Visit Plants at Bonne Terre, Flat River and Fredericktown—Many Social Features

The St. Louis Section of the American Institute of Mining & Metallurgy held its Autumn meeting in the Lead Belt. The party left St. Louis on the evening of Oct. 15 and were entertained that evening at the Bonne Terre Club House with dancing and bridge whist. The morning of the following day was spent in visiting the mines and mills at Bonne Terre and Flat River of the St. Joe, Federal and National companies, with luncheon at Farmington. In the afternoon the entire party went by auto through the picturesque hills of the Ozarks, which were in their beautiful Autumn foliage, to Fredericktown, in Madison County, and inspected the mill and smelting works of the Missouri Cobalt Co., the only plant in Missouri that is producing copper, nickel, cobalt and some lead, the latter as a by-product, although the mine was originally worked for lead alone.

The local committee entertained the members in the evening with another dancing and bridge whist party, followed by refreshments.

The morning of the following day was spent at Iron Mountain, which is being reopened on a small scale, and a very enjoyable picnic luncheon was served on the "Elephant-Rocks," the huge granite boulders at the Graniteville quarries that have been formed by aerial erosion. One of these is a 20-ton rocking stone that some of the members tilted with ease. Beautiful, bright, warm weather favored the excursion until the conclusion of the trip to the granite boulders, when as the party was on the eve of breaking up to return home, a violent thunder storm arose that was reminiscent of April, rather than the late fall.

The energetic efforts of the local committee made the event a great success, which was enjoyed by over 200 members and guests, in which the local membership was well represented. Those chiefly responsible for the success of the meeting, in which the ladies participated as an innovation, were C. J. Adami, of the St. Joseph Lead Co.; H. G. Washburn, of the Federal Lead Co.; Messrs. Comyns & Thompson, of the National Lead Co., and T. J. Mateer, of the Missouri Cobalt Co.



WIRE MODEL (1 IN. = 50 FT.) EXHIBITED BY UTAH-APEX MINING CO. TO ILLUSTRATE PETRO-YAMPA CASE. MODEL MADE BY E. C. UREN, NEVADA CITY, CALIF.

But nine fatal accidents have occurred in Marquette County, Mich., during the last year, according to the report of the mine inspector, James H. Yelland. The fatality rate is 1.88 per 1,000 men employed. During the year 4,799 men were employed on the average in the industry, including quarries. This is the lowest fatality record made in the county.

Claim Increased Freight Rates on Bullion Absorbs Profit

Colorado Operators and Traffic Managers Seek Remedy for Interstate Shippers

During the recent investigations in Colorado into the matter of increased freight rates it developed that the increase on bullion shipped from western smelting points to refining plants on the Atlantic seaboard, places a heavy burden upon the mining industry. While mine operators do not directly pay this freight, the cost of moving the bullion is passed back to them by the smelters in increased charges and deductions. Operators claim that the increase, when apportioned back to each ton of ore produced, often absorbs the profit in mining it.

On Oct. 16, the Colorado Metal Mining Association filed with the Western Trunk Line Committee, an application for a hearing looking to a readjustment of bullion rates in effect between smelting points in Colorado and seaboard refining points. Mining organizations in the various western states were invited to join with the Colorado organization in asking for the hearing, since any readjustment of rates must necessarily include an entire revision of the bullion rates from all western smelting points.

The Colorado organization in support of their petition stated:

"Owing to the increased cost of operation, producers of lead and copper ores, except in the most favorable locations and conditions, have found it no longer profitable to mine them and the output has declined to an alarming degree. Conditions in Colorado are now such that unless relief is granted, the few remaining mines which make an appreciable production of these ores, must cease shipping.

"The following table shows the decline in production since the increased rates became effective early in 1918:

PRODUCTION IN POUNDS FROM COLORADO MINES

	1917	1918	1919
Lead	69,990,012	65,960,760	35,859,675
Copper	8,122,004	6,122,004	3,310,090

"It now seems probable that the 1920 output will show an even greater decline.

"The falling off in production was due to the increased cost of operation in which transportation charges are a large factor both directly and indirectly. Transportation charges are said to affect the producer not only directly in the movement of ore and bullion, but in still greater measure are reflected back in increased treatment charges, deductions and cost of supplies.

"Prior to the order of the Railroad Administration of May 25, 1918, the bullion rate from Colorado common points to the Atlantic seaboard was $7.60 per ton. Under Order No. 28 the rate, instead of taking a 25 per cent increase, as in the case of other commodities, was arbitrarily advanced $6.50 per ton. With the 33⅓ per cent increase recently ordered, the rate is now, including war tax $19.34 per ton, or an increase of 153 per cent over the pre-war rate.

"The first increase, figured on each ton of ore as mined, in many instances entirely absorbed the profit, and a large proportion of the mines were forced to close down. The last increase will still further curtail shipments, and instead of increasing the revenues of the carriers will result in just the opposite effect. The decline of the mining industry in Colorado has greatly reduced the revenues of railroads serving the mining districts and the distressing conditions are rapidly leading to the almost complete depopulation of communities which depend upon the mines."

WEEKLY RÉSUMÉ

The long awaited decision in the lawsuit between the Utah Apex and the Utah Consolidated mining companies was rendered on Oct. 29 in favor of Utah Apex. Advices from Wallace, Ida., state that the pending apex litigation between the Federal Mining & Smelting Co. and the Hecla Mining Co. has apparently been settled out of court. In British Columbia, the Canada Copper Corporation finally started its new concentrator at Allenby on Oct. 18. Mine operators of the Cobalt district, Ontario have adopted a flat wage scale in place of the bonus plan recently in effect. At Bisbee, Ariz., the Phelps Dodge Corporation has laid off part of the force engaged on the Sacramento Hill excavation work owing to the delay experienced in building the new concentrator. In the Grass Valley district, California, the power restrictions hampering the operations of the gold mining companies have been removed.

In Washington, the gold committee of the American Bankers' Association reported unfavorably on the McFadden gold bonus bill at the convention of the Association held during the week. O. C. Ralston, of the Bureau of Mines, who has recently returned from Alaska, states that the erection of a smelter there is not advisable.

Federal and Hecla Apparently Settle Apex Dispute

Both Companies Stop Work Intended To Demonstrate Possession of Apex

After a year of intensive preparation for a battle in the courts over apex rights involving the ownership of the bonanza orebody in what is commonly termed the "east" vein of the Hecla mine, the Federal Mining & Smelting Co. and the Hecla Mining Co. have apparently settled their differences out of court. So far as the public is concerned, there had been no intimation that a settlement was pending, and the orders issued by both companies on the same day to discontinue all work that was under way in preparation for the litigation came as a complete surprise. James F. McCarthy, manager of the Hecla, was in New York the day the order was issued, and Frederick Burbidge, manager of the Federal, was in Spokane.

Northwest Convention Date Set

The Northwest Mining Convention will be held in Spokane, Wash., February 28 to March 5, next year, according to a preliminary announcement.

Phelps-Dodge Corp. Cuts Down Sacramento Hill Force

Slow Delivery of Mill Construction Material Delays Completion—Market Conditions Also a Reason

The Copper Queen Branch of the Phelps Dodge Corporation announced on Oct. 16 that a number of men would be laid off from the Sacramento Hill steam shovel work on Nov. 1. The reason given is that owing to delay in receiving materials needed for mill construction the starting of the new concentrator will be delayed approximately six months or until July 1, 1920, so that the company can now lay off one-half of the Sacramento Hill force and be ready for ore production by the time the mill is completed. Present market conditions are also given as a further reason. About 350 men are effected.

Work of removing Sacramento Hill, in Bisbee, Ariz., was begun in April, 1917, with steam shovels, the object being to recover approximately 25,000,000 tons of low-grade copper ore that lay under the flank of the hill. This tonnage includes smelting, concentrating and leaching ore. The peak of the mountain was originally about 300 ft. above the gulch on the upper side. When the work is finished, in place of the hill, there will be two pits, roughly circular in outline, one about 1,500 ft. in diameter and 420 ft. deep and the other about 2,200 by 1,500 by 440 ft. deep. The total amount of material to be moved was about 40,000,000 solid cu.yd. in place, of which by volume slightly less than one-third was ore. It will require in all about sixteen years to complete the work.

To date, about 5,500,000 cu.yd. of material has been moved, which was nearly all waste, and has been hauled away and dumped about two miles from the pit. A concentrator is being built to handle 4,000 tons of ore per day and ore production will begin in 1921.

The hill is being worked off in horizontal benches 60, 45 or 30 ft. in height. About sixteen miles of railroad track were required to connect these benches with the waste dumps and the concentrator. The ground is drilled with churn drills and heavy compressed air drills, and blasted with dynamite to break it up and facilitate loading by the shovels. Seven steam shovels are used on the work, all standard machines, weighing about 110 tons, and having 3½-yd. dippers.

Cobalt Operators Drop Bonus for Flat Wage Scale

At a recent meeting of the Cobalt Mine Managers' Association it was decided to drop the bonus plan of wages, under which a bonus was paid depending on the price of silver, and adopt a flat scale. The wages will be unchanged, $5.25 for miners and others in proportion. Following the drop in the price of silver, wages were retained at the same level as when silver sold for $1.20 per ounce, and it was felt better to drop the bonus altogether and go on the flat wage basis.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Smelter Unnecessary in Alaska, Says O. C. Ralston

Tonnage Insufficient To Warrant Erection of Plant—Granby Accessible to Southeast Mines

Concentration or hydrometallurgy seems to be the logical recourse in handling the copper ores in Alaska, rather than attempting to smelt these ores within the territory. This is the opinion expressed by Oliver C. Ralston, of the Bureau of Mines, who with Alfred H. Brooks, of the Geological Survey, at the direction of the Secretary of the Interior, collaborated in an investigation of the metallurgical needs of the Alaskan copper ores. "In general, it is hard to see any justification for a smelter," said Mr. Ralston, "to be built by anyone in either the Prince William Sound or southeastern Alaskan districts. The impression seems to have prevailed that a copper smelter was needed in the Territory. Such demand arose for an investigation that a report on the subject was called for."

Mr. Ralston's report will discuss the various types of ore and the methods which seem to him to be best adapted for their treatment. There are several thousand copper prospects in Alaska which are not being worked. There is not enough tonnage available from the so-called independent operations to justify the erection of a smelter. Even if the output of the principal producers were added, the tonnage even then might not be sufficient to justify a smelter of sufficient size to be really economical.

Since the smelter of the Granby Consolidated Mining, Smelting & Power Co. at Anyox, B. C., is fairly accessible to the copper mines in southeastern Alaska, there apparently is no thought of an additional smelter in that region.

Mr. Ralston did not visit Broad Pass. While there are a number of very promising copper prospects in that region, no large amount of shipments can be expected for some time to come.

Cottrell May Continue as Head of Bureau of Mines

The latest development in the discussion of the Bureau of Mines' directorship is the suggestion that in view of the wide differences of opinion as to the type of man who should hold this position, Dr. F. G. Cottrell may withhold his proposed resignation and continue at the head of the bureau for an indefinite period.

At the close of business on Oct. 23, the total purchases of silver which have been made by the Bureau of the Mint under the Pittman Act was 20,091,231 fine ounces.

McFadden Gold Bill Reported On Unfavorably by Committee of American Bankers' Association

Measure Defended by Sponsor on Floor of Recent Convention in Washington—Report Referred to Economic Policy Commission for Further Study

A report unfavorable to the McFadden gold bill was made by the committee on gold of the American Bankers' Association at the convention of that organization in Washington last week. The report was signed by the three members of the committee; namely, George M. Reynolds, president of the Continental and Commercial National Bank, Chicago; A. Barton Hepburn, chairman of the board of the Chase National Bank, New York; and Lawrence E. Sands, president of the First National Bank of Pittsburgh. The report, however, was not adopted by the Association as a whole but was referred to the economic policy commission of the Association for further study. Waldo Newcomer, president of the National Exchange Bank of Baltimore, was chairman of that committee.

Representative McFadden, of Pennsylvania, the chairman of the Banking and Currency Committee of the House of Representatives, not only defended his bill on the floor of the convention to which he was a delegate, but made a detailed reply to the arguments of the committee on gold. Extracts from the report made by the committee on gold follow:

"A large body of other industries, whose costs have risen faster than their prices, have similarly suffered.

"Recognizing that no national emergency exists calling for special treatment of the gold mining industry, it is difficult to make a case for singling out the gold mining industry for special relief from the Government. That it has suffered is unfortunate, but it is one of the costs of the war. It is one among a large class of those which the war has injured.

"Gold mining, however, though suffering under present conditions, enjoys a peculiar advantage which few other industries enjoy. As a consequence of the fact that gold is the standard of value the price of gold in terms of gold money is necessarily fixed. The demand for gold, however, is always unlimited. The gold miner can always sell at a fixed price as much gold as he can possibly produce. He finds his costs rising in periods of boom and prosperity, and he suffers as a consequence. On the other hand, periods of adversity, depression and falling prices bring to the gold miner, as to no one else, increased profits. He has an unlimited market in the worst depression, and the more severe the depression the lower his costs of production tend to be. He is at present suffering in an intensified form from the upswing of prices and costs. He has in the past, however, enjoyed periods of prosperity when the rest of the community was suffering, and in the natural course of things he may look forward to the recurrence of similar situations.

"In reality the propaganda in favor of doing something for gold is exactly on a par with the propaganda in favor of doing something for silver, about which we heard so much a generation ago. It has no more stable foundation than did the silver propaganda. There is nothing to justify Government interference in behalf of this industry, or to justify a Government bounty upon the production of virgin gold. Per contra there is very much to be said against such action on the part of the Government.

ARGUMENTS AGAINST BONUS

"We may pass briefly over the difficulties of administration of such an act; the danger that frauds would be practiced upon the Government; the difficulty of distinguishing virgin from old gold melted down. Gold which differs from other gold merely in having a special history. . . . The temptation to manufacture history instead of mining gold would be very great.

"Again, the provisions in the McFadden Bill introducing the index number of commodity prices as a basis for fixing the rate of taxes on gold manufacture and of premium on gold mining constitute an opening wedge for the general introduction of the index number as a standard of value in the United States.

"The greatest objection of all, however, lies in the danger in which this measure would involve the gold standard itself. Nearly all of the European states are on a paper basis. Only a few of the smaller countries of Europe are even approximately maintaining the gold standard. The United States, par excellence, and Japan, as well, stand out conspicuously as nations maintaining the gold standard. All the world believes that our dollars are as good as gold. All the other nations of the world are struggling and hoping to get back to the gold standard. We enjoy a proud preëminence in this respect, and it should be zealously guarded and maintained.

"Offering to pay a premium for the production of gold in this country, in-

stead of strengthening our position would weaken it. . . . Great Britain, with far greater difficulties than we are facing, has resolutely refused to do anything of the sort in reply to the petition of her South African gold miners. . . . Action of the kind proposed by the United States would be a red flag to the commercial world. The passage of the McFadden Bill, instead of strengthening confidence in the position of the United States would weaken it. . . . Increased gold production in a period of low prices and low costs makes it easier for prices to rise again, while diminished gold production in periods of high prices and high costs tends to reduce prices and costs again."

In answering the arguments advanced in the committee report Representative McFadden said:

"Since the consumers of gold in the industrial arts and trades are receiving their metal at the pre-war price no reason can be assigned why they should not pay an increased cost alike with all other industries which have been forced to pay the increased cost for their raw materials.

"As compared to 1914 the purchasing power of the dollar in terms of all commodities in 1919 was 47 cents. The gold producers' ounce in 1914 had a purchasing power of $20.67, whereas during 1919 the same ounce could purchase in terms of all commodities but $9.70. Since the price of gold has been arbitrarily fixed by statute at $20.67 an ounce the gold producer is in the same position as a person who received the same income in 1919 as in 1914 and finds that a $2,000 income has shrunken in purchasing power to $970. This is the principal reason for the decline in the gold production from $101,000,000 in 1915 to less than $60,000,000 this year. Were it not for the fact that the Government has arbitarily fixed the price of gold, in which event the law of supply and demand does not operate, it would not be necessary to consider compensating the gold producer for a part of the decline in the purchasing power of the dollar which has taken place the last four years. The premium to be paid to the gold producer, based upon the new ounce of production, cannot be construed as a bonus or subsidy for the above reason. Most of the wage increases that have been allowed by various industries and the increases in transportation rates, car fares, and for municipal gas and electric services throughout the country have been based upon the increase in commodity prices or the decline in the purchasing power of the dollar. The products of all other industries except that of the gold mining industry have been automatically increased in price during this period, so that the cost of production is fully covered, together with a profit, by which alone future production of such commodities may be assured. . . .

"Particularly in view of the fact that Congress has fixed the price of gold, it seems that Congress has now the power to stimulate the production of gold by creating the machinery whereby the consumer of gold in the industrial arts may pay more nearly the cost of production for his raw material, thereby enabling the producer of new gold to increase his output to meet the industrial requirements of the arts and trades, and protect the monetary gold reserve from further industrial depletion. The Government should legislate to stimulate the domestic gold supply and thus relieve the strain and send into the currents of industry the invigoration of this new gold. . . .

"The Committee's objection to the bill, based upon the possibility of fraud arising from the difficulty of distinguishing between virgin and old gold, is more serious in theory than it will prove in practice. With the co-operation of the Bureau of the Mint, the Bureau of Mines, and the Geological Survey, all of which organizations have field representatives in the gold mining districts, any successful fraud on the Government could only be on a very small and negligible scale. The affividavit of production specified in the bill and the penalty provided insures the Government protection against fraud.

"The British gold producer has been aided by the exchange premium. This bill offers a domestic solution for our own gold problem."

NEWS BY MINING DISTRICTS

Special London Letter

How Shall Government Dispose of Broken Hill Concentrates, If Strike Ends?—Esperanza Disappoints

BY W. A. DOMAN

London, Oct. 12—Now that there is a probability of a resumption of mining operations at Broken Hill a question of importance in connection with zinc concentrates arises. Before the war the output of lead and zinc concentrates of the bulk of the Barrier mines was controlled by what was termed the German metal octopus, concerning which much was heard on your side during the war. To provide itself with spelter the British Government was compelled to make ruinous contracts with American firms. Mr. Hughes, the Premier of the Australian Commonwealth, decided to cut the German connection absolutely, and even abrogated contracts. For a long time he endeavored to induce the British Government to support him in his action and met with little success. After considerable correspondence, however, the Australian producers made an arrangement with the Imperial authorities by which the latter determined to thwart any renewal of the Zinc Convention, and to prevent the Germans from again depriving this country of essential metals. A contract was entered into to purchase a moderate supply of zinc concentrates at a high price. Later this was thought to be unworkable, and by a modified agreement the government contracted to purchase a much larger quantity, 300,000 tons per year, at a lower price for ten years after the war. The price has never been divulged and considerable speculation has existed as to what it may be. For the first five years it is to be a flat rate, and for the second period it will be determined by market conditions, with the previous flat rate as a minimum. As the Broken Hill mines have not produced for about seventeen months in consequence of the miners' strike, the Government has not bought any considerable quantity of concentrates. The object of the arrangement was to encourage the smelting of concentrates in this country, and financial assistance was given by the government to at least one important undertaking at Swansea Vale. For various reasons, partly technical and partly labor, no real industry has been established, and the Swansea Vale works have come to a standstill. In fact it is credibly reported that only one smelting works is now in operation, as the costs are on such a scale as to preclude profitable results being obtained. This is a great blow to certain metal interests in the country who had expected to employ large amounts of capital remuneratively. But quite apart from supplying concentrates to smelters here at reasonable rates the British Government has undertaken to guarantee a certain quantity to French and Belgian smelters, which before the war were largely dependent upon German goodwill, even if they were not in fact dominated by the metal ring. The question now is, how will the British Government dispose of the large tonnage of concentrates which it has contracted to purchase.

Esperanza shares after their skyrocketting as a result of the phenomenal gold and silver values in the Descubridora vein at the No. 5 level have received a nasty shock. This rich vein, though no sensible person could have expected it to persist with such high metallic content, has temporarily cut out and the price has tumbled about 20s. per share from the highest touched. As a borehole has proved the existence of the reef about 150 ft. from

the present face there is still the probability of good, profitable values being found again. Shares of neighboring mines, especially the Mexico Mines of El Oro, through which the Descubridora vein is expected to pass, also experienced the effect of the disappointment though the manager of the Mexico Mines announces some very high gold and silver values. But "Hope springs eternal," and in the Asquithian phrase holders of Mexican shares are prepared to "wait and see."

Twelve months ago the Falcon Mines of Rhodesia had a large stock of copper on hand, and also had borrowed something like £144,000 to finance it. Now a rumor is in circulation that the unsold metal has been disposed of and that the indebtedness has been repaid.

Special Australian Letter

Gold Producers' Association Distributes Premium — Broken Hill Prop. Outlines Plans in Report

From Our Special Correspondent

Melbourne, Sept. 20 — Broken Hill South Ltd., New South Wales, received £127,733 during the year ended June 30 from realization on the products of former periods, all active operations being in abeyance throughout the year on account of the strike. Sundry revenue items, such as dividend and interest, yielded a further £36,578. Maintenance and cessation expenses totalled £98,645, and after meeting administration and taxation costs, and allowing £19,637 for depreciation, a net profit of £13,599 remained. The surplus of liquid assets, as on June 30, was £488,907, as against £617,149 at the commencement of the term. Ore reserves were estimated at 3,500,000 tons.

The Gold Producers' Association, Ltd., which attends to the marketing of gold for Australian producers, paid premiums totaling £1,365,506 to its shareholders, up to June 30, 1920. The latest distribution, which covered the balance of premiums earned in the first half of 1920, amounted to £300,857, and was divided among the several states as follows: Western Australia $220,860; Victoria, £45,668; Queensland, £21,913; New South Wales, £7,474; Tasmania, £3.258; South Australia, £1,159; Papua, £523.

Owing to strikes and consequent shortage of coal, the Wallaroo & Moonta company's mines and smelting works were closed down for five out of the twelve months ended June 30, 1919. From Wallaroo mines 64 336 tons of material was mined, the yield therefrom being equal to 2,044 tons refined copper. From Moonta mines the tonnage mined was 8,340 tons, assaying 2.51 per cent copper. The cementation plant at Moonta produced 650 tons of precipitate, containing 71.8 per cent copper. Experiments have proved that Moonta ore can be successfully concentrated by mixing it with Wallaroo vein matter. The smelters treated during the year 21,203 tons of Wallaroo ore, 1,410 tons from Moonta, 684 tons purchased, and 434 tons of precipitate from the cementation works. The total product was 2,302 tons refined copper, and 301 oz. gold. The acid plant was in commission twenty-four weeks, and produced 2,430 tons sulphuric acid. An important change is being made at the smelters, in the erection of a large reverberatory furnace with a hearth area of about 2,000 sq.ft. Pulverized coal will be used for firing, and a pulverizing plant is to be installed, the first consignment of machinery for this having arrived from America. The year's work resulted in a loss of £38,914. Liquid assets at June 30 exceeded liabilities by £267,200.

Extensions of plant at the Newcastle iron and steel works, which it will take two years to complete, and the establishment of new industries are outlined in the annual report of the Broken Hill Proprietary Co., Ltd. One statement of especial importance is that, with the large number of coke ovens in operation, distilling about 270,000 tons of coal a year, it is desirable to save all the byproducts, and a fully qualified man has been engaged to take charge of the coke oven department and erect a by-product plant.

CANADA

British Columbia

Dolly Varden Planning for Winter Work

Stewart—The Algunican Development Co. has decided that further development of the George Group situated on the south side of Bear River shall be postponed to next season.

Good progress has been made in opening up the property of the Indian Mines, Ltd., situated on the west side of Cascade Creek, between the Salmon River glacier and Cascade Creek. Development consists of three open cuts on the outcrops and two tunnels.

Alice Arm—For several weeks there have been about 200 men employed at the Dolly Varden mine. During the summer large shipments of ore have been made, development and construction work also being carried on. It is understood that about 65 men will be kept on the payroll for development during the closed season.

Nelson—Spokane capital, which became interested in the Revenue group, on the South Fork of Kaslo Creek, early in the summer, has carried on extensive surface development with a view to putting the property in shape to be worked underground during the winter. Accommodations for over twenty men have been provided, and if the heavy snowfall does not come too early, and interfere with the getting in of supplies during the late fall, work along the lines originally planned will likely be carried out.

The Cork-Province Mines, Ltd., owning extensive mineral holdings and a mill and camps on the South Fork of Kaslo Creek, has leased the camps and the saw mill to the Howland & Waltz logging syndicate, of Minneapolis. The syndicate will use the camps during a part of the winter, but the lease contains a proviso to the effect that the mining company may resume occupancy upon a month's notice.

Indications are that tonnage handled at Consolidated M. & S. smelter at Trail for 1920 will be well in excess of that handled during 1919. By the middle of October the tonnage for 1920 had already surpassed that of 1919, being 267,768 tons. The tonnage of the Sullivan mine in 1919 was considerably smaller because of labor troubles and strikes. Of the 1920 tonnage, about 155,000 tons came from mines operated by the Consolidated M. & S. Co.

The Keystone Development Co., in which Winnipeg capital is chiefly interested, has maintained development of the Charleston group, near Whitewater, during the past summer and fall with encouraging results, according to reports, particularly as to work on the Keystone claim. The property carries values in silver-lead, and is located on veins paralleling the Whitewater lode, which has been one of the best producing areas of the Slocan.

Ontario

Engineer Reports on Associated Goldfields as Result of Criticism

Gowganda—At the Castle property of the Trethewey mine, the Office vein has been crosscut on the 75-ft. level and shows several inches of high-grade ore.

Cobalt—The Coniagas has stopped the re-treatment of old slimes until next summer. Some minor mechanical troubles developed, and this, coupled with the low price of silver, has caused the management to anticipate suspension of the season's operations by a few weeks.

During September eleven Cobalt companies shipped 1,607 tons of ore and concentrates, of which 93 per cent went to Canadian smelters and 7 per cent to American smelters.

Kirkland Lake—The Kirkland Lake Gold is treating 125 tons a day and expects to bring the mill capacity up to 175 tons. Drifting has been started on the 900-ft. level, the deepest in the camp. Labor shortage is impeding development, as is also the case with the Teck-Hughes, where sufficient men cannot be obtained to put on an extra shift.

The Wright-Hargraves mill is waiting delivery of thirteen motors which will delay the starting of the mill until after Jan. 1. The main vein has been developed for a length of 400 ft. and a width of over 20 ft., on the 400-ft. level. The north vein is 6 ft. wide, and carries good values.

The scarcity of labor and the high cost of materials has caused the Ontario Kirkland to delay work on its mill. It was planned to build the foundation this fall, but this has also been postponed.

The Hunton has decided to increase its capital from $1,500,000 to $2,500,000 in order to have sufficient treasury stock to finance development. The main shaft is to be sunk to 400 ft.

It is officially announced that the Kirkland Lake Proprietary (1919, Ltd.) has completed the taking over of the assets of the English Tough Oakes Gold Mines, the old Kirkland Lake Pro-

prietary Co., the English Aladdin Cobalt, and the Sudbury Syndicate. A notice sent out to the stockholders of the Ontario Tough Oakes states that arrangements are now under way for the acquisition by the new company of the assets of the Ontario Tough Oakes, the Burnside and the Syndicate Gold Mines.

A recent report on the Associated Gold Fields of Larder Lake again brings this company into the limelight. The report was the result of action taken by several of the large shareholders who were not satisfied with the statements made by the management. The control of the company is in the hands of Dr. McKay, a dentist, whose knowledge of gold, prior to his connection with this company, appears to have been limited. At the annual meeting, held some time ago, he stated that the ore ran over $11 a ton, and that the company had reserves aggregating $159,000,000.

The complete text of the report has not been published. Apparently it accepts the assay results of the company's engineers, and the conclusions are almost entirely based on the results of diamond drilling. It is said that experience has shown that in the gold district of Northern Ontario, diamond drilling is not a safe guide for the estimation of values and that numerous instances could be quoted in support of this, but results at the Dome may be considered as typical. This may be said to be the first engineer's report to have been made on this property, which has succeeded in obtaining so much of the public's money and which has aroused such a storm of criticism.

MEXICO

Boston Syndicate Buys Iron Property in Durango—Explosives Embargo Removed

City of Mexico—The Secretary of finance in a recent interview expressed considerable indignation because a number of banks in the City of Mexico have refused to receive on deposit the new silver coins in quantities beyond twenty pesos, alleging that the coins are under weight and not legal tender. They claim also that the Government has been working overtime in the mint because the exchange of the new silver peso and half dollar for gold coin is "good business." Secretary Alvarado denies that the government is making an excessive issue of silver and says that there is still a great scarcity of change in the interior.

Advices from Durango City state that the large iron property near there, locally known as Cerro del Mercado, has been sold to a Boston syndicate. The Cerro del Mercado, which is almost within the city limits, is a remarkable single deposit. It is 3,600 ft. long and 1,100 ft. wide, covering ninety acres. The hill is 640 ft. high and is estimated to contain above the base 200,000,000 tons of ore of unusual purity, free from sulphur and phosphorus and running about 63 per cent iron. An option was secured by Japanese capitalists some time ago, but owing to international objections, it was cancelled.

The war department has withdrawn the restrictions regarding the importation of explosives into mining camps, which restrictions together with red tape formed one of the main drawbacks to active mining operations in many parts of the country under the late Carranza regime. General Calles, minister of war, during his recent trip through Chihuahua and Sonora made a careful investigation of complaints regarding these obstacles and upon his return issued an order permitting the free importation of explosives of all kinds. The fact that Mexico is absolutely at peace with herself is best proven by the withdrawal by the government of all the small garrisons which were formerly maintained not only in country villages, but in the principal mining camps, and the lifting of the embargo on explosives.

The fact that Mexico passed the United States, her nearest competitor in silver output in 1919, and resumed her position at the head of the silver producing countries of the world caused the Minister of Commerce and Industry to state that the silver production this year in Mexico would be over $200,000,000. The minister bases his statements on reports already in for more than half the year and the fact that more mining concerns will open in the next three months than were actually in operation during the past three stormy years. The recent drop of silver again has in nowise affected operations as it is generally assumed that the metal will strike a normal gait above 90c. and remain there.

The finance department is preparing to enforce the provisions of the last presidential decree which requires that all receipts for taxes paid on mining property must be in order by Nov. 1. The government apparently intends to be severe with those who have made no attempt to set themselves straight, either intentionally or from neglect. Companies that have not complied by Nov. 1 will be listed and a complete record turned over to the Department of Commerce and Industry with instructions to cancel the titles at once and to open the properties for redenouncement.

MICHIGAN

The Copper District

Osceola's September Output Drops—Michigan To Suspend—Isle Royale Purchases Tamarack Hoist

Houghton—The production of the old branch of the Osceola Consolidated Mining Co. decreased to 4,700 tons in September. This was owing to the fact that the branch operated but one shift.

The Victoria Copper Mining Co. is producing about 125,000 lb. of copper with 100 men, which is considerably less than half its normal quota. The management is now reaping the advantage of the Taylor hydraulic air compressor which it installed on the west branch of the Ontonagon River about fifteen years ago. This equipment furnishes all the motive power needed, even in the stamp mill. With coal around $10 per ton this surely is a distinct advantage.

The Michigan Copper Mining Co. have decided to suspend mining operations temporarily. This decision has been reached because of the high prices of supplies and decreased labor supply. The property is in good condition as regards equipment and copper content of the openings on the Butler lode, which is from 30 to 80 ft. wide. Even with the small labor force Michigan has been producing from 100,000 to 200,000 lb. of copper per month for the last six months.

The Mayflower-Old Colony is passing through some well mineralized ground in the south drift about 200 ft. from the shaft. The indications are that it has passed through the disturbed zone and is about to enter the more regular vein formation.

The auxiliary hoisting engine at the old Tamarack No. 3 shaft has been purchased by the Isle Royale Copper Co. and is being installed at its No. 5 shaft. This is a 32 x 72-in. duplex hoist with an 18-ft. drum built by the Nordberg Manufacturing Co., of Milwaukee.

Gogebic Range

Production Stops at Davis Mine—"G" Pabst Coal Handling Equipment Being Installed

Ironwood—The new change house at "A" shaft of the Norrie mine is now in use. It is similar to the one at "E" Aurora, single story, 40 x 138 ft., and of fireproof construction. The coal and ash handling equipment at "G" Pabst power house is being erected. The coal will be loaded by locomotive cranes fitted with grab buckets, which will dump into a large hopper car from which it will be loaded into small cars and hauled to the crushing plant, from which point it will be taken by conveyors to the feed hoppers over the stokers. The ashes will be drawn off into cars, run outside the building, and dumped into a skip, which will hoist them up and dump into a large bin over the railroad tracks. The coal dock has a capacity of 35,000 tons but has not yet been filled. Last week several fires have developed in the coal piles and are causing trouble; even at "A" Aurora where the piles are very small there have been fires.

The Davis mine has temporarily ceased to produce, the small amount of ore which was left on the upper levels having now been worked out, and development work on the bottom levels has not yet reached the ore which is expected to be encountered coming over from the Newport mine as the footwall carries it northward. The fire which occured in the Davis shaft 18 months ago delayed this development at least six months and brought on the present condition. The work on the pump house on the 26th level is progressing well. A mucking machine is being used to get out the rock.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Lucky O. K. Gives Up Option on Acme Mines

Hockerville, Okla.—The Lucky O. K. Mining Co., after a 30-day investigation, gave up its option on the mines of the Acme Mining Co., southeast of Picher. P. W. George, manager for the Lucky O. K., which is a subsidiary of the Federal Mining & Smelting Co., states, however, that the option was given up more because continued low zinc ore prices and falling lead ore prices do not encourage as much additional operational activity as the taking on of the Acme mines would mean for his company. However, the Lucky O. K. has recently taken an option on the Lucky Jenny and Choctaw Chief mines, which are located in Hockerville, a short distance south of the Farmington mine. The Farmington was taken over by the Lucky O. K. some months ago, and, after a thorough drilling campaign, was opened up and has been made a profitable property. Under its original management it had been considered a failure. The success of the Lucky O. K. management is due to deeper operations. The company has placed a drill right in the middle of the main street in the little town of Hockerville.

A short distance south of the Choctaw Chief mine the Hawkins Mining Co. continues developing its recently discovered lead mine. While slowly sinking its discovery shaft, the company is making an average of about five tons of lead per day, with only two men in the ground and a total force of six men. In the meantime it has been sinking a field shaft about 350 ft. to the north, but the manager is now considering the advisability of sinking still a third shaft in between these two and erecting a concentrator at this shaft. He has a mill at Sunnyside ready for moving. The first 100 tons of lead from his mine he sold at $115 per ton, and the next 100 at $100. He declines to sell at the new low prices and will hold for a time at least.

The Right Good Mining Co. is erecting a concentrator on a 40-acre lease of the Kropp land, about one-half a mile south of Hockerville. Drill prospecting is being carried on while the mill is being erected, but there is a shaft into ore at a depth of only 154 ft. W. T. Dunlop, Clay Center, Kan., is manager of the company, which was unsuccessful in developing a good mine in the Lincolnville camp.

Tar River, Okla.—Auburn Mining Co. has purchased the Cliff mill at Joplin, and is moving it to a 40-acre lease southwest of Tar River, where the mine already has been well developed by Douthat Mining Co. The latter company got in litigation and the property was recently sold by order of the court, the Auburn Co. getting it on a bid of $40,000. The principals of this company include several of those formerly interested in Douthat. Abel Green, formerly manager of the Adams-Hicks, is manager.

Miami, Okla.—Al Standefer has been appointed receiver of the Pottorff-Smith mine, three miles south of Baxter Springs. H. Logan had claimed a one-half undivided interest in the property and protested the appointment of a receiver, and asked for a court order directing partition of the property. This was denied.

Blue Mound, Kan.—The Blue Mound Mining Co. has recently opened up promising lead ground on a lease a quarter of a mile east of its mill and at the foot of the blue mound which marks this entire section. The ore is found almost in solid soapstone, the dirt as it comes from the shaft containing scarcely any grit. For this reason the company is considering the installation of some kind of log washer equipment such as is used in the Batesville, Ark., manganese field for ore cleaning. If this is done it will be an innovation for zinc mining. The Blue Mound Co. has temporarily abandoned development at the shaft it equipped last winter and which is still east of the lead strike, but plans to reopen it when the price of ore becomes more satisfactory.

The Euterpe Mining Co., located in Kansas, northeast of Hockerville, Okla., has started up its new mill and reports exceptionally good dirt. It has had difficulty in getting coal for operations, however.

The Empire Development Co. is temporarily down while it carries on some prospect development work on its lease, just to the northeast of the Euterpe.

Webb City, Mo.—A very fair strike of coal has been made by the Home Coal Co. on the Connor land, south of Carterville, in a district that for a long time was a rich zinc and lead field. The strike was made at a depth of only 17 ft. from the surface, where a vein 7 ft. thick has been proved up. Three skilled coal miners have been engaged to bring the coal to the surface, where it is commanding a price of $6, undelivered, or $7 delivered to Carterville and $7.25 delivered to Webb City. George J. Kusterer, formerly manager of the Onamena Zinc Co., is manager.

MISSOURI

Southeast Missouri Lead District

Lee Mine, Near Vineland, Being Opened —Beulah Closed Down for Winter— Shulte Under Option to Picher Lead

Anaconda—The Picher Lead Co. is developing its recently acquired Fisher mine near Anaconda, in Franklin County, where some small, rich lenses of solid galena were discovered by the former owners. Churn drills have been brought in to test the lower ground and some encouraging lead is said to have been found at about 400 ft. This will be checked up with diamond drills. The rich galena lenses were found at 40 ft., as is customary in this district, or at very shallow depths.

Annapolis—The Annapolis Lead Co. has sunk its shaft over 200 ft. at Annapolis, in Iron County, and expect to bottom it next month, when the erection of the mill will be started. A large body of disseminated lead ore has been proved up on this property with the diamond drill.

Fredericktown—The Shulte property at Fredericktown, in Madison County, has been taken under option by the Picher Lead Co., which will do further drilling before finishing the shaft started by the late Harry Cantwell. Considerable nickel and cobalt occur, besides lead. The tract is only two miles from the mine of the Missouri Cobalt Co.

Vineland—The old Lee mine, near Vineland, in Jefferson County, is being re-opened by Desoto and Joplin people. This property produced considerable shallow lead from gash and pipe veins many years ago, but has been full of water for over twenty years.

The Sherry Lead Co. is about to start drilling for disseminated lead east of Vineland, near the old Valle mines, where a heavy fault has more or less mineralized the country.

Kelcey—The Beulah mine, at Kelcey, in Franklin County, has closed down for the winter, on account of the pyrite shipments freezing in the cars. This mine has produced considerable pyrite, of the marcasite form, and has recently been put in good shape for a large tonnage that at present is going to the Chicago market. The ore runs from 40 to 44 per cent in sulphur and is very desirable for acid making, as it is free burning. The property is owned by East St. Louis parties.

COLORADO

Valley View L. & M. Co.'s Mill in Operation

Matterhorn—The new 100-ton mill of the Valley View Leasing & Mining Co. is in operation. It is equipped with a gyratory crusher, ball mills, tables and flotation.

Leadville—Work was recently resumed on the Emma and Mabel placer, in the East Tennessee section of the Leadville district, which has been idle since last June on account of surface water which necessitated a close-down. Lessees of the property expect to carry out extensive development work in an attempt to locate the source of free gold which has been found in the placer fields of the East Tennessee section. A shaft 50 ft. deep was sunk through the quartzite on the property a year ago and a 90-ft. drift run through a varied formation. It is expected that but little work will be required to bring the breast of the drift into the contact under the parting quartzite, and it is here, the lessees believe, that the gold veins should be found.

Although the East Tennessee section has never produced any large mines, mining men are of the opinion that it will ultimately prove a good producer. The Jenny June and Lucy L. claims, comprising a portion of the Emma and Mabel placer, have both produced gold ore, which has been taken from small

veins in the lime formation. The free gold found in the placer fields of the district is sharp-edged and shows no signs of being washed for a very great distance. This fact has lead mining men to the conclusion that somewhere in the district the mother lode will be found.

Cripple Creek—An ore shoot opened recently on the 13th level of the Modoc mine is developing into an important deposit. The shoot has been opened for a length of 120 ft. and has an average width of over 30 ft. The ore extends up to the 11th level. About 50 per cent of the stope now being worked is shipping ore. New hoisting equipment is being installed, and development will proceed on the 14th and 15th levels. The new hoist will be operated by a 250-hp. Westinghouse motor, and will be designed to operate two double-deck cages from a depth of 2,000 ft. The new installation will cost about $25,000.

Idaho Springs—The Little Mattie mine has been taken over by the Commonwealth Silver Mines, Inc., J. F. Cleveland, president, and is being unwatered, preparatory to a campaign of active development work. The mine is opened by about 5 miles of underground workings, including a 900-ft. shaft. Equipment includes a 60-ton concentration and flotation mill.

Alice—The Roosevelt Mining Co. will build a tram about three-quarters of a mile long, from the Reynolds mine to the mill, and install a new air compressor. The 15-stamp mill is being remodeled.

Breckenridge—During July and August the Wellington Mines Co. operated at a loss, but in September it distributed a dividend of $100,000. Total dividends to date amount to $2,050,000. During 1919 the company suffered from unsettled market and labor conditions and high cost of production. However, systematic development work was carried on. New equipment has been installed recently, including a new compressor. The company proposes to resume sinking the old Oro shaft as soon as miners are available. J. W. Oldham is president and R. M. Henderson manager.

NEVADA

Nevada Con.'s Giant Blast Breaks Huge Tonnage—Pioche Shipments Falling

Ely—It is estimated that 200,000 tons of rock were moved when twelve tons of powder, placed in eight holes drilled in the hill in the center of the pit at Copper Flat, where exploded recently. It was one of the biggest blasts ever set off by the Nevada Con. and the location of the holes was carefully planned by engineers of the company. The school at Ruth was adjourned in order that the pupils might witness the sight, but from the spectacular point of view it was somewhat disappointing to those who expected to see the whole hill go up in the air. However, it was entirely satisfactory to the engineers.

Dayton—The big steel dredge of the Gold Canyon Dredging Co., the initial performance of which was witnessed by over 1,200 persons on Sept. 5, is working smoothly and several cleanups have already been made.

Pioche—Mining activity is waning in the Pioche district, owing, it is said, to the apathetic attitude of the officials of the Salt Lake Route towards the effect of the recently increased freight rates. Ore shipments from the district showed an increase over last week's total, but were considerably below the average. The Prince Consolidated produced a larger tonnage but the smaller properties showed a decided decrease. Shipments were: Prince Consolidated, 1,510 tons; Virginia Louise, 515 tons; Bristol Silver Mines, 150 tons; Black Metals, 100 tons; Combined Metals, 55 tons; Currency Lease, 40 tons; and Zero Lease, 40 tons.

CALIFORNIA

Power Restrictions Removed in Grass Valley District—Ruby Copper Instals Mill

Quincy—The Ruby Copper Co., in the Plumas copper belt, has installed a mill and is making an average of 1,000 lb. of concentrates per 10-hour day. The mill at present is losing much of the bullion.

The Reinmiller Copper Co. has practically completed the road from the main Susanville road to the mine and the men will soon be put on mine development. Recently the grading crew opened up a promising blind quartz vein.

Johnsville—The old Plumas-Eureka, which is one of the historic gold mines of Plumas County, is about to be taken over by the Guggenheim interests, according to local reports. The Plumas-Eureka was located in 1850 and has produced several million dollars. The most of the free-milling gold ore averaged between $6 and $8 per ton, but occasional bodies of very rich ore were also found. Colonel Proskey, of Reno, at one time owned the property.

Doyle—The Plinco Consolidated group of 23 claims, located about 15 miles east of the Walker mine, has been taken over by John F. Cowan, of Salt Lake City, according to a recent announcement. High-grade copper ore has been opened up on three levels and is said to be 25 ft. wide in some places on the 200-ft. level.

Grass Valley—The Pennsylvania plant of the Empire Mines will be opened as a result of the order issued to remove power restrictions. The effect of the new order will be to make available all power needed to restore the operating schedules of the mines in the Grass Valley district.

ARIZONA

Bisbee—The work of reopening the Irish Mag shaft is practically completed. The work was started in April, 1920, by the Irish Mag Leasing Co. under the management of M. J. Elsing. This company is operating on a lease of the Irish Mag claim from the Calumet & Arizona Mining Co. Three hundred and sixty feet of the shaft was completely caved.

IDAHO

Coeur d'Alene District
Big Creek Again Operating After Shutdown

The Big Creek Mining Company is again in operation after an enforced suspension due to an order from the court forbidding the company to contaminate the water of Big Creek by discharging water from the mill into the stream, this being the source of domestic water supply for the town of Kellogg. The company constructed a flume which diverts the water to a point far removed from the creek The mill is now running full time on a large accumulation of low grade ore on the dump. Men are being put on in the mine as fast as they can be secured, and in addition to the usual mining operations, a raise will be driven from the lower tunnel to the level 550 ft. above. The management announces that it is expected to be on a dividend paying basis by spring.

Crosscutting from the bottom of the 400-ft. shaft at the Chicago-Boston has advanced about 50 ft. and it is expected that the vein will be reached in about 200 ft. This work is being done by the Interstate-Callahan, which controls the Chicago-Boston.

WASHINGTON

Mining at Republic Suffering Because of Gold Situation

Index—Development during the summer at the Kromona mine in the Sultan Basin district has been encouraging. The copper vein has an extended natural exposure and a crosscut recently completed shows that it maintains its values over a good width. Winter rains and snows have stopped work until next summer. The Florence Rae mine, in the same district, has been bonded by a syndicate which is planning active mining operations.

Republic—Operations in the Republic camp are dormant, more so than for years. This is owing to the present gold situation which will not permit shipment of gold ores of medium grade. The mines of the district are working below the 500-ft. level and increased costs and freight rates are discouraging extensive shipments of ore. The revival of the district appears to be contingent upon the solution of metallurgical problems, the gold ore having so far proved refractory.

The Quilp mine is supplying siliceous ore to the Trail smelter where it is used as a flux. This ore is being drawn from stopes above the 700-ft. level. It is probable that when these stopes are exhausted the Surprise shaft will be sunk 200 ft. further.

The Last Chance and Lone Pine-Surprise properties are involved in apex litigation and neither is producing at present.

THE MARKET REPORT

Daily Prices of Metals

Oct	Copper N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y	Lead St. L.	Zinc St. L.
21	15 10	38.50	39.00@39.50	6 75@7.00	6 60@6.90	7.05
22	15 10	38.00	38.75@39.00	6.75@7 00	6.60@6.80	7.00
23	14 85@15. 10	38.50	39.00@39.50	6.75@7.00	6.60@6.75	6.95@7.00
25	14.85	38.75	39.25@39.75	6.75@7.00	6.60@6.80	6.95
26	14.85	39.00	40.50@40.75	6.75@7.00	6.60@6.90	6.95
27	14.85	39.50	40.75@41.00	6.75@7.00	6 60@6.90	6.95

*These prices correspond to the following quotations for copper, "delivered": 15.25, 15.25, 15.00@15.25, 15.00, 15.00, and 15.00c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Oct.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
21	91	89½	101	251½	256½	36⅛	35⅞	38¾	39⅞
22	89¾	88⅝	100	248	254¾	36	35¾	39	40
23									
25	91½	90	100	251½	257¼	36⅛	35⅞	39½	40½
26	89¼	88¼	100	258½	263¼	36½	35⅞	39¾	40¾
27	88¼	87¾	100	261¾	265¾	36⅜	35¾	39	40

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Oct.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
21	343½	99½	81⅞	53¼	25	347	99½	80⅞	52½
22	343½	99½	80½	52⅝	26	346½	99⅛	80⅜	52⅛
23	345¼	99½	80	52⅛	27	347	99½	80⅜	52⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Oct. 27, 1920

Price recessions have continued during the last week but to a diminished degree. Both producers and consumers are beginning to consider that present prices are at or near the bottom and it is unlikely that any further marked declines such as have taken place during the last few weeks will occur. Metal for forward delivery is beginning to command a slight premium as a general rule, for the spot demand is totally lacking. With present general conditions and a declining tendency in price levels, it is, however, almost too much to expect any marked increase in metal prices. The approaching election seems to have been overshadowed by other conditions and has probably exerted little influence on the market. Those who look for increased buying after Nov. 2 may, therefore, be disappointed.

Copper

The market seems to have reached a stable basis at 15c., delivered, after the recent rapid decline from the 18@19c. level. Large producers are now selling about on a parity with the outside market. Rumors have been circulated about large lots of copper having been sold both at 15c. delivered and slightly under this price, but after careful investigation, both among producers and consumers, we are unable to confirm any of these transactions. There is no doubt that several sales of rather large volume were made on the quiet during the recent recession, producers slashing prices to make sales without wishing to make the facts known. So far as we know, business at the current level is of small volume, buyers not wishing to carry large stocks on their inventories at the end of the year. Some sales of somewhat larger volume are being booked for January delivery.

Lead

The A. S. & R. official price continues at 7¼c., New York, and some producing interests are quoting this price without, however, making any sales. The market is gradually becoming more restricted, and unless it improves, producers are apt to find at the end of next month that some of their November metal is unsold. The number of cancellations and requests for postponed deliveries is increasing. Another striking feature is the fact that consumers are offering spot metal for resale, a particularly depressing influence. At current prices, London lead cannot be laid down here for less than 7⅛@7⅜c., so that trouble from importations is hardly expected.

Chemical lead is scarce and a slight premium is being demanded for this variety in the St. Louis district, where 6.90c. has been asked for the last two or three days. Mexican lead is offered at ¼c. under this figure in St. Louis, owing to its having been thrown into that market by a cancelled contract.

Zinc

This metal has exhibited a further gradual decline, and yesterday the 7c. level was passed, sales taking place at 6.95c. Not all producers were willing to sell at this figure but apparently little or no business could be induced at any higher quotation. Consumers are simply not buying. The curtailed production should tend to help the market as it did last summer, and also, with black sheets in better supply, the galvanizing business should improve. Stocks of zinc are, however, larger than producers would like to have them. Metal for forward delivery commands 5 to 10 points premium.

Tin

One producer says the principal feature of the tin market just now is a demand for futures at the prices quoted for spot. There are large supplies of spot Straits now in New York, and consumers are not interested. Recent forced sales caused by buyers of unknown reputation declining to accept deliveries have had a depressing influence. The market is very irregular. Some electrolytic has been moving at around 39c. One consumer was offering electrolytic for resale yesterday at 39¾c.

Straits tin for future delivery: Oct. 21st, 40.00 @ 40.75c.; 22d, 39.75 @

40.00c.; 23d, 40.00@40.50c.; 25th, 40.50 @41.00c.; 26th, 41.25@41.75c.; 27th, 42.25@42.75c.

Arrivals of tin in long tons: Oct. 20th, Rotterdam, 10; 21st, London, 50.

Silver

From October 21 to 27 the London price has fluctuated between 53¼ and 52⅝ pence. London reports buying for Indian bazaar and China account as responsible for the upward movements; and further sales of melted coin from the Continent and a certain amount of speculative selling are the factors causing the decline.

During this same period the improvement in sterling exchange has been sufficient to increase the London parity by over one cent, but the fall in the London quotation has more than offset this.

The New York price continues to follow closely the London parity, as buying for China account in this market is not strong enough to cause any appreciable advance over the London rate.

Exports of bar silver from San Francisco for the month of September amounted to 5,958,000 ounces, and from New York to England for the period October 1st to 20th to 185,600 ounces.

Mexican Dollars—Oct. 21st, 52; 22d, 61⅛; 23d, 60⅞; 25th, 60⅞; 26th, 60⅞; 27th, 60⅞.

Gold

Gold in London on Oct. 21st, 119s. 3d.; 22d, 119s. 6d.; 25th, 118s. 2d.; 26th, 118s. 2d.; 27th, 117s. 9d.

Foreign Exchange

With brighter prospects of settling the labor troubles in England, sterling has tended to strengthen during the last few days. Other exchanges have generally been quiet with narrow movements. On Tuesday, Oct. 26, francs were 6.35c.; lire, 3.74c.; and marks, 1.43c. New York funds in Montreal, 10½ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33.1c.; 98@99 per cent, 32.90c.

Antimony—Spot metal, 6⅛@6⅜c. per lb. Cookson's "C" grade, 12½@13c. Chinese and Japanese brands, 6⅜@6⅜c. W. C. C. brand, 8¼c. Chinese needle antimony, lump, firm at 6@6¼c. per lb. Standard powdered needle antimony[1] (200 mesh), 10c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $400@$450 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for the metal in 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$85 per oz. Dull.

Platinum—Firm at $95@$105 per oz.

Quicksilver—Market quiet; $60 per 75-lb. flask. San Francisco wires $62.50@$65. Market steady.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 75@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore[1]—60@70c. per unit, seaport; chemical ore (MnO_2) $70@$80 per gross ton, lump; $80@$90 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 65@70c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.50@ $5, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$1.25@$1.50 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 23—Zinc blende, per ton, high, $51.10; basis 60 per cent zinc, premium, $41; Prime Western, settling basis, $50@$40; buying basis, $40; fines and slimes, $37.50@$35; calamine, 40 per cent zinc, $35. Average settling prices: Blende, $45.14; calamine, $38.48; all zinc ores, $45.01.

Lead, high, $111.85; settling basis 80 per cent grades, $110@$65; buying basis, $65; average settling price, all grades of lead, $98.69 per ton.

Shipments for the week: Blende, 13,135; calamine, 263; lead, 1,906 tons. Value, all ores the week, $773,990.

The second mine close-down of the year became effective this week. Sellers claim the production is lessened 90 to 95 per cent and buyers concede a possible 80 per cent. The first week ends with the production restricted approximately as in July. At that time a part of the mines resumed operation the middle of the second week. There is to be another week and possibly will extend over Election Day. The mines operating are generally selling on the market, but ore held by those down is not offered. It is estimated that there is an unsold tonnage of 20,000 to 25,000. The purchase this week was 3,250 tons, approximately the production. Seven regular buyers were out of the market this week. The car situation tightened at the week-end.

Platteville, Wis., Oct. 23—Blende, basis 60 per cent zinc, $45@$45.50 per ton base for high grade. Lead ore, no sales. Reported shipments for the week: Blende, 1,117; sulphur ore, 58 tons. Shipments for the year: Blende, 55,896; calamine, 2,474; lead, 4,398; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 2,308 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@ $3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@ $75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@ $12; washed, $12@$15; powdered, $18@ $22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@ $30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@ $23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chemical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content.

Gravel—No analysis guarantee, f.o.b. Roseview, Ill., $25 per ton; gravel suitable for acid, chemical or enameling purposes, $60.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30. The foregoing domestic prices obtain also in the Chicago district.

[1]Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 15½c. per lb.; sulphide, powdered, 20@21c. per lb., f.o.b. works, carload lots.

Nitrate—Soda, $3.85 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—For 76 to 80 per cent, prompt delivery, $170@$175 freight allowed; last half, $170; English, $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $82.50@$85, f.o.b. furnace.

Ferromolybdenum[1]—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $82.50@$85; 75 per cent, $150@$160.

Ferrotungsten[1]—Domestic, 70 to 80 per cent W, 80@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8 per lb. of V contained, f.o.b. works.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Metal Products

Copper Sheets — Current New York price, 25½c. per lb.; wire, 19c.

Lead Sheets—Full lead sheets, 10½c.; cut lead sheets, 10¾c. in quantity, mill lots.

Nickel Silver—Unchanged at 36½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 23½c.; sheathing, 23½c.; rods, ⅝ to 3 in., 20½c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Oct. 26, 1920

Throughout the steel trade it has been admitted of late that prices of independents will decline to the Steel Corporation level. This leaves two interesting questions, how it will be until the decline is completed, and whether the Corporation prices then will be what they are now. As to the first question, some of the independents have fairly well-filled order books, despite recent cancellations, and are indisposed to reduce their quotations until they have shipped as much as possible on existing contracts.

Pig Iron—On an inquiry for a small lot of foundry iron for Pittsburgh delivery several Valley furnaces showed that they would shade $45, furnace, but the order went to another district at a lower delivered price. We quote foundry at $45, Valley, against $47 formerly quoted. Some in the trade insist that basic iron is quotable at $40, Valley, on the basis of some small sales, the former quotation having been $42, and we quote basic at $40@$42. On offerings of bessemer, not taken, we quote that grade at $47, Valley, instead of $48.50 formerly quoted. Freight to Pittsburgh is $1.96.

Semi-finished Steel—No transactions are reported, and we quote the market nominal at $55@$60 for billets and $65 for sheet bars.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16.50@$17; foundry, $18

The Decline in Copper

Cheap Metal Will Cause Decrease in Production and a Natural Readjustment to Existing Economic Conditions—Producers Are in the Same Position as Those in Other Industries—Production Above Pre-war Rate

COPPER has yielded to the long strain under which it has been laboring. Month after month—in fact, ever since last winter's heavy buying—there has been anxious anticipation of a buying movement, which, unfortunately, has not matured. Glancing over the average prices of electrolytic copper for the first nine months of the year, it is surprising to note the small fluctuation in the price of the metal. The lowest average price in June, 18.065c., and the highest in January, 18.918c., show a difference of only .853c. This stability of copper prices emphasizes the comparative dullness of the market for practically the entire period. Contrasted with a similar period of 1919, we have a range from a low in March of 14.856c. to a high in August of 22.319c., indicating by this wide variation the intense speculative trading that occurred last year, when large quantities of American copper were purchased by the Japanese only to ruin the market subsequently in this country.

AVERAGE PRICES NEW YORK ELECTROLYTIC COPPER, 1919-1920

	1919	1920		1919	1920
January	(a)	18.918	August	22.319	18.345
February	16.763	18.509	September	21.755	18.144
March	14.856	18.331	October	21.534	..
April	15.246	18.660	November	19.758	..
May	15.864	18.484	December	18.295	
June	17.610	18.065			
July	21.604	18.576	Year	18.691	..

(a) No market.

In the middle of September copper was sold at about 18.50c., delivered. The price then gradually declined, but sharply of late, so that copper can now be obtained for 15.00c., delivered—a decline of 3½c. in a little over a month. The copper companies are producing copper to sell, and not to hold, and the consequent lowering of their price to make a market accounts for the sharp decline. The policy of most producers has been to hold their output from the market at the absurdly low prices for the metal, with the thought that not only was there a great and potential demand for copper all over the world but that domestic production was going on at an unprecedented rate and a buying movement would start of its own accord—at any rate, they felt that a further concession in price would not result in increased purchases.

Finally the financial strain of carrying so much unsold copper became acute. Certain producers no longer found themselves able to follow the policy they had mapped out, and gossip had it that they underbid their competitors in order to sell their copper. During the period of market dullness the largest business recorded was by the smaller producers, and always at prices below that of the major operators. This trade inequality has begun to disappear; practically all the large copper interests are participating in the market and are furnishing keen competition to those interests which formerly consummated the greater share of business. As a result, the price of copper reflects the keener competition for trade among the copper sellers.

At 15.00c. copper is decidedly below a pre-war price basis (the average price of New York electrolytic for the years 1906-1913 inclusive was 15.274c.), and is undoubtedly below the cost of production of all but the lowest-cost producers. The cost of producing copper as given by representative copper companies in their annual reports for last year follows:

Utah Copper (open-cut porphyry)	12.366c
Copper Range (deep lake mine)	a 15.02
Inspiration (deep mine porphyry)	a 13.412
Ray Consolidated (deep mine porphyry)	b 14.94
Nevada Consolidated (porphyry)	b 16.14
Tennessee Copper (lode)	c 18.72
Calumet & Hecla (deep lake mine)	19.77
Chino (porphyry)	b 15.49
Shattuck Arizona (lode)	22.20
Chile Copper (porphyry)	18.35

(a) Exclusive of depreciation and depletion charges.
(b) Exclusive of Federal taxes.
(c) Exclusive of New York charges

The list is selected from both large and small producers, porphyry and lode copper mines, and although the method of cost accounting in many cases is different, the table furnishes an indication of what 15c. copper means to the industry.

Of course business moves in cycles. There are periods of depressions and periods of prosperity. Losses must be taken with the gains. The copper industry is passing through one of these depressed periods, after having experienced a period of unprecedented prosperity when copper prices ruled abnormally high. That is the one comforting feature of the situation, and were it not for the financial surpluses which most copper companies accumulated during the war, the industry would indeed be in dire straits. But there is a limit to which these financial reservoirs can be drained, and for many months they have been called upon to tide the companies over the present trying period.

If copper cannot be produced at a profit—15c. copper does not represent a profit—mines will shut down. Production is already being curtailed. A preliminary estimate of copper production for September places it at 103,000,000 lb., which is a decided decrease from the preceding month's figure of 116,000,000 lb. and the smallest output of the year. There is one striking feature of the activity of the copper mines during the post-war period: although they have not operated to *capacity* they have been operating above the pre-war rate of production. The following table is intended to illustrate this point. From 1909 to 1913 smelter production in the United States averaged 1,149,000,000 lb. In 1919 production was about 1,210,000,000, but in 1920 a preliminary estimate, should production continue at the present rate, is 1,350,000,000 lb. This is about 18 per cent above the pre-war average given, and would indicate that there is much room for healthy contraction in the copper supply.

COPPER PRODUCTION AND PRICES, 1906-1920

	Smelter Production in Pounds	Average Price Electrolytic N. Y.		Smelter Production in Pounds	Average Price Electrolytic N. Y.
1906	917,000,000	19.27c	1914	1,093,000,000	13.602
1907	879,000,000	20.004	1915	1,424,000,000	17.275
1908	948,000,000	13.208	1916	1,943,000,000	27.202
1909	1,105,000,000	12.982	1917	1,923,000,000	27.180
1910	1,086,000,000	12.738	1918	1,938,000,000	24.628
1911	1,084,000,000	12.376	1919	1,210,000,000	18.691
1912	1,241,000,000	16.341	1920	a1,350,000,000	
1913	1,229,000,000	15.269			

aEstimated

How great a curtailment of production may take place it is hazardous to predict, but that producers are becoming tired of the present state of affairs and are determined to force an issue seems clear. Europe is in no position to purchase the copper it needs under the present foreign-exchange situation, and is content to utilize the large amounts of scrap material still available on the Continent. This attitude alone of our greatest copper customer should be sufficient to compel the industry to contract its output, and, coupled with the smaller domestic demand, would seem to insure it.

Despite the serious predicament of the copper producers, no one doubts for a moment that the industry will emerge successfully from its ordeal, and that after economic laws have again become balanced, a period of unexampled prosperity may confidently be expected. The market is seeking out its bottom with a determination to reach a level from which confidence on the part of the consumer in a stable market will be restored. To do this it is necessary for the market to not only reach the bottom but also to get under it so that prices will be raised or the market supported. This state of affairs is progressing at the present time, and low levels for the year are being recorded.

MINING STOCKS

Week Ended October 23, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	*60	*60	*60		
Ahmeek	Boston	55½	54½	55	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb	⅛		⅛		
Allouez	Boston	23¼	23¼	23¼	Mar. '19,	1.00
Anaconda	N. Y.	50¼	49¾	50¼	Aug. '20, Q	1.00
Ariz. Com'l	Boston	9	9	9	Oct. '18,	.50
Big Ledge	N. Y. Curb	½		½		
Bingham Mines	Boston	9¼	9⅛	9⅛	Sept. '19, Q	.25
Calumet & Ariz.	Boston	55	52¼	54¼	Sept. '20, Q	1.00
Calumet & Hecla	Boston	255	246	249	June '20, Q	5.00
Canada Copper	N. Y. Curb			⅛		
Centennial	Boston			9½	Dec. '18, SA	1.00
Cerro de Paseo	N. Y.	39½	37¼	39¼	Sept. '20, Q	1.00
Chief Consol.	Boston Curb	4	3½	3½	Feb. '20, Q	.10
Chile Copper	N. Y.	14	13⅜	14		
Chino	N. Y.	25⅜	24	25¼	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*36	*33	*34		
Con. Ariz.	N. Y. Curb			⅛	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb			*61		
Copper Range	Boston	34¼	33	34	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*48	*32	*48		
Davis-Daly	Boston	7½	7	7⅛	Mar. '20, Q	.25
East Butte	Boston	10⅛	9¼	9¼	Dec. '19, A	.50
First Nat'l	Boston Curb	*88	*80	*85	Feb. '19, SA	.15
Franklin	Boston			2 1/16		
Gadsden Copper	N. Y. Curb			*70		
Granby Consol.	N. Y.	30	29	29½	May '19, Q	1.25
Greene Cananea	N. Y.	27½	27	27	Aug. '20, Q	.50
Hancock	Boston	3	3	3		
Houghton	Boston Curb			*40		
Howe Sound	N. Y. Curb	1⅜	1¼	1⅜	Oct. '20, Q	.05
Inspiration Con.	N. Y.	44⅜	42¼	43¼	Oct. '20, Q	1.00
Iron Cap	Boston Curb			8½	Sept. '20, K	.25
Isle Royale	Boston	24	23	23½	Sept. '19, SA	.50
Kennecott	N. Y.	22⅞	22¼	22⅜	Sept. '20, Q	.50
Keweenaw	Boston	1⅜	1⅜	1⅜		
Lake Copper	Boston			3		
La Salle	Boston	2¼	2¼	2¼		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb			17	Jan. '19, Q	.50
Majestic	Boston Curb	*14	*10	*14		
Mason Valley	Boston	2¼	1⅜	1⅜		
Mass. Con.	Boston	3	3	3	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	5⅜	4½	4½		
Miami	N. Y.	19	18⅜	18½	Aug. '20, Q	.50
Michigan	Boston	3¼	3¼	3¼		
Mohawk	Boston	57⅛	55	56	Aug. '20, Q	1.50
Mother Lode (new)	N. Y. Curb	5⅜	5⅛	5⅜		
Nevada Con.	N. Y.	11⅛	10⅛	11	Sept '20, Q	.25
New Arcadian	Boston			2⅜		
New Baltic	Boston Curb			3		
New Cornelia	Boston	18⅛	18	18	Aug. '20,	.25
Nixon Nev.	N. Y. Curb			*9		
North Butte	Boston	14	13⅜	14	Oct. '18, Q	.25
North Lake	Boston			*25		
Ohio Copper	N. Y. Curb			3/16		
Osceola	Boston			1¼		
Old Dominion	Boston	23	22⅛	22⅛	Dec. '18, Q	1.00
Osceola	Boston	32	31	31	June '20, Q	.50
Phelps Dodge	Open Mar.	†190	†170		Oct. '20, Q	2.50
Quincy	Boston	43¼	42⅛	43	Sept. '20, Q	1.00
Ray Con.	N. Y.	14⅛	13⅜	13⅞	June '20, Q	.25
Ray Hercules	Boston Curb			*50		
St. Mary's M. L.	Boston	35⅛	34	34	June '20, K	2.00
Seneca	Boston	17⅛	.14	17⅜		
Shannon	Boston	1⅛	1⅛	1⅛	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	8	7⅛	8	Jan. '20 Q	.25
South Lake	Boston			2		
South Utah	Boston	*10	*9	*10		
Superior Copper	Boston			4½	Apr. '17,	1.00
Superior & Boston	Boston	3⅜	3	3		
Tenn. C. & C.	N. Y.	9⅜	9⅛	9⅛	May '18, I	1.00
Tuolumne	Boston			*54	May '13,	.10
United Verde Ex.	Boston Curb	*29½	*29	29	Aug. '20, Q	.50
Utah Con.	Boston	6 3/16	5⅛	5⅜	Sept. '18,	.25
Utah Copper	N. Y.	58⅛	55⅞	58	Sept. '20, Q	1.50
Utah M. & T.	Boston	1⅜	1 1/16	1⅛	Dec. '17,	.30
Victoria	Boston	2⅛	1⅞	1⅞		
Winona	Boston	*35	*25	*35		
Wolverine	Boston	12⅛	10⅛	10⅛	Jan. '20, Q	.50
LEAD						
Hecla	N. Y. Curb	5	4	4⅞	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14⅛	14⅛	14⅛	Sept '20, QX	.50
Stewart	Boston Curb			*13	Dec. '15,	.05
Utah Apex	Boston	4	2⅜	3⅜	Nov. '18,	.25
ZINC						
Am. Z. L. & S.	N. Y.	11⅞	11⅛	11⅛	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.			45	Aug. '20, Q	1.50
Butte C. & Z.	N. Y.	6⅞	6⅜	6⅜	June '18, I	.50
Butte & Superior	N. Y.	17	15⅞	16	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	9⅜	8⅜	8⅛	June '20, Q	.50
New Jersey Z.	N. Y. Curb	173	169	169	Aug. '20, Q	4.00
Success	N. Y. Curb	4⅛	2⅛	3	July '16,	.03
Yellow Pine	Los Angeles			*95	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1¾	1⅜	1⅜		
Alaska Juneau	N. Y.	2	1⅛	2		
Carson Hill	N. Y. Curb			22⅜		
Cresson Consol. G.	N. Y. Curb	1⅛	1	1⅛	June '20, Q	.10
Dome Ex.	Toronto	*40⅛	*39¼	*40		
Dome Mines	N. Y.	11¾	11⅛	11⅛	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb	*10	*8⅛	*9⅛	Dec. '19,	.05
Hedley	Boston			4½	June '19,	.10
Hollinger Con.	Toronto	5.75	5.60	5.60	Oct. '20, BM	.05
Homestake	N. Y.	*47½	*45	45	Sept. '19,	.50
Kirkland Lake	Toronto			*46		
Lake Shore	Toronto	1.05	1.04	1.05	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	2.05	1.99	2.00	Sept. '20, K	.05
Porcupine Crown	Toronto	*23	*23	*23	July '17,	.03
Portland	Colo. Sprgs.	‡		*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb	5½	4	5	May '19,	.05
Silver Pick	N. Y. Curb	*6½	*6	*6½		
Teck Hughes	Toronto			*8¾		
Tom Reed	Los Angeles	1.50	1.37½	1.44	Dec. '19,	.02
United Eastern	N. Y. Curb	2½	2⅛	2⅛	Oct. '20, Q	.15
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome Consol.	Toronto			*6⅜		
White Caps Min.	N. Y. Curb	*8½	*7	*7½		
Yukon Gold	Boston Curb	1⅜	1⅛	1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*21	*16	*18	Apr. '20, M	.03
Beaver Con.	Toronto	*39	*37½	*37½	May '20, K	.03
Coniagas	Toronto	†2.50	†2.40	2.55	Aug. '20, Q	.12½
Crown Reserve	Toronto			*27	Jan. '17,	.05
Kerr Lake	Boston	3⅛	3⅛	3⅛	Oct. '20, K	.12½
La Rose	Toronto	*31⅛	*31⅛	*31⅛	Apr. '18,	.02
McKinley-Dar.	Toronto			*50	Oct. '20, Q	.03
Mining Corp.	Toronto	1.75	1.70	1.74	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	9	8⅞	9	Oct. '20, QX	.50
Ontario Silver	N. Y. Curb	5⅜	5	5	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	1 1/16	3/16	3/16	Jan. '12,	.10
Peterson Lake	Toronto	*1⅛	*11	*11	Jan. '17,	.01½
Temiskaming	Toronto	*32	*32	*32	Jan. '20, K	.04
Trethewey	Toronto	*28	*24½	*27½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*1⅛	*1	*1⅛		
Barnes-King	Butte	‡		1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb	*7½	*6	*6		
El Salvador	N. Y. Curb	1	7/16	7/16		
Jim Butler	N. Y. Curb	*17	*15	*16	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*6⅛	*5	*6⅛	June '16,	.05
Louisiana Con.	N. Y. Curb			1/16		
MacNamara M.	N. Y. Curb			⅛	May '10,	.02½
N. Y. Hond. Rosar.	Open Mar.	†12	†11		Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅞	1 11/16	1⅞	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb	2	1⅞	1 13/16		
Tonopah Ex.	N. Y. Curb	1 3/16	1⅛	1	Oct. '20, Q	.05
Tonopah Mining	N. Y. Curb	1 3/16	1⅛	1⅛	Oct. '20, SA	.05
West End Con.	N. Y. Curb	1 1/16	1	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb	*18	*15	*18	July, '20, M	.01
Consol. M. & S.	Montreal	24	22⅛	22½	Oct. '20, Q	.62½
Daly Mining	Salt Lake	2.50	2.45	2.45	July '20, Q	.10
Daly-West	Boston	4⅜	4⅛	4⅛	Oct. '20, Q	.25
Eagle & Blue Bell	Boston Curb	2 1/16	2 1/16	2 1/16	Apr. '20, Q	.10
Electric Point	Spokane	*14	*13	*14	May '20, SA	.03
Fed. M. & S.	N. Y.			13	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	31⅜	31⅛	31⅛	Sept. '20, Q	1.75
Florence Silver	Spokane			*25	Apr. '19,	.01½
Grand Central	Salt Lake			*37½	June '20, K	.03
Iron Blossom	N. Y. Curb	*28	*25	*25	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake			3.97½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*14	*11	*11		
Prince Consol.	N. Y. Curb	*31	*14	*14	Nov. '17,	.02½
Rambler-Cariboo	Spokane			*9	Feb. '19,	.01
Rex Con.	N. Y. Curb	*6	*6	*6		
South Heola	Salt Lake	*89	*85	*85	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb	3/16	3/16	3/16	Oct. '17,	.05
Tamarack-Custer	Spokane	2.47	2.20	2.20	Dec. '19, K	.03
Tintic Standard	Salt Lake	3.05	2.90	2.90	June '20, Q	.10
Wilbert Mining	N. Y. Curb	*4⅛	*3⅛	*4⅛	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	18⅛	17⅛	17⅞	Mar. '19,	.50
Internat'l Nick.pf.	N. Y.	83	83	83	Aug. '20, Q	1.50
QUICKSILVER						
New Idria	Boston			5	Jan '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb			*10		
VANADIUM						
Vanadium Corp.	N. Y.	65	62½	63½	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	97	94	94	Oct. '20, Q	1.50
Asbestos Corp. pf.	Montreal	103½	100	100	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	59⅛	58⅛	58½	Sept. '20, Q	1.00
Am. S. & R. pf.	N. Y.	92½	91½	91½	Sept. '20, Q	1.75
Am. Sm. pf. A	N. Y.	78	77	78	Oct. '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	53	52⅛	52⅞	Oct. '20, Q	1.50
U S S.R.& M. pf.	Boston	45	43⅛	45	Oct. '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, semi-annually BM, bimonthly. K, Irregular. I, Initial X, includes extra

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Volume 110 New York, November 6, 1920 *Number* 19

The McFadden Gold Bonus Bill

THE statement of Congressman Louis T. McFadden, chairman of the Banking and Currency Committee of the House of Representatives, presented before the recent Forty-sixth Annual Convention of the American Banking Association in Washington, is printed in abstract on another page. We commend it as a sound and thoughtful discussion of fundamental monetary economics.

Concerning the advisability of a bonus to gold miners, as proposed by Mr. McFadden, the bankers are by no means in agreement—there are two mutually dissenting parties, as there are outside the banking world. Mr. McFadden's argument is directed against the report of a certain Gold Committee appointed by the American Banking Association, which rendered an adverse report on the bill; but this committee is held by the sponsors of the bill to represent a minority, and it is certain that some important banking interests remain so much in favor of the bill that they have included a statement of their support in their newspaper advertisements.

Now, the proposition, if it is to stand, and if it should stand, must be shown to be desirable, first and last, on the basis of national welfare. While we of the mining profession naturally have our own industry very much at heart, it would be not only unfair but suicidal if we should advocate any measure which, though it would rescue the gold-mining industry from disaster, would depress the prosperity of the rest of the country and delay the natural healing processes which supervene on the wounds of war. It is on this broad basis of national welfare and no other that the measure is presented, and on which we support it.

Those bankers who oppose the bill are misled in some cases, it appears, by some elementary knowledge of economics, proving anew that a little knowledge is a dangerous thing. Mr. McFadden, for example, combats the statement of the Gold Committee that "Increased gold production in a period of low prices and low costs makes it easier for prices to rise again, while diminished gold production in periods of high prices and costs tends to reduce prices and costs again."

Here, in a way, is a true and fundamental statement; and yet it is absolutely inapplicable in the present case. It is evident that with gold, or silver, or anything else, as a medium of exchange, the greater the supply of the standard, the cheaper it will become, and the less it will purchase; in other words, the prices of other commodities will rise in terms of gold or silver, as the case may be. This was illustrated by the discovery of the great Valenciana silver mine, in Mexico, in the sixteenth century: the flood of silver caused a rise of commodity prices throughout the civilized world. The absolute inapplicability of this law to the present world monetary conditions lies in the fact that our basis of exchange is now not gold and silver, but so-called money which is mostly paper with a minimum and quite insufficient security of gold and silver. Therefore, it is now and long will be the case that the monetary control of prices (there are, of course, other factors) follows the law that commodity prices will tend to increase as the ratio of paper to metal (gold) increases: that they will rise with inflation and diminish with deflation. Deflation means a diminished ratio of paper to gold; and there are two ways of accomplishing it—one by decreasing the amount of paper, the other by increasing the amount of gold. The latter is what the McFadden bill proposes to do.

A more astonishing economic view, urged by a great financier against the McFadden bill, was that it was inadvisable to increase the gold reserve, as that would mean more credit based upon the increased gold, and so further inflation! It is difficult to argue concerning this warped point of view, as it assumes the fundamental depravity of American bankers—which may or may not be true. Certainly, the financier who uttered this objection should know better than we; but, if so, the remedial castigation should be applied to our banking system. On this theory the way to induce deflation would be by reducing the gold reserve, and complete deflation would be accomplished with its disappearance.

Though we are not threatened with any situation so extreme as the condition of complete disappearance, apparently viewed with equanimity by our great banker, we are face to face with a shrinking gold reserve, which we can hardly escape. We can hardly expect stable return of prosperity till Europe again becomes a buyer as largely as of old. The present situation in copper is typical of this. Now, Europe cannot buy before her exchange depreciation is remedied—until then she has nothing to offer us. The slowing down of her purchases, however, increases the amount of her exports as compared with her imports, and, as regards us, this means that her balance of trade with us is being gradually adjusted, which means eventually a movement of our gold to Europe to adjust balances; and this is a tendency which will be healthy for the world. Against this the fact is that more gold is now going into the arts in this country—principally jewelry—than we are producing—so that our outstanding paper currency will tend to have a shrinking basis of metal security.

Our whole endeavor should be to build up the world's metal security underlying its paper notes. The McFadden bill could wisely be adopted in this country, and copied in all other gold-producing countries. It serves the double purpose of tending to increase the production of gold, and decrease the economic waste of it by turning it into purposes of adornment. The tax of ap-

proximately 50 per cent which the jewelers would have to pay is a moderate one. Considering the general problem of taxation for revenue, together with the McFadden problem of taxation for increase of gold reserve, we would be inclined to recommend a 500 per cent tax on gold and jewelry, of which 50 per cent would be turned over to the miners as a bonus, and the remainder into the Treasury to help meet the general expenses of government. We think that the McFadden proposition might well be modified so as to exempt from taxation gold employed for useful purposes, as in dentistry; this would further insure the retaining of the commodity standard of gold value as on the old fixed basis, and would, in addition, refute the charge of a change in the gold standard. But the hoarding of gold, especially in times of great financial stringency, is looked upon with disfavor by bankers; indeed, if the reader will ask for a single $20 gold piece from his bank, he will probably detect some disfavor or suspicion on the part of the banker; and it is nothing less than hoarding to suspend it around one's neck or across one's chest, or locked up in one's strong box as jewelry. Hoarding of this sort of silver and gold (as ornaments) in India has long made that country a veritable sink of the metals; and at the present time more than the total production of gold of the country is thus hoarded in this country, as jewelry. Will not the bankers view this also with the appropriate alarm?

The Government Employee And His Discoveries

RECENTLY a meeting was held at the Chemists' Club in New York, under the auspices of the American Institute of Chemical Engineers, the New York Section of the American Chemical and American Electrochemical Societies, and the American Section of the Society of Chemical Industry, to hear Dr. Cottrell, Director of the Bureau of Mines, and Dr. Alsberg, Director of the Bureau of Chemistry, present their plan for solving the problem of discoveries or inventions by Government investigators. This plan is embodied in Senate bill 3,223, which has been passed by the Senate, and will go to conference in December. Briefly, it provides that inventors who are Government employees may be assigned to the Federal Trade Commission (subject to the acceptance by that commission), which may license such inventions, and collect fees and royalties therefor, out of which fees and royalties a certain per cent shall be set aside to remunerate the inventor.

The submission of the plan in New York met with the most plain and hearty disapproval of the important and representative meeting of chemists to which it was submitted, and the meeting and the proposal are discussed in a long and able editorial in *Chemical & Metallurgical Engineering* for Oct. 27, which aligns itself against the project.

We are inclined to join in the general reaction of dissent from the proposed plan. Though the problem of retaining able scientists in the Government pay is doubtless an important one, we do not think this is the solution, for this preventive remedy, we judge, is far worse than the disease. The effect, in our opinion, would be to subsidize scientists while they were working out inventions by which they hoped eventually to profit financially.

There is no use minimizing the spur and the bias given by the prospect of monetary reward, and if the Government should adopt this system we could not blame the employee for shaping his efforts in that direction. He would be in an enviable position—nothing to lose for the time spent in his researches, for the Government would support him comfortably and indefinitely, and everything to gain. We can imagine what a horde of hungry inventors, who have had experience in being on the losing side of the gamble, would apply for Government jobs!

Neither is the proposal to still further expand the powers and functions of the Federal Trade Commission likely to prove popular. This organization has already been accused of socialistic ideals, and the plan in question certainly trends in the direction of intensifying that paternal nursing by the Government which is called state socialism. The industries apprehend it as such, if we may judge from the very definite antagonistic attitude of the meeting to which we have referred. We believe that the plan is a dangerous and unsound one, and hope for the rejection of the bill by Congress.

The Newer Branches of Engineering

JUST why it is we do not know, but engineering seems to be getting more popular. Perhaps it is the free advertising which Herbert Hoover has given the profession, or possibly the Federated American Engineering Societies is having some influence. But, anyway, an engineer is no longer considered one who runs an engine, just as a chemist is no longer merely a soda-water clerk.

The latest is Real Estate Engineering, or, as the pioneers in the profession call it, Property Management Engineering. This is the heading of an advertisement occupying the entire last page of the *New York Tribune* of Oct. 26. The advertisement goes on to say that engineers are scientists who know the facts about materials with which they work and who must not merely guess. They must also have the ability to put their knowledge to practical use. That is just the way the officials of the company running this ad. feel about the handling of real estate. Hence the title. They admit that the question as to what Property Management Engineering means has been asked them many times, and we do not wonder.

Julian Street, in his interesting little satire on the modern advertising man, just published under the title "Sunbeams, Inc.," follows the career of Mr. H. Bell Brown from newspaper reporter through his "'induction' into the profession of advertising engineering. It would seem that he was cut out for it. Either he learned with a speed hardly short of miraculous, or else advertising engineering may be mastered in a much shorter space of time than engineering in the commoner branches. Had he, for example, become an automobile engineer, a constructing engineer, or a civil engineer, instead of an advertising engineer, and progressed as rapidly, he would have been building motor cars, skyscrapers, steel bridges, or railroads within a year."

We are glad to see engineering becoming so popular, but we hope that the new-coming class will not totally supplant the old. No doubt Soup Engineering and Baked Bean Engineering will soon be featured in the advertising pages of our popular magazines. At present,

as is well known from the advertisements, our beans are baked by chemists, who analyze each bean as it goes into the can. Why wouldn't a good engineer be fitted to superintend the ovens, or, as they might be termed, roasting furnaces? Or even—but this is too much to expect—a good cook?

The Wrong Kind of Immigrants

EMISSARIES from Soviet Russia with well-lined pockets are reported on good authority to be coming to this country. The immigration from former Russian territory, is, at least, becoming heavy, and it would not be at all surprising if agitators were slipping in despite the vigilance of the Federal authorities. The trouble in Italy, the seizure of many large factories, is, of course, Russian inspired, even if not actually financed, as alleged, by Soviet funds. The recent miners' strike in Britain probably has some foundation in Russian agitation.

We in America cannot watch too closely the character of immigrants which we are welcoming to solve our labor problems. Mining districts have been in the past a particularly fertile field for inspired discontent among foreign laborers, and it is unlikely that agitators will overlook them again should definite plans be made to stir up trouble. To secure the best efficiency, mining officials and others whose position gives them an insight into labor conditions should co-operate to the fullest possible extent with the Federal authorities. It is not enough these days to keep an eye on suspicious foreigners: they should be reported to the U. S. Commissioner of Immigration at Washington, that their history may be traced so far as is possible. In this way known trouble makers of national rather than local reputation may be more readily apprehended.

Communism in Russia seems to have been a very profitable undertaking for the group who are making misery for the rest of Russia, and it is to be expected that they will use money liberally to widen their field.

Scientists and the Divining Rod

IN ANOTHER COLUMN will be found an account of the discussion at a meeting of the Royal Society of Victoria, in Australia, of the divining rod as a water finder. It is interesting reading. The general feeling of the meeting on the subject was the one we have before editorially expressed, that the divining rod, though often used in good faith, "was a subject for investigation on the part of the psychologist rather than the geologist." A number of experiments were cited indicating the cheerful and conscientious blundering around of divining-rod operators. Sometimes they struck water, sometimes not—exactly as if they had shot an arrow into the air and dug for water where it fell.

We recommend the study of the phenomena of the divining rod to a mixed committee of geologists and psychologists. A great deal of interesting data on the human mechanism would be the result; and the subject is well worthy of scientific investigation. Solid citizens —exceptionally solid and square-set on their feet—are credulous of this, as of all other wonders beyond their ken. They live by faith, for they really understand little of what is going on in this world.

We once watched an honest divining-rod operator who walked over a field, and his rod bent over with irresistible force when he passed over a certain kind of soil which he said he had assayed, and which ran $5 a ton in gold (his apparatus, we should have said, was "set" for gold, by slipping a gold bar into each of the handles). We noted with amusement the massive gold watch and chain which lay across the operator's breast, and the massive gold rings on his fingers, all of which fine gold did not affect the instrument that was convulsed by the supposedly $5 a ton dirt beneath his feet! Yet this evidence made no impression upon a lawyer and a banker who were present.

Therefore, to be complete, the study of the psychology of the divining rod should be extended to that of some of those who believe in it; and this would lead further on to the study of the similar firm basis of their other beliefs, and to the psychology of solid citizens as a whole. These are the types of men we observe going around the streets these days with their winter overcoats on, although for some days (as we write) the temperature has been above 80 deg. midday; but is it not after October the first, which is the one incontrovertible fact that these gentlemen grasp? They are of the solid supporters of society, who know quite firmly whether they are Republicans or Democrats, Baptists or Presbyterians: and what is right and what is wrong in general.

The Chemical Wizard

PROF. F. W. CLARKE, chief chemist of the U. S. Geological Survey, whose great work "The Data of Geochemistry" has gone through several editions and revisions, is now engaged in making a study of the chemical composition of waters. He finds the mineral contents of waters from different rivers and lakes to vary widely, and to correspond in the proportion of the elements which they contain to the chemical characteristics of the rocks which underlie the drainage basins, and from which the mineral elements have been derived by solution. So close is this that when a notable exception was found in one instance, and the mineral elements of a certain stream were found not to correspond to those of the rock terrains over which its drainage flowed, according to the map, Dr. Clarke investigated with great interest this apparent exception to the rule. He found that the map was wrong and showed the stream in a wrong location; and the corrected location showed the usual chemical correspondence between stream and rock.

On Making a Correction

THE total depravity of inanimate things is illustrated anew in the accidental misplacing of the tables and a transposition of headings on page 809 of *Engineering and Mining Journal* of this volume, in the article on "Mineral Resources of the Belgian Congo," in the Oct. 23 issue. Also the gold content per cubic meter of the Moto mine, in the same article, should have read 2.32 grams instead of 3.32 grams. The *Journal* wishes to make due acknowledgment to Mr. Sydney H. Ball for directing our attention to the matter.

Through a typographical error, on page 815 of the *Engineering and Mining Journal* of Oct. 23, Mr. Gilbert H. Montague was made to say in his article on the western hearings of the Minerals Separation case, "To make its demand for a 25-c. royalty effective, Minerals Separation . . . " This should have read, "To make its demand for a 12-c. royalty effective."

WHAT OTHERS THINK

Advantages of Alignment Charts

Permit me to refer to an article published in your issue of July 17, 1920, page 108, entitled "Charts for Computing Blast-Furnace Performances." This article discusses only the construction of the charts. The author evidently does not employ the alignment charts invented by M. D'Ocagne in 1884, which have advantages over rectangular co-ordinate charts for the plotting of equations with three variables.

I have at hand a catalogue issued by the Robins Belt Co., called "Handbook of Conveyor Practice." This shows, as a recent innovation, some charts used in substitution of many tables. This practice is valuable and ought to be followed by all manufacturers when presenting their products to the public; they need to give useful, definite data, which, if presented in tabular form, might occupy many pages of their catalogs, but when charted are in a very condensed and useful form. However, they should undoubtedly choose the system best suited to their needs.

In this system each variable is represented by one scale and the values which satisfy an equation of three

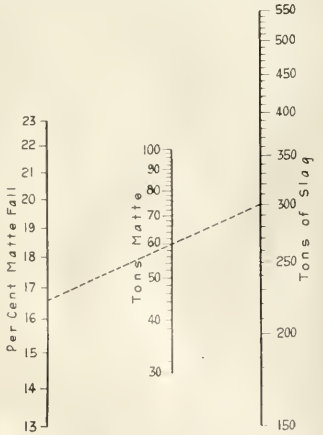


CHART FOR DETERMINING PERCENTAGE OF MATTE FALL

variables are always in a straight line. If one of the variables is the unknown quantity, it is only necessary to connect with a straight line the values of the other two variables and the prolongation of this line will intersect, in the scale, the corresponding value, which will solve the equation connecting the three variables. In practice, the straight line can be drawn with a lead pencil or indicated with a tightly drawn thread or by the edge of a rule or triangle.

To me the rectangular co-ordinate charts possess no other interest except historical; their construction is laborious, especially when curves must be drawn; the visual interpolation required to determine the approximate value of a variable is more difficult than on a scale, and the general aspect of the chart is confusing and similar to a cobweb.

I present for the consideration of your readers two charts of alignment scales which solve the same problems worked out by Mr. Ficket in order to show the greater simplicity obtained. For their construction the following data should be furnished: (a) The formula

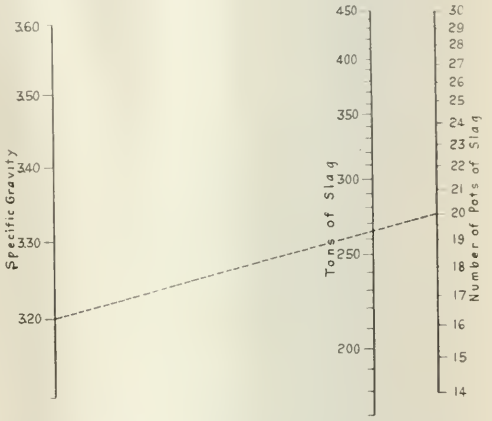


CHART FOR COMPUTING WEIGHT OF BLAST FURNACE AND REVERBERATORY SLAG

which connects the variables of the problem. (b) The limits within which the variables will be used. (c) The degree of accuracy which it is desired to obtain.

Pachuca, Hgo., Mexico. ABEL VALADEZ,
Santa Gertrudis Mine.

Turbo vs. Reciprocating Compressors

In Mr. Bancroft Gore's article entitled "A New High-Speed Turbo Compressor," appearing on page 717 of your Oct. 9 issue, he makes the statement, "Although the turbo blower, for capacities considerably in excess of these requirements, has generally supplanted cumbersome steam-driven reciprocating units, considerable difficulty was found in placing the order for the machine shown herewith." The capacity he refers to for his requirements is 4,000 cu.ft. per minute. I believe this statement is misleading.

I know of only four copper-smelting plants in the West in which a steam-driven turbo compressor has been installed for supplying air to copper converters. These compressors are rated at from 20,000 to 30,000 cu.ft. per minute, and deliver air at a pressure of from 11 to 16 lb. per square inch. At three of these plants the turbo compressors were shut down after operating only a short time, on account of their high steam consumption. At the other plant waste-heat steam is used for driving the turbo compressor, and the waste-heat steam is in competition with low-cost hydro-electric

power; however, the turbo compressor is operated only during the summer months, when there is no excess of waste-heat steam.

In two of the plants new reciprocating steam blowing engines have been installed since the turbos were installed, so that the latter may be kept shut down except for emergencies.

It appears from Mr. Gore's graph that his compressor, when working at its rated capacity of 4,000 cu.ft. per minute at 15 lb. pressure, requires about 4,600 lb. of steam per hour at 150 lb. gage and 100 deg. F. superheat and with a vacuum of 4 in. absolute and barometer reading 28.1 in. This is equivalent to 1.92 lb. of steam per 100 cu.ft. of air delivered, or, at 30 in. barometer, it would be about 1.94 lb. of steam. Under these air and steam conditions I would expect a good reciprocating engine equipment of this capacity to deliver 100 cu.ft. of air from 1.25 lb. of steam. A larger reciprocating unit would do better. Also, larger turbo compressors, when working at their rated capacity and with high vacuum, will more nearly approach the performance of reciprocating blowing engines. However, the economy of a turbo falls off rapidly at loads less than its rated capacity, whereas a reciprocating blowing engine maintains its economy fairly uniformly over a wide range in capacity.

The turbo compressor has advantages, as pointed out by Mr. Gore; however, for furnishing air for copper converter plants, where the amount required usually varies widely, and when the cost of generating steam is of consequence, it will often be found that these advantages are not of sufficient importance to be worthy of great financial consideration. A. G. McGREGOR.

Warren, Ariz.

The Cave Creek District, Arizona

I have just finished reading an article on the Cave Creek District, north of Phoenix, by Mr. Lewis in the *Engineering and Mining Journal* of Oct. 9. I made an examination of the Red Rover mine for the owner, Frank A. Gillispe, in September, 1920, going into the geology of this deposit in great detail, and I believe that Mr. Lewis is mistaken in his analysis. I will quote from our report.

"*Geology:* The Red Rover mine is situated in an area of sedimentary rocks which have been intruded by a dark greenish diabase and is overlain in part by a thick flow of rhyolite.

"To the south of the Bridal Chamber on the opposite side of the gulch is a granitic schist which has a strike of N 40 deg. E and dips 52 deg. to the north. Upon this granitic schist lies a series of sedimentary rocks. In order from the granitic schist upward and to the north they are red to brown sandy slate showing much jasper, a sandy slate, a white crystalline limestone, a sandy slate, a white crystalline limestone, a variegated brownish limestone, a sandy slate, arkostic sandstone, slates, a conglomerate and a highly metamorphosed slate. Under ground part of these same sedimentary rocks are found, and in addition there is a large area of a dark greenish diabase which has been introduced.

"In the vicinity of the vertical shaft the sedimentary rocks are covered by a rhyolithic flow which forms in a half moon to the south of the shaft. The surrounding mountains are capped with a heavy basaltic flow.

"The granitic schist has the appearance of having been faulted against the sedimentary rocks. The sediments show the effect of great pressure which has produced a schistosity in all of the sediments which has an almost vertical dip and strikes to the northeast. The sedimentary rocks have all been very much metamorphosed by the compressive force.

"*Orebodies:* The principal orebodies occur in a fissure which follows very closely a stratum of crushed variegated limestone. With the exception of a short distance near the west end of the ore drift south of the shaft on the 500-ft. level, the hanging wall of the ore is the bedding plane of a fine-grained sandy slate which overlies the variegated limestone, and the foot wall of the ore is a white crystalline limestone. In the vicinity of the ore the crushed variegated limestone is completely silicified. On the surface the diabase is seen in contact with the ore to the west of the inclined shaft."

The orebodies are some distance from the granitic schists and have no connection with them.

Los Angeles, Cal. RUSH T. SILL.

Boxite or Boozite

As an early contributor to *Engineering and Mining Journal*, in fact as long ago as 1883, I feel that I want to enter a protest against the use of its columns as a means for disseminating the principles of the proper use of language.

In the issue of Oct. 2 your correspondent, and with the well-chosen pseudonym (for we all know how light of weight is aluminum), takes a whack at the philologists by interrogating their authority. Unfortunately, he apparently does not know that bauxite, or beauxite, is not, I believe, found at Bozeman, Mont., although corundum is, nearby: that this hydroxide derives its name, not from Bozeman, Mont., but from the original locality, Baux, near the old Roman town of Arles, southern France, and that most, if not all, of the authorities (and I do not add an inclosed interrogation) agree that the mineral be pronounced as is the name of the French locality, with the added *lithos* or ite. I never could understand how box could come out of baux or beaux.

He then adds: "But who ever heard it called that? Why, even professors of mineralogy," etc. Well, I have very generally heard it pronounced correctly. To be sure, I have also heard boxite, but by a very few persons who are not supposed to know better, and hence were excusable. However, my preceptors of years ago pronounced it as indicated by Murray, the Standard, the Imperial, et al., wherein I appear to have been more fortunate than Al. U. Minum. And it was never my misfortune to have my teachers make lapses in English like e. g. "Ain't it fine?" but I am told that there are some guilty ones even today. But Al. U. Minum does not in his communication venture to tell us how he pronounces bauxite.

I refer your correspondent to my article in the New York *Sun* of Nov. 23, 1919, and if he really is in search of some "choice bits" of deviation from the straight and narrow path of good English, to the Cleveland daily papers. JOHN EYERMAN.

[The derivation of the word bauxite has been familiar to us since our earliest infancy, and we are perfect in French, as in all other languages; yet in America we (ourselves) pronounce it "boxite." We like to make ourselves intelligible, and the Anglicization of the pronunciation of words of foreign origin is an established linguistic principle. The discussion is closed.—EDITOR.]

Trailing Out of Murphy, Idaho

MURPHY, IDAHO, IS THE SHIPPING POINT FOR THE DEMING MINES CO.

The property of the Deming Mines Co. consists of thirty-eight claims and is situated about forty miles southwest of Murphy, Owyhee County. The ore is sulphide and carries gold and silver. Considerable new development has been done. The equipment, in addition to a hoisting and compressor plant, consists of a 100-ton mill provided with ball mill, six-cell Janney flotation machine, Senn tables, Oliver filter, roasting furnace and cyanide plant. The property is temporarily shut down pending re-financing.

HALF-WAY STATION ON FORTY-MILE WAGON ROAD BETWEEN MURPHY AND THE DEMING MINE

ON THE TRAIL FROM MURPHY. THE FERRY ACROSS THE SNAKE RIVER. SUPPLIES ARE TAKEN IN AND CONCENTRATES BROUGHT OUT

PART OF THE FORTY-MILE WAGON ROAD BETWEEN MURPHY AND THE DEMING MINE. TRANSPORTATION OF SUPPLIES AND CONCENTRATES IS BY MOTOR TRUCK

Recovery of Silver From Manganese-Silver Ores

Chloridizing Roasting Followed by Cyaniding Offers Considerable Promise on Material Which Cannot Be Treated by Less Costly Processes—Volatilization and Recovery By the Cottrell Process Also Being Developed

By Jay A. Carpenter
Consulting Metallurgical Engineer, Los Angeles, Cal.
Written for *Engineering and Mining Journal*

IN PRESENTING a method of treating certain refractory manganese-silver ores by chloridizing roasting followed by cyaniding, it is necessary to state that it is simply the combination of two well-known metallurgical processes that in the last two decades have had the disadvantage of high loss of silver by volatilization and too high an operating cost with silver at low prices. With the steady development of roasting furnaces and pyrometers, with the use of crude oil and powdered coal as fuels, with the invention of the Cottrell system, and, lastly, with the marked increase in the price of silver, this method may now be applicable to silver properties with refractory ore that at present lie dormant.

Rapid development has taken place in the treatment of silver ores since the days of Hofmann, Stetefeldt, Brückner, and Russell. In the 60's and 70's the chloridizing roast, followed by the hyposulphite leach or amalgamation, was the accepted method of silver recovery from ores of too low grade to smelt. With the drop in the price of silver this low extraction method became impracticable. Starting with the new century came the application and intensive development of the cyanide process to the treatment of both oxidized and sulphide silver ores. This process, alone or in conjunction with table concentration, treats successfully nearly all silver ores that carry little of the interfering base metals.

Economic Limit of Flotation

In the last five years the flotation process has solved successfully the problem of treating base silver ores in which the silver occurs in the form of a sulphide along with copper, zinc, or lead sulphides. Just as the ambitious cyanider of fifteen years ago found to his sorrow that cyaniding had its limits when applied to manganese silver ores, so the flotation expert of today is learning that flotation has its economic limit when applied, with sulphidizing, to treat oxidized silver ores. Low extraction and erratic results will probably limit this combination to sulphide ores with a very small oxidized content.

The combination of the cyanide process with a reducing process successfully solved the treatment of Nipissing low-grade silver ore, in which the silver was combined with arsenic and antimony in refractory sulphides. There still remains to be successfully demonstrated, however, a practical way to treat the refractory manganese silver ores and the oxidized ores of silver combined with copper, lead, and zinc.

Two Available Methods for Treating Manganese Silver Ores

Two proposed methods of treating the manganese ores are about to be tried out in operating plants. The older one is that of giving the ore a preliminary wet treatment with SO_2 gas, to reduce the refractory oxidized silver compounds. This method should prove successful where the SO_2 can be made cheaply and where it would not be destroyed by carbonates in the ore. The other method is that of giving the ore a reducing roast before cyaniding, and can be applied to ores containing carbonates. The success of this process will depend on the type of the roasting furnace, and the operating care given the roast, as silver oxidizes very readily to compounds insoluble in cyanide. It will probably solve the treatment problem of certain manganese silver ores, but not all, as many of these ores are benefited but little by a reducing roast and a few are made more refractory. Skilled metallurgists worked on the treatment of oxidized silver ores combined with copper, lead, or zinc without success, and it was only because of a rapid rise in the price of metals that the practical metallurgist ventured to try roasting as an aid to the problem.

The Chloridizing Roast

As the silver is locked up in an insoluble form by an oxidizing roast, it was natural that the line of attack lay in a chloridizing roast. The process of preliminary chloridizing roasting as applied to oxidized lead ores, before brine or acid leaching, was carried out in plants in Utah with small volatilization loss and with fair success, owing to cheap salt and fuel. However, with strictly silver ores there was still the drawback of the loss of the metal by volatilization of the chlorides. In the silver plants of the 60's this loss usually amounted to from 10 to 25 per cent of the silver content. It is true that early in the first decade of the present century came the idea of driving off all the metals as chlorides and catching them in specially constructed dust chambers, but one such commercial plant proved a failure.

The Importance of the Cottrell Process

The development of F. G. Cottrell's remarkable and simple method of collecting dust and fume revived this process. Volatilization, which was the difficulty in the chloridizing roast in the 60's, is now relied upon to recover all of the silver, copper, and lead as volatile chlorides, giving the roasted ore as a tailing product. The Western Precipitation Co., of Los Angeles, controlling the Cottrell patent, is doing a great deal of experimental work with special reference to gold- and silver-bearing copper carbonate ores in a limestone gangue. The U. S. Bureau of Mines, at its Salt Lake station, has done and is doing much valuable work on the application of the process, especially to lead ores.

Small-scale tests have demonstrated that over 90 per cent of the gold, silver, copper, and lead in oxidized ores can be recovered as a chloride fume by this method. The fuel and chemical consumption and other details of treatment in these tests have been such as to give hopes that the process can be made commercially

successful on low-grade ores where fuel and salt can be delivered at a reasonable cost for freight charges. The process is fortunate in that the mechanical details of chloridizing roasting and recovery of the fume by the Cottrell system and its reduction by fusion appear to offer no serious difficulties. The scope of the process depends principally upon the oil consumption per ton of ore, not only to chloridize the ore but also to maintain the necessary temperature at which the large stream of heated air gradually picks up and carries off the chlorides from the roasting furnace to the collectors.

Application of Chloride Volatilization Process

The vapor pressure of silver chloride is probably considerably less than either that of gold, lead, or copper, and this accounts for its slower recovery by this method. Hofmann, in his "General Metallurgy," states that silver chloride alone is non-volatile at red heat, but is carried along with the more easily volatilized chlorides. From this it would seem that the chloride volatilization process opens a new field for the treatment of oxidized copper and lead ores carrying silver and occurring in a limestone gangue, but that it is not well adapted to the treatment of ores containing silver only. However, its development is rapidly increasing available knowledge of chloridizing roasting and the recovery of volatilized chlorides, and suggests the possibility of treating refractory silver ores containing no copper by a chloridizing roast at just high enough a temperature to chloridize the silver, and recovering the volatilized silver by the Cottrell system and the major portion by leaching the roasted ore with a weak cyanide solution.

A CREW OF TONOPAH CYANIDERS

From Hofmann's "Hydrometallurgy of Silver" I condense the following information:

Chloridizing roasting was usually applied to complex sulphide ores, although in some cases ores free from sulphides were successfully roasted. The object of the roast was first to oxidize the sulphides, then chloridize the metals, and then, if followed by amalgamation, to drive off the base-metal chlorides by volatilization. In the first part of the roast the sulphides burned, forming sulphates, which then reacted with the sodium chloride to give chlorine and metallic chlorides. The iron chlorides did not volatilize, but gradually oxidized, releasing chlorine for the chlorination of the other metals. The copper, lead and zinc chlorides volatilized readily, whereas the silver chloride did not, the quantity volatilizing depending on the amount of the other metal chlorides volatilizing and upon how high the heat was carried. Arsenic and antimony volatilized rapidly as the oxides before chlorine was released, and the balance went off as chlorides. If the ore contained gold, a considerable portion of it was lost as a volatile chloride, and the balance left as metallic gold, making amalgamation necessary.

The action of quartz in the ore was indifferent until at high temperature it decomposed salt, giving chlorine and sodium silicate. Clay, slate, and gypsum were inert. Lime rock acted unfavorably, as it decomposed metallic sulphates and chlorides to give calcium sulphate and chloride, thus consuming much salt and preventing the complete chlorination of the silver.

In general, the ore was crushed coarse in order to leach after roasting. To it was added about 5 per cent salt, and it was roasted with wood as the fuel in various types of furnaces, including the Brückner, Stetefeldt, and Howell-White. The metallurgists varied the degree of heat, length, and time of roast, the amount of air used, the time of adding, and the amount of salt, all according to the composition of the ore and their ideas of the process.

The roast took several hours, the dusting losses were heavy, and the volatilization loss of silver high. The consumption of fuel was low on heavy sulphide ores but high on oxidized ores unless a Stetefeldt furnace was used to bring the ore in direct contact with the flame. However, Hofmann states from his own experience that if he used a thick bed of ore, lots of air, and a low heat, the fuel consumption could be kept low and that the loss of silver by volatilization could be reduced to as low as from 2 to 5 per cent.

When the difficulties of maintaining an even heat with wood as a fuel are considered, and the unreliable method of judging temperature by the color of the furnace, the difficulties under which these metallurgists worked to find and maintain the best conditions readily can be appreciated. After sampling, in great anticipation, a couple of tailing piles of roasted silver ore in Nevada, I have come to the conclusion that they succeeded very well in removing the silver from the ore.

I do not know how much of the silver went up the roaster stack, but they were aware of this loss and worked hard to prevent it. In contrast to this is the fact that nearly all of the work in the present century on the chloridizing roast has been to get the silver to go up the stack. The pioneer in the work is Stuart Croasdale, of Colorado, who, in 1903, carried out successful experiments and patented the process. In 1906 a large plant, based upon the experimental work, was erected at Mayer, Ariz. Cement kilns were used for roasting and specially designed dust chambers to recover the fume. As is usual with a new process, much was written about the plant and what it would do. Later, the work of Christianson and Holt in chloridizing lead ores, and the invention of the Cottrell collectors, stimulated new interest in the process, and in 1917 the Bureau of Mines station at Salt Lake City, under O. C. Ralston, published the results of a great deal of experimental work.

Speaking of the volatilization of silver, Ralston states that in a reverberatory furnace treating an oxidized lead ore, with one hour's treatment at 900 deg. C., all the lead and copper are volatilized, leaving 10 to 20 per cent of the silver. The zinc volatilization varied greatly, being from 5 to 75 per cent. Concerning sulphur, he states that over 2 to 3 per cent in the ore gives lower silver volatilization recovery. His conclusion was that oxidized lead-silver ores can be chlorinated at 600 deg. C. and then successfully leached, or at 900 deg. C., and the metals recovered as a fume.

However, a working plant based on this experimental work was erected by a mining company at Eureka, Utah, the history of which is similar to that of the Mayer plant of eleven years before.

Recent Work on the Volatilization Process

The Bureau of Mines is still working on the problem, having recently made a working test at the Yellow Pine mill at Goodsprings, Nev., on the volatilization of silver and lead from a zinc carbonate concentrate. Another working plant under the direction of Robert H. Bradford is about to start up at Salmon, Idaho, to treat a copper ore. A subsidiary of the Western Precipitation Co. has a small plant at Humboldt, Ariz.

With so many working on the process, and with the failures of the past as a guide, there is a good chance for success, for the problem is mainly that of reducing the fuel and chemical consumption. The Bureau of Mines did not publish the percentage of recovery of the volatilized metals, but with ample collector capacity it is stated that from 95 to over 99 per cent are recovered.

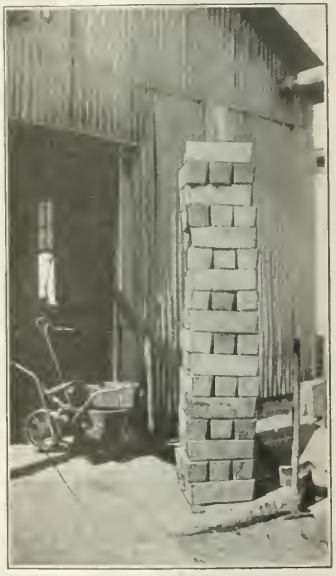
From a chemical standpoint present-day chemists have not added much to the improvement of the chloridizing roast, the principal improvements being mechanical. The best chemical improvement is the addition of calcium chloride along with the sodium chloride, a change which undoubtedly speeds up the chlorination, with a consequent saving of fuel. To melt down the fume, producing calcium chloride as a slag, is also an advantage. The present-day investigators have found, contrary to the old idea, that zinc is very slow to volatilize, and that limestone in the ore is generally beneficial to chlorination. Although the mixing of ores to prevent sintering has been given some attention, nothing has been published about it, or about the design and control of the furnace, or other ways greatly to increase or reduce the temperature of chlorination and the speed of volatilization, all of which are now the weak points of the process. The Cottrell system, by not only recovering the volatilized metals but also the volatilized sodium and calcium chlorides, has come to the rescue of the chlorination roast of silver ores.

Benefit of Fine Grinding

The silver metallurgist who knows the ease with which a silver chloride is cyanided is naturally inclined to believe that with a refractory manganese-silver ore containing no copper it is unnecessary to attempt to drive off the silver as a chloride when it can be recovered as a metal cheaply by a well-tried process.

The silver of a raw silver chloride ore goes into solution in a weak cyanide solution very rapidly, and the time and percentage recovery are usually dependent upon fine grinding. A minimum of agitation and aëration is required. Sodium cyanide dissolves more than its own weight of silver, adding harmless sodium chloride to the solution. On precipitation with zinc, the double zinc cyanide formed under reducing conditions is an excellent solvent for silver chloride under oxidizing conditions in the agitators. At a mill that I operated, treating a silver chloride ore, the actual consumption of cyanide was less than the theoretical amount of new cyanide required to dissolve the known weight of silver. This, taking in consideration also the mechanical loss of free cyanide from the plant, indicated that the same cyanide molecule must have been combined several times in rotation with silver, then zinc, then silver, and so on. On recent experiments with a raw silver chloride ore containing zinc carbonate, solution used for the sixth time showed as low a cyanide consumption and as high an extraction on the ore as when used the first time. The reason is that the solution remains free from soluble sulphides, sulphocyanides, and the like. Such ores are usually well oxidized, which aids the solution in remaining fresh and active.

Freshly precipitated silver chloride is apparently as quickly soluble in cyanide solution as salt in water, as one notices when titrating a cyanide solution containing sodium chloride in solution with the standard silver nitrate solution. As long as there is a trace of cyanide, the cloud of silver chloride formed by the rapid addition of the nitrate disappears almost instantly. Titrating with Aero cyanide shows the same action.



A TOWER OF SILVER

It is thus easy to understand how quickly the freshly formed silver chloride from a chloridizing roast of a silver ore goes into solution in a cyanide solution. With such a roasted ore I have obtained with a 0.75-lb. NaCN solution an extraction of 50 per cent in one minute, 75 per cent in five minutes, and the maximum extraction in one hour. Zinc in the roasted ore will do no harm, because, if it forms any double zinc cyanide with the free cyanide in the solution, this compound still remains an active solvent for the silver chloride. With the sulphur removed from the ore by the roast, and the iron thoroughly oxidized, the contact of the ore with the solution tends to oxidize instead of reduce it, thus promoting extraction.

Comparing this with the loss of cyanide and lack of dissolving efficiency of cyanide solutions working on silver sulphide ores so well discussed in E. M. Hamilton's "Manual of Cyanidation," one can appreciate the simplicity and cheapness in cyaniding a silver ore that has been given a chloridizing roast. From a mechan-

ical standpoint the roasted ore is coarse enough to leach readily. The wider one's acquaintance becomes with the cost and difficulties of the modern all-sliming mill, the more he will appreciate this brief statement.

The question arises as to what effect the continuous accumulation of soluble chlorides in the cyanide solutions would have on the extraction or precipitation. The answer, without detailed operating experience, would be that ocean water has been used as the source of supply for cyanide plants. The American Cyanamid Co. states also that Aero brand cyanide contains 43 per cent of soluble sodium and calcium chlorides and that it is used in one mill at the rate of 278 lb. per ton of ore on 3,000-oz. silver ore, with the barren solutions retained in the circuit, and "no fouling occurs." However, if the soluble chlorides should give trouble, or their recovery would be of economic value, they could be leached off as a strong brine before cyaniding, to be used in whole or part as a solvent in the Cottrell system and then to dampen the ore going to the roaster, and thus furnish chlorides for the roast.

Short Treatment at 900 Deg. C. Gives Good Results

From my test work on several oxidized refractory silver ores I have drawn a few general conclusions as follows: A temperature of about 900 deg. C. is necessary to get a high chlorination of the silver. The time of roasting at this higher temperature is short, being only thirty to forty-five minutes. Sulphide ores do not give better results on silver chlorination at lower temperature than oxidized ores, which is contrary to Hofmann's results from practical experience, but agrees with Croasdale's idea of the efficiency of the action of silica in freeing chlorine from salt, and of the Bureau of Mines' statement of the efficiency of volatilized sodium chloride as a chloridizer. With an oxidized ore the presence of carbonates appears to be beneficial, probably from the fact that they retain the chlorine down in the ore bed as chlorides, releasing it slowly with rising temperatures. Hofmann, in his "General Metallurgy," states that lead, zinc, and iron carbonates decompose when the temperature reaches 400 deg. C., manganese and magnesium at 600 deg. C., whereas calcium requires 900 deg. C. However, I believe the reaction between limestone and salt starts considerably below this temperature, as an ore with considerable limestone in it showed no contained carbonates after roasting at less than 900 deg. C.

Calcium and magnesium chlorides appear to react and volatilize faster and at a lower temperature than sodium chloride. I cannot, however, agree with Haria R. Layng that they are so much superior to sodium chloride as chloridizing and volatilizing agents. In fact, on oxidized silver ores I have been unable to make a high volatilization recovery of the silver with either of these chlorides or with sodium chloride, with a temperature of over 1,000 deg. C. for one hour, with rabbling and a fairly strong current of air.

The Treatment of Mined Gold and Silver Ores

Gold volatilizes more quickly than silver, and on a certain refractory oxidized silver ore carrying 0.5 oz. gold and 10 oz. silver which was chlorinated several times at 900 deg. C. for forty-five minutes, approximately 40 to 50 per cent of the gold volatilized, whereas the silver showed no measurable loss. This was rather exceptional, as with another ore containing no gold but the same amount of silver, and chlorinated under the same conditions, approximately 10 per cent of the silver volatilized. The total percentage of silver chlorinated under similar roasting conditions apparently varies rather directly with the silver content, for with a 40-oz. ore the tailings after cyaniding showed an extraction of 95 per cent, whereas with a 5-oz. ore it was only 80 per cent. However, the cost of the chloridizing roast limits it to 10-oz. ore or better.

From a manipulation standpoint it is easy to determine when the salt melts, when the sulphides burn, when the chlorides start to come off, and when the chlorine is about exhausted. When a stream of warm air is directed over the roast the volume of fume is increased many times, but there is little difference in the total percentage chlorinated, although considerable difference in the amount volatilized. However, contact with air is necessary, as roasts without rabbling gave poor results. On roasts similar except in the use of calcium chloride instead of sodium chloride, the chlorine fumes started at a lower temperature and were much heavier, but diminished to a small volume in very much less time. This proved the value of a mixture to maintain uniform chlorination with the minimum amount of chlorides. Refractory manganese-silver ores contain silica and iron oxides, and usually calcite or limestone. Care must therefore be taken, if the temperature is raised to 1,000 deg. C. to drive off the chlorides, that the ore does not sinter and thus lock up the silver compounds, preventing chlorination as well as volatilization. Steady rabbling of the ore, and fluxing it to change its composition, will aid somewhat. These observations on the roast are given in detail to aid anyone who wishes to experiment. In my work I use for preliminary experiments 400-g. portions of ore, using as the roasting dish a 6 x 12-in. muffle cut away at the top, and making the roast in a large muffle furnace with auxiliary gas burners, air hoses, and complementary appliances.

Only Coarse Crushing Necessary

In the practical application of the process of chlorinating and cyaniding refractory manganese-silver ores, the ore would be crushed to only 4 or 20 mesh. In out-of-the-way places with wood as a fuel it would be roasted in charges in Brückner furnaces. Where fuel oil or coal can be obtained, the choice would lie with a continuous rotary kiln, or a furnace with horizontal hearths if it would stand the heat. The Cottrell collectors can be placed in the stack flues, or individual units used, or they may be built of wood, as at certain cement plants. The size of the installation is remarkably small, and the amount of power required surprisingly low. A simple leaching plant would cyanide the roasted ore, and the same refining furnace would treat both the zinc precipitate and the silver chloride, giving silver bullion as the final product.

The reduction in cost of the simple crushing and leaching plant over that of an all-slime plant should go far toward balancing the cost of the roasting furnace. The economy in power and labor should balance to a large extent the extra cost of supplies, which would be largely for fuel and salt. Where these can be delivered at the reduction plant without high freight charges, it may be possible to treat refractory silver ores that can otherwise be treated only by smelting.

The amount of oil necessary to bring a ton of ore to 1,000 deg. C. and keep it there a sufficient time to

volatilize the metals is variously estimated at from 15 to 25 gal. To heat the ore to 900 deg. C. for a shorter time, for chlorination only, would require considerably less. The amount of new salt required for volatilization is estimated from 50 to 180 lb. per ton, with probably less for chlorination only.

The volatilization process has not yet been demonstrated in working plants, but there is, in my opinion, a wide field of refractory ores to which it is adapted. On the other hand, the combination of chloridizing and cyaniding as outlined in this article can be considered as established, and the only new feature is its combination with the Cottrell system. It is limited to silver ores that cannot be treated by less costly processes.

For students of these processes I append a list of books and published articles. Unfortunately, the list of authors does not contain the names of many metallurgists now working on chloridizing and volatilizing precious-metal ores. A discussion of their work would be of benefit to all:

Hofmann's "Hydrometallurgy of Silver."
Eissler's "Metallurgy of Silver."
Hamilton's "Manual of Cyanidation."
A. I. M. E., Vol. LVII, "Salt in the Metallurgy of Lead," with discussions.
A. I. M. E., Vol. LIX, "An Automatic Bag Filter at Depue."
A. I. M. E., Vol. LX, "Electrostatic Precipitation."
A. I. M. E., Vol. LXI, "Use of Coal in Pulverized Form."
A. I. M. E., June '20, *Bulletin*, "Tooele Flue-Type Cottrell Treater."
E. & M. J., Vol. 76, Articles by Stuart Croasdale and others.
E. & M. J., Vol. 106, "Roasting Sulpho-Telluride Ores for Amalgamation and Cyaniding," by A. L. Bloomfield and J. M. Trott.
E. & M. J., Vol. 108, "Silver Volatilization in Smelting," by F. P. Dewey.
M. & S. P., Sept. 1, 1916, "The Mayer Arizona Plant."
M. & S. P., July 12, 1919, "Chloride Volatilization Process," by Blamey Stevens.
M. & S. P., Jan. 17, 1920, "Chloride Volatilization Process," by Haria R. Layng.
Chem. & Met. Eng., "The Cottrell Process," by A. A. Heimrod and H. D. Egbert.

South African Diamond Mines Prosperous In 1919

The diamond-mining industry, which, next to gold mining, is the most important of the mining industries in South Africa, enjoyed a particularly prosperous year in 1919, according to *Commerce Reports*. The output was increased from 2,543,735 carats in 1918 to 2,592,099 carats in 1919, a gain of 48,364 carats, and the value increased from $33,876,008 in 1918 to $54,688,647 in 1919, or nearly $21,000,000. Exports of diamonds during 1919 amounted to 2,752,303 carats, valued at $56,192,346, as compared with 2,571,646 carats, valued at $34,372,298, exported in 1918. In the pre-war year 1913, however, the exports of diamonds amounted to 5,503,861 carats, valued at $58,478,419.

The diamond market throughout the whole year was in a buoyant state. Prices advanced materially, owing primarily to the limitation of sales to market requirements, a policy which has been consistently pursued by the principal diamond producers in South Africa. A comprehensive agreement was reached by the three largest producers of diamonds in South Africa and the principal group of producers in the Southwest Africa Protectorate, whereby their entire output will be purchased by the London Diamond Syndicate, and placed upon the world's market through this one channel only.

Movements of Metals and Ores in August

Imports and exports of the more important metals and ores, as reported by the Department of Commerce for August, 1919, and the figures for August, 1920, as finally revised, are as follows:

IMPORTS, AUGUST, 1919 AND 1920
(In Pounds, Unless Otherwise Stated)

	Aug., 1919	Aug., 1920
Antimony ore, contents	78,400	146,284
Antimony matte, regulus or metal	741,550	2,570,743
Copper:		
Ore, contents	4,172,049	5,752,146
Concentrates, contents	3,262,921	5,287,911
Matte, regulus, etc., contents	1,648,708	130,588
Imported from (in part)		
Canada	2,670,936	3,831,447
Mexico	3,204,371	2,134,787
Cuba	2,143,507	4,123,917
Chile	169,385	203,252
Peru	54,633	405,361
Unrefined, black, blister, etc	15,954,604	17,971,202
Refined, in bars, plates, etc	1,429,343	
Old, etc., for remanufacture	439,915	1,894,317
Composition metal, copper chief value	98,400	324,717
Lead:		
Ore, contents	860,654	1,500,484
Bullion, contents	4,959,021	5,139,435
Imported from (in part):		
Canada	300,765	745,597
Mexico	5,508,058	5,873,237
Pigs, bars and old	1,120,089	7,403,826
Manganese ore, long tons	8,240	99,601
Imported from (in part):		
Brazil, long tons	3,600	88,776
British India, long tons		4,900
Tungsten ore, long tons	553	131
Pyrites, long tons	30,705	48,832
Imported from (in part):		
Spain, long tons	21,275	19,201
Canada, long tons	9,430	16,940
Tin ore, long tons	33	5,385
Tin bars, blocks, pigs, etc	9,872,459	11,195,937
Imported from (in part):		
United Kingdom	5,901,348	2,039,044
Straits Settlements	2,746,253	5,969,928
Dutch East Indies		220,459
Hongkong		2,387,847
Australia	224,000	181,440
Zinc:		
Ore, contents	1,606,497	2,083,429
Imported from:		
Canada	195,646	366,162
Mexico	1,402,151	1,717,267
Blocks or pigs, and old	11,545	1,826

EXPORTS OF COPPER, LEAD, AND ZINC
(In Pounds)

Copper:		
Ore, contents	None	None
Concentrates, contents	10,500	None
Unrefined, black, blister, etc	1,176,390	61,437
Refined, in ingots, bars, etc	47,385 901	39,050,235
Exported to (in part):		
Belgium		2,978,454
France	8,901,736	14,633,149
Germany		4,808,472
Italy	4,490,261	112,285
Netherlands		2,327,411
United Kingdom	11,358,619	6,828,152
Japan	15,095,000	
Sweden		2,889,617
Composition metal, copper chief value	1,226	11,417
Old and scrap	20,223	123,907
Pipes and tubes	295,856	653,994
Plates and sheets	591,784	3,901,891
Wire, except insulated	3,203,901	2,056,285
Lead:		
Pigs, bars, etc.:		
Produced from domestic ore	1,657,083	188,057
Produced from foreign ore	7,498,822	509,504
Exported to (in part):		
Denmark		112,000
Canada	230,023	17,074
Brazil	258,719	134,400
China	224,305	6,092
Zinc:		
Dross		82,100
Spelter:		
Produced from domestic ore	23,204,687	16,268,344
Produced from foreign ore	1,519,872	196,020
Exported to (in part)		
France	6,914,357	2,082,267
Italy	2,075,780	280,035
United Kingdom	11,390,296	12,579,686
Mexico	120	28,776
In sheets, strips, etc	3,964,261	1,385,433

Norwegian Nickel Industry Curtailing.

It is reported by the *Mining Journal*, London, that 200 out of 1,250 workmen employed by the Evje Nickel Ore Mines, in Norway, have been discharged, owing to the costs of production making it almost impossible for the company to compete with foreign rivals.

Stuck Steel

Methods That May Be Used To Eliminate One of the Annoyances That Beset the Drill Runner — Several Causes Contribute to the Handicap of Stuck Steel, Which Is Incidental to Operations in All Mining Districts

By D. E. Dunn
Written for *Engineering and Mining Journal*

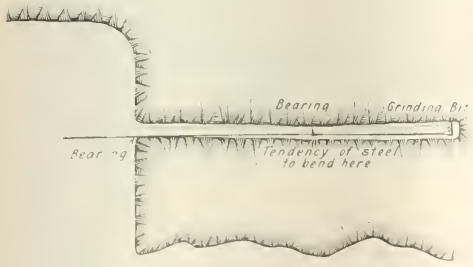
EVERY mining district has the most difficult drilling in the world. If you don't believe this, ask the drill runners about the conditions in their district. In the Michigan copper country the amygdaloid is bad and conglomerate is worse. In the Lake Superior iron district the soft hematite is sticky and the cherty iron carbonate wears the bit gage. Butte rock is hard and "fitchery"; Joplin ground is full of "vugs," and the pebbles falling behind the drill bits stick the steel—and so it goes.

One of the principal troubles that cause difficult drilling is stuck steel. Drill steel becomes stuck for the following reasons:

1. Improper alignment of drill steel and hole.
2. Incorrect type of bit.
3. Incorrectly formed bits.
4. Feeding too much or too little water.
5. Weak drill rotative power.
6. Worn or broken shanks.
7. Worn or broken drill parts.
8. Drilling into a seam or in "fitchery" ground.
9. Pebbles falling behind bit or mud collar forming behind bit.

A common cause of stuck steel is the improper alignment of the drill steel with the hole. When this occurs the drill steel will bear on at least two points in the drill hole, there is a tendency for the steel to bend, increasing with the divergence from true alignment, and a severe grinding on the reaming surfaces of the bit. All of this will cause difficult rotation and will, in many cases, stop rotation entirely.

This condition is due to poor operating. The steel must be brought nearly into line to have it enter the hole. The experienced drill runner can line up the

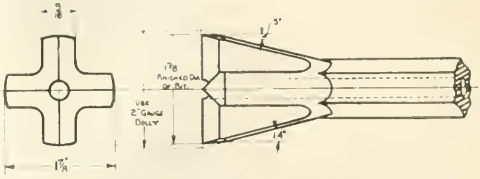


STEEL AND HOLE OUT OF ALIGNMENT

drill laterally "with his eye." He will do this after entering the steel and cranking it nearly to the cutting face, and tighten his "tee-bolt nut." He will then open the throttle (inlet) valve a little, and let the drill find its own vertical line, helping it a little by raising up on the crank end, and finally tightening the clamp bolt nut. If the hole is very much out of line time can often be saved by abandoning it entirely and starting a new one.

The choice of the proper type of bit is important in helping to eliminate stuck steel. For example, a narrow rapid-cutting chisel bit would bury itself in some soft limestones. Six-point bits are usually in disfavor because of their slow drilling and small clearance space for the cuttings.

The cutting edge has the greatest diameter on a single taper bit. This cutting edge wears rapidly, and soon the diameter is less than at another point farther back on the bit. Then the hole cut by the cutting edge is too small to admit the rest of the bit and a reaming action takes place which will soon stall the rotation and



11 AND 5 TAPER 4 POINT CROSS STRAIGHT FACE WET BIT

stick the steel. To overcome this many and varied designs of bits have been made, some of which were extremely complicated, and if they had any advantage underground, the time taken by the blacksmith to make them and resharpen them more than outweighed this advantage.

The bit that has been found most successful for rapid cutting, long-wearing gage, and ease of making and resharpening is the 14 deg. and 5 deg. double-taper cross or four point. This double-taper bit when properly made has a reaming surface whose diameter is the same as the diameter of the cutting edge and which backs up the latter with a good stock of metal, increasing the life of the gage. It also acts as a guiding surface, preventing the steel from running off into seams or fissures. The use of this type will, in the majority of cases, remedy any trouble caused by wear of gage.

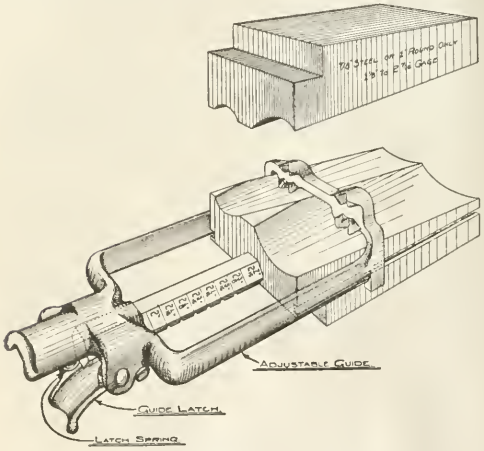
It has already been said that the bit should be properly made. That leads to consideration of the methods of making and sharpening drill steel and their bearing upon stuck steel. Primarily, there are two methods of sharpening drill steel, by hand and by machine. The latter method is by far the more rapid, accurate, and satisfactory, and should be used wherever three or more drills are in operation. However, even machine-made bits are sometimes faulty. This is usually due to careless blacksmithing, because the machines are extremely simple and rugged and, should they get out of adjustment, it is a relatively easy matter to put them into proper condition again.

The manufacturers of drill-steel sharpeners are continually making the machines more nearly fool-proof. One of the latest improvements for assuring better bits is the use of double-bored gaging blocks with an ad-

justable latch guide. The wide range of these blocks permits the operator to gage accurately an entire normal run of steel on the one set of blocks, and these adjustments for the various gages require only the pressure of a finger on the adjustable latch guide.

An interesting but less common cause of stuck steel is the feeding of too much or too little water through the hollow drill steel. When too little water is fed a mud collar frequently forms behind the drill steel, which makes it difficult to extract the latter. Sometimes when drilling into rock bearing metallic ore, and too much water is fed, a mineral separation takes place. The gangue is sludged off, and the drill pounds away ineffectively on the metallic residue, finally becoming stuck. Sometimes dry drills are run in abrasive ground. The steel soon heats up, and the temper is rapidly burned out of the bit. This condition may be remedied by using a water feed or a wet drill.

Sometimes the shank portion of hexagon steel becomes so worn that it permits the steel to slip in the rotative sleeve, or the lug on round steel becomes worn



DOUBLE BORED GAGING BLOCKS

or broken off, with the same result. The drill steel will then be hammered into the ground without rotating and will soon become stuck. The only remedy for this is to keep the shanks in proper condition. The same results are obtained when use is made of worn or broken drill parts, principally worn pawls, chuck and bushings, and broken pawl springs and rifle bars. The only remedy for this fault is to replace the worn or broken parts.

The rotation of some drills may be too weak for the rock conditions. This, however, is exceptional, because rock-drill manufacturers have strengthened the rotative power of the drills up to a practical limit. Frequently, drill trouble is attributed to weak rotation when that is far from being the true cause.

Unequal cutting may easily take place when drilling into a seam or in fitchery ground, and this throws the steel out of line and sticks it. Drilling into brecciated ground sometimes causes pebbles or small bits of rock to fall behind the bit, and these wedge against the steel and the drill hole, stopping rotation. In some limestones and other calcareous formations the water mixing with the cuttings will form a mud collar back of the bit.

In all of these instances mentioned it becomes a question of loosening and removing the stuck steel. There is one popular method of performing this operation that should *not* be followed, and that is to pound away on the drill steel with a 16-lb. double jack. This manner

HAMMERING DRILL STEEL BREAKS THE STEEL AND THE DRILL

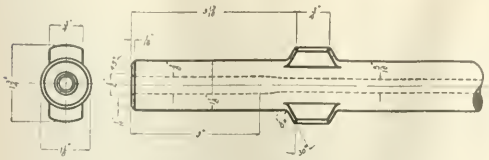
of loosening the steel is common, but usually the only real results obtained by it are bent steel, broken drill parts, strong back, and increased vocabulary. Usually the steel itself stays stuck. However, there is another method of loosening the stuck steel that is practiced

LUBRICATING GIVES THE ROTATING PART CHANCE TO WORK AND FREE THE STEEL

effectively in many camps. Here is how it is worked by Bert Chadwick, mine foreman of the Black Hawk Lead & Zinc Co. at Picher, Okla.

Upon employing a new man he shows him his working place, tells him what he wants done, and then retires to the background to wait for the new man to get into

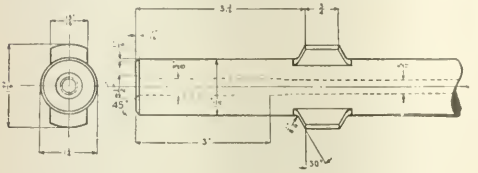
trouble. This the new man usually does, as the rocks are very oppressive and small pebbles continually fall behind the drill bits. Usually in a short time the steel will get stuck in the hole, the drill man begins to sweat, pounds the steel with a sledge, and gets no results. About this time Chadwick steps up, saying "Let me try it." He takes the oil can, fills the back and front cylinder oil pockets with oil, opens the throttle, and 99 per cent of the time the steel backs out of the hole



ONE AND ONE-EIGHTH-INCH LUG SHANK

without any further trouble. The blow slightly loosens the drill steel and the properly lubricated rotative parts take care of the rest.

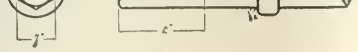
Rock-drill lubrication is not given sufficient thought, yet it is one of the most important items in drill operation. Representatives of the large oil companies and of the large rock-drill manufacturers are waging a continual campaign of education along these lines. Their greatest foes are ignorance, thoughtlessness, and neg-



ONE AND ONE-FOURTH-INCH LUG SHANK

ligence. However, the increased ease of operation and the greater speed of drilling of properly lubricated drills should convince the operator that this matter ought to be properly considered. The increased footage and the decreased cost for drill repair parts should convince the mine manager.

There are proper and improper lubricants for rock drills as for any other machinery. With every drill



JACKHAMMER SHANK

shipped is sent an "oil tag," which designates the best lubricants for that drill. These tags embody information that has meant exhaustive and costly testing on the part of the drill manufacturers. The information is valuable, and should be recognized as such. However, sad to say, a great number of operators still think that axle grease is good enough, others think cylinder oil will do, and others don't think. Representatives of either oil companies or the rock-drill manufacturers are always pleased to consult with the representatives of the mine management and to give them the benefit of expert knowledge and long and varied experience.

Italy's Mining Industry During the War

The following table by Consul General D. F. Wilber gives the amounts, in tons, of the principal products of the mining, quarrying, and also of the metallurgical industries in Italy produced during the four years of the war as compared with the production in 1913:

Products	1913	1915	1916	1917	1918
Iron ore and manganiferous iron	603,116	679,970	946,604	998,632	694,677
Manganese ores	1,662	12,557	18,147	24,582	31,896
Copper ores	89,847	74,470	88,475	86,842	82,302
Lead ores	44,654	41,590	39,460	39,076	37,583
Zinc ores	158,278	80,622	94,043	79,453	67,116
Iron and copper pyrites	317,334	369,320	410,290	500,782	482,060
Mercury (metal)	1,004	985	1,093	1,071	1,038
Sulphur and sulphur mineral, ground	406,406	380,240	287,965	230,074	253,390
Coal and lignite	701,079	953,082	1,305,840	1,722,157	2,171,397
Petroleum	6,572	6,105	7,035	5,668	4,907
Pig iron	426,754	377,510	467,005	471,188	313,576
Iron and steel	933,500	1,009,240	1,269,486	1,331,641	992,523
Copper	2,091	940	860	1,248	1,114
Lead	21,674	21,812	24,362	16,237	18,332
Zinc			258	367	1,188
Antimony	76	548	660	535	367
Aluminum	874	904	1,226	1,740	1,715
Marble	509,342	246,883	200,700	134,233	87,483

The production of iron and steel increased considerably during the war, but fell off again in 1918. The production of aluminum about doubled and that of zinc, none of which was produced in 1913, reached 1,188 tons in 1918.

There was a great decrease in the production of marble, which was 509,342 tons in 1913 and only 87,483 tons in 1918.

The following table shows the number of mining companies in Italy and total amount of capital invested in them, from 1912 to June 30, 1919, inclusive:

Year	No. of Companies	Capital, Lire	Year	No. of Companies	Capital, Lire
1912	39	129,622,490	1916	49	164,865,775
1913	41	131,289,390	1917	56	235,486,950
1914	46	145,655,815	1918	75	283,596,950
1915	48	153,541,615	1919 (to June 30)	82	336,806,950

Whereas from 1912 to 1916 the total capital of the mining companies in Italy increased only from 129,600,000 to 164,800,000 lire, and their number was increased by 10, from January, 1917, to June, 1919, the number of companies increased from 49 to 82 and the capital investment from 164,800,000 to 336,800,000 lire.

The Italian mining industry is most highly developed in Sicily (the Province of Caltanissetta), in Tuscany (the provinces of Florence, Arezzo, and Grosseto), and in Sardinia (the provinces of Cagliari, Sessari, and Iglesias). It is also developed in Lombardy, particularly in the provinces of Bergamo and of Brescia, and in Piedmont, in the province of Turin.

Mica in India

The two principal mica-producing regions in India are the Hazaribagh district, in the Province of Behar and Orissa, Bengal, and the Nellore district, Madras Presidency. There is every reason, says D. A. Hall,* to expect that India will retain its position as the most important mica-producing country. The great number of deposits offer almost every grade of muscovite required in the trade. The industry is well established, and labor conditions are extremely favorable for the production of a commodity requiring such a large amount of hand labor before being ready for market. It is true, however, that the richest and most accessible deposits have been mined out, and scientific methods must be applied to mining if production is to retain its former place.

*"Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Experiences of a Custom Assayer

Intentional Salting Easier To Detect Than Accidental Preliminary Examination of Samples Important

By E. C. D. Marriage
Pioche, Nev.
Written for *Engineering and Mining Journal*

FIFTEEN years' continuous operation of a custom assay office in Nevada has demonstrated to me the importance of exercising the utmost care in the preliminary examination and preparation of samples submitted for assay. Errors will creep in despite of all efforts to avoid them; and it is by the successful elimination of these errors that business is built up and the necessary confidence of the community secured and held. Often, in such custom assay offices too little importance is attached to this work. Samples are tagged as received, and turned over to an assistant. A quartz sample, possibly brought in by a prospector from a new district, is passed through the crushing plant following a rich sample, with the result, sometimes, that the really barren quartz is found to contain several ounces of silver to the ton, and the prospector undertakes a long trip back to his discovery, only to find, on checking, that a mistake has been made. Thus time and money are wasted, owing to the negligence of the assayer in whom the prospector places his trust.

A few years ago several samples of gold quartz were brought into my office by a local mining promoter, which I was requested to assay for gold. The promoter explained to me that they were low in grade but represented a big tonnage and asked that I save them for future checking and for possible mill tests. As I was busy weighing my day's pulps, I turned the samples over to my assistant for preparation after quickly examining the character of the quartz in the top of the sacks, which bore out the promoter's description, being hard, glassy, and apparently very low in grade. Later in the day the promoter returned for the results. As I watched the cupels which were finishing in the muffle I could see very plainly that the results were going to be surprisingly high. Subsequent weighing indicated gold values of which the lowest was $300 per ton and the highest over $2,000. The promoter was dumfounded. He assured me of his extreme care in sampling and watching the samples when taken and evidently felt that my work was at fault. I suggested an examination of the quarterings, and together we quickly picked out a number of small pieces of apparently rich ore. Resampling, which necessitated over one hundred miles of night traveling, in which I myself assisted, gave the true results of from $2 to $16 gold per ton, but the loss of confidence resulted in killing the prospective deal.

The exact method employed by the salter in tampering with the samples and inserting the rich ore was never discovered, though his identity was known to me. He had previously requested me to melt a quantity of rich telluride ore from Colorado, the resultant gold being of a beautiful greenish color which compared exactly with the big button obtained when I assayed the saltings found on examining the original samples.

Later in the same year an owner of a group of mining claims who was endeavoring to sell his property locally made an abortive attempt to raise the grade of the prospective purchaser's sample right before my eyes. Knowing that I was alone in the assay office, and that I was in possession of the samples, he came into my office just as I was about to finish pulping them. Engaging me in conversation about some work he intended to give me, he followed me into the bucking room. Just as we entered, my telephone bell rang. Excusing myself, I started toward the front office. On second thoughts, however, I turned quickly at the door, and re-entered the bucking room, catching my friend right in the act of adding a quantity of rich argentiferous galena to one of the pulps in which he was interested. Caught red-handed, he tried to bribe me to increase the assays, and, failing in that to buy my silence. Subsequent assay of the quarterings which I had kept showed very low values. The whole matter was dropped, and my friend henceforth pursued his mining career in other fields.

In my opinion it is much easier to detect intentional salting than that which sometimes takes place in a day's run. In instances of the latter kind, a sample that apparently should assay a trace is found sometimes to contain fair values, and all the ordinary sources of possible error are traced down without the mystery being solved.

For a number of years I had been assaying for a company developing a big silver deposit, and although rich spots occurred quite frequently in the deposit, the average of the whole was proving disappointing as a milling proposition. One day a number of pulps were brought to my office by the superintendent of this company with the request for very careful assaying in duplicate for silver only. My results when submitted checked very poorly with the returns on duplicate pulps made by a traveling assayer who had recently settled in the district, mine being considerably lower. This man claimed to be employed by an Eastern exploration company which was considering an option on the property. As usual, the higher assays were trusted, and I temporarily lost considerable work.

Soon after this I ran across a number of samples of barren-looking material from the same district, the owner of the property having obtained results from the same traveling chemist showing an average of over 10 oz. in silver per ton, and he told me that he had already located a whole mountain and considered his fortune made. Needless to say, the samples ran a trace, and I suggested the only possible solution, salted flux, unless my traveling competitor was just naturally optimistic of the district's resources. The next day the latter called on me and requested me to assay his fluxes. The litharge carried a pleasing amount of silver and the mystery was solved.

In a custom office, in assaying widely varying samples of ore, too much care cannot be taken in examining the original sample as submitted for assay. The preservation of the original quarterings is a great aid in running errors to ground, thus protecting one's customers and establishing and maintaining the confidence of the mining community.

Platinum in Colombia

Foreign Capital To Realize Future Possibilities of Industry — Output of Choco Region Increasing — That of Urals Passed Its Peak Before War — Ordinary Methods of Production Employed

By J. Ovalle
Written for *Engineering and Mining Journal*

THE United States of Colombia is the second largest producer of platinum in the world, being outranked only by Russia. At present, Colombia produces an average of 30,000 troy oz. of platinum per year. Her exports of the metal to the United States during the war period are shown in the following table, which also reveals the total imports into the United States:

IMPORTS OF PLATINUM FROM COLOMBIA TO UNITED STATES DURING WAR

Year	Imports From Colombia, Oz.	Value	Total U. S. Imports, Oz
1915	13,601	$417,938 00	40,538
1916	25,588	1,473,553 00	89,656
1917	21,278	1,536,422 00	30,170
1919	5,246,522 00	....	....

The value of platinum exported by Colombia in 1918 through the port of Cartagena alone amounted to $1,325,481, and the quantity exported in 1919 was over 30,000 troy oz. The decrease in imports in 1917 was due to the protracted dry season in the Quibdo district.

The significance of the table printed above becomes apparent when the fact is borne in mind that in the three years preceding the war the imports into the United States of platinum in bars, unpolished, and in other forms averaged between 100,000 and 120,000 oz. per year, and of that quantity Colombia supplied only 10 per cent, that is to say, an average of from 10,000 to 12,000 oz yearly.

The production of the metal in Colombia has been greatly stimulated by the high prices prevailing during the war. Before the war the price in New York averaged about $45 per oz., as compared with $20 per oz. for gold in the same period. In 1917, platinum was quoted at over $100 per oz. in New York. The demand for war purposes tended to push the market price even higher, until the United States Government found it expedient in 1918 to fix the price at $105 per oz. But with the signing of the armistice the market experienced an unfavorable reaction. In 1919, the price came down considerably, but soon thereafter the demand was stabilized and the market resumed its former strength, so that in August of this year the metal was quoted in the Choco district at $110, and this price is substantially in effect at the present time. Despite the unsettled situation prevailing in 1919, Colombia managed to increase the amount of platinum exported to the United States.

Platinum is found in the Choco region, near the western frontier of Colombia, at an altitude of from 1,500 to 5,000 ft. The platinum region extends all along the Atrato River and its headwaters and along the Cauca Valley as far south as the Ecuadorean border; but the richer districts are found at the headwaters of the Atrato and along the San Juan and Condoto rivers. Most of the Colombian supply, however, comes from the Quibdo (Atrato) district.

The Condoto River district, which is a great producer of the platinum, is of alluvial formation. On account of the broken nature of the ground and the dense jungle, no accurate estimate has been made of the possible future production or of the extent of the platinum-bearing ground. In this district platinum predominates, the amount of gold found with it being about 4 per cent of the combined metals. In the Quibdo deposits gold predominates, the platinum content being only from 15 to 10 per cent of the combined metals.

Another producing section embraced in the Choco and Quibdo district, and of growing importance, is near the headwaters of the Quito River. It is being actively worked now.

The Atrato River is about 300 miles long, two-thirds of its course being navigable by steamers. It empties into the Gulf of Uraba (or Darien) through fifteen mouths, two of which are navigable by small sea-going vessels and eight by canoes. This river drains 24,000 square miles and during floods discharges 175,000 cu. ft. per second, a larger discharge, in comparison with the area drained, than any other river in the world. This voluminous discharge is due to the heavy rainfall common to this section of the country. The bars at the river mouth are covered by only 5 or 6 ft. of water, but the channel for about 100 miles inland has a depth of from 40 to 70 ft., and a width ranging from 750 to 1,000 ft. At Quibdo, 220 miles inland, the river has a depth of from 8 to 20 ft., with a width of 850 ft. The Atrato is navigable by steamers as far as the confluence of the San Pablo and Certigui rivers, a distance of about thirty miles above Quibdo.

The San Juan River has a length of 245 miles, but owing to a great number of navigable affluents, the system affords 300 miles of navigable waters. Navigation, however, is greatly hindered by bars at the mouth of the river, which are covered by only 6 or 7 ft. of water. The main river, which empties into the Pacific Ocean through seven mouths, is navigable for 140 miles by small steamers. Its width varies from 300 to 1,200 ft. Its discharge is 50,000 cu.ft. of water per second, a larger discharge than that of any other South American river flowing into the Pacific.

It has been a tradition that platinum was discovered in what is today known as Colombia in 1735 by a Spaniard named Antonio Ulloa. His report was the first news in Europe of the existence of such metal. In the old days, long after Ulloa's discovery, platinum was separated from gold and thrown away as being of no value in the Choco region. Large quantities of this platinum dust have been recovered. Recently one owner extracted seventeen pounds of platinum from the foundation of an old building in the Quibdo district.

Platinum in Colombia is generally gathered from the bottom of rivers and, as a rule, is found with gold, the proportion varying according to locality. Both metals are dug from the sand and substratum of small streams,

a work mostly done by Indians and negroes on their own initative. This method of recovering platinum is now being improved by the introduction of steam dredges. The platinum so collected is exported by way of Cartagena and Barranquilla, Colombia's chief seaports.

Foreign capital is gradually taking cognizance of the vast possibilities involved in the future of the industry and, accordingly, is entering the field in Colombia. The most important undertaking up to the present is that of the Anglo-Colombian Development Co., a subsidiary of the Consolidated Gold Fields interests, and certain American interests known under the corporate name of Compañia Minera Choco-Pacifico.

URAL AND CHOCO (COLUMBIAN) FIELDS COMPARED

In reviewing the platinum situation in 1918, the chairman of the British Gold & Platinum Corporation said, in part, with regard to the two main platinum fields in the world:

"Some time previous to the war, 90 per cent of the world's output of platinum was produced in Russia, later falling off, which was very marked even before the war, being due to the exhaustion of the best known areas in the Urals. We find that in 1911 the Russian production was 300,000 troy oz. In 1912 it had diminished to 185,381 oz., in 1913 to 173,642 oz., and in 1914 to 156,775 oz. In 1915, the Russian output fell to 107,774 oz., and in 1916 to 78,674 oz., but no doubt the decline since 1914 has been as much due to the dislocation caused by the war as to the exhaustion of the deposits, However, due attention must be paid to the fact that Mr. de Hautpick, an authority of the Russian Imperial Government, some years ago predicted the exhaustion of the Urals within a period of thirty or forty years, and it is a fact that gravels which were left as unpayable in former years have now been treated, the increase in the price of the metal having made the treatment of these gravels profitable.

"In the case of the Choco district of Colombia we have a virgin ground, with steadily increasing instead of diminishing production of platinum, the output having been 12,000 oz. in 1911, 15,000 oz. in 1912, 15,000 in 1913, 17,500 in 1914, 18,000 in 1915, and 25,000 in 1916, and I understand that in 1917 it went up to some 50,000 troy oz., showing a gradual increase since 1911, which has now reached 300 per cent, and this, be it remembered, eliminating the production of one dredge with very crude appliances indeed.

"Careful survey and prospecting carried out by British and American engineers have proved the existence of platinum and gold in payable quantities over many square mile of (Colombian) territory. The deposits of the Choco district are such as to be well suited for treatment by means of dredging and hydrauliclicking. When I was out there I was much impressed with the natural facilities for such mining. But the Colombian fields are really only in their infancy."

Tungsten in Eastern Asia

The increase of output of tungsten from eastern Asia has been marvelous. In 1913 it amounted to 2,497 tons, and in 1918, to 20,228 tons—more than 56 per cent of the world's production. As elsewhere, production must decrease until the accumulated stocks in the reducing centers are used; then production will again proceed.

The alluvial deposits of China are by no means exhausted, the veins are scarcely touched, the tungsten-bearing area is large and only partly prospected, and such prospecting as has been done has been almost wholly for placers. Labor is cheap, and a large future output is sure. More liberal ideas of trade and government are slowly taking root in China, and ultimately educated Chinese or trained foreigners will work the deposits. The output for a long time will be large, though it may never again be as large as it was in 1918.

So far as can be learned, the easily worked placers and the upper parts of the veins in Burma are becoming exhausted rather rapidly, and recourse must therefore be had more and more to the mining of those parts of the veins below water level and in harder rock, and this will probably mean a diminution rather than an increase in output. Siam seemingly should give an increased production, as the mines are comparatively new, and there still should be opportunity for discoveries. The Federated Malay States and the Unfederated States (Johore, Kedah and Trengganu) should produce at least as much in the immediate future as in the past—given the demand and an equal price.*

Iron Ore Discoveries in Russia

According to Swedish reports, enormous deposits of magnetic iron ore exist near the town of Kursk, on the borders of the Ukraine. This discovery is the result of twenty-four years of systematic surveys carried out by Dr. Ernst Leyst, formerly professor of geology at Moscow University, who died in 1918, but whose papers were rescued and brought to Sweden, where they were examined by Dr. Valfried Petersson, professor of mineralogy at the School of Mines, and by Mr. Nathorst, mining engineer to the Swedish Iron and Steel Association. It is stated that these experts have come to the conclusion that magnetic deviations of unprecedented intensity and extent established by Professor Leyst can be explained only on the assumption that they arise from enormous deposits of iron ore, running in two parallel lines in the direction north-west south-east, and situated at a distance of thirty-seven miles from each other. Both lines have a length of about fifty-seven miles and consist of a series or orebodies, but it is impossible solely on the basis of Professor Leyst's magnetic charts to estimate accurately the extent, quantity, or quality of the beds.

British Columbia Fluorite Shipments

The volume of fluorite shipments from the Rock Candy mill, in Lynch Creek, in the Similkameen district of Canada, is increasing rapidly, according to Consul Norton F. Brand, and the Kettle Valley Ry. has established a twice-a-week service to handle the business. About 100 tons of fluorite is mined daily. It runs about 25 per cent waste, so that the resulting concentrates amount to about 75 tons per day.

Shipments of fluorite concentrates are now being made to eastern Canadian steel plants as well as to those at Gary, Ind., which latter have received the bulk of the concentrates up to the present. An examination of the exports to the United States since Jan. 1, 1920, indicates the rapid expansion which the fluorite industry has enjoyed. During the months of January, February, March, and April the exports amounted to 64, 196½, 251½ and 416½ tons, with values of $835, $2,255, $3,270, and $5,772, respectively, making a total of 918½ tons, valued at $12,132.

*F. L. Hess in "Political and Commercial Geology," McGraw-Hill Book Co., 1920.

Men Prominent in Mining

James Finch Callbreath

IT HAS long been conceded that the virile spirit of the West is catching. It is not necessary that one be born within the confines of that vast domain, to be hailed as a "Westerner," for it is a generous country, democratic in its impulses, and proud to own those men and women who claim it by adoption. The West is by no means half hearted in its expression of good will to those who have aided in the work of making great those institutions in which it has an entirely justifiable pride and satisfaction. On the evening of Nov. 20, 1919, hundreds of mining men assembled at St. Louis started an ovation that has seldom been equaled in the history of industrial conventions—an ovation that began with appreciative applause and ended in an outburst of spontaneous cheering. This tribute was paid to James F. Callbreath, secretary of the American Mining Congress, in recognition of fifteen years of unbroken service in behalf of that organization. The American Mining Congress stands today as a monument to the persistence, diligence and whole-heartedness with which Mr. Callbreath initiated and carried out his plan for a great national mining organization. James Finch Callbreath was born at White Lake, Sullivan County, N. Y., in 1858. He received his early education in the public schools, and was graduated from the University of Denver with the degree of LL. B. During the early period of his life, which was spent in Sullivan County, he devoted his efforts largely to newspaper work, and was for many years editor and publisher of the *Sullivan County Republican*. From 1887 to 1890 he was chairman of the Sullivan County Republican Committee and took an active interest in political affairs.

JAMES FINCH CALLBREATH

Mr. Callbreath was among those who believed in the opportunities of the West. Establishing himself in Denver, he became editor and publisher of the *Mining Reporter*, which he conducted for a number of years before that publication was merged into *Mining Science*. From 1895 to 1906 he practiced law in Denver and again became active in political affairs, finding himself a member of the Denver Charter Convention in 1903 and elected to the Denver City Council in 1904, with which body he served conspicuously as an exponent of civic improvements. He was also elected president of the Denver Chamber of Commerce in 1903. During these years he became interested in a number of mining operations. The American Mining Congress then had its headquarters at Denver. It was an ambitious organization, but mostly ambition. No one seemed to have sufficient time to execute its mission, and interment seemed imminent. In 1904, at the Portland, Ore., session of the organization, Mr. Callbreath was persuaded to step into the breach, with the understanding that he was not to be called upon for more than half of his time. As secretary, the office which he still holds and which has always been the chief executive and active position, he not only caught the spirit of the co-operative movement but quickly visualized the great opportunities of the future. Agitation was then developing for representation of the mining industry at Washington. Mr. Callbreath was the logical leader, and he quickly developed a program of activity that has since occupied his entire attention. He spent many months at Washington in an effort which eventually resulted in the creation of the United States Bureau of Mines, with the late Dr. Joseph Austin Holmes as its director.

The success of the American Mining Congress and the worth of Mr. Callbreath's straight-line methods became recognized. He has, since 1907, devoted himself exclusively to the furtherance of the interests of the mining industry and the upbuilding of the organization. It is no longer a one-man, one-room institution. It is a great national chamber, with a continuous record of signal accomplishments, embracing seven distinct divisions, representing practically every branch of the minerals industry, with a trained specialist in charge of each department. Its offices occupy 4,000 sq.ft. in the Munsey Building, Washington.

The history of the mining industry is replete with individual accomplishments of national value, but perhaps no one servant of the mining interests has covered such a representative field as the Secretary of the American Mining Congress—James F. Callbreath.

By The Way

The Aërial Tramway Improved

The psychological moment has been seized by the Davino Aërial Apparatus Co., of Los Angeles, to put their aërial transportation device before the mining public. Shippers in many localities have been confronted with a serious problem since freight rates went up on Aug. 26. In some cases the old rate has been restored but many operators are still facing the dilemma of having to shut down or else ship at a loss. At this crisis the Davino company appears on the scene. This company, according to an advertisement in a southwestern contemporary, manufactures, or will do so if it receives an order, a whale-shaped propeller-driven airship that is depicted in an illustration as speeding from mountain peak to mountain peak suspending from an overhead aërial tramway, resembling a series of miniature Brooklyn Bridges. No money is needed—an interest in the mine will suffice. The company states:

> We offer to anyone who can show us a mine worth operating the installation of our lines at our own expense for an interest in the mine. We can construct small light capacity lines, single rail or double rail, to handle any mine capacity regardless of the nature of the country, and our machines will climb steep grades impossible by other types of transportation at high speeds. We will guarantee our service and if you are interested, and have a mine, especially one that is held up on account of transportation, here is your chance.
>
> Send in a map, mark your mine; if you have some neighbor miners interest them so we can link a group of mines on one line. If you can send us a sample of your ore, or asbestos, or whatever your product is (we will return upon your request), have it accompany a letter giving the value of each mine, an approximate value of ore per ton or product per ton, and your offer of an interest in the mine for our transportation, or for handling the raw material to the finished product at our expense.
>
> Gentlemen, our machines may seem odd, especially the use of the propeller in connection with mining work, but we do not care about anyone's opinion. We furnish the money and our machines do what we claim.

The value of this new mode of transportation has already been demonstrated in the amusement world, according to the company. The chances are that it will continue to furnish amusement on being introduced in the mining world. Whatever the outcome, however, the company cares for no one's opinion, as it proclaims.

Wet Competition

An amusing experience was related by one of the early adventurers on the Yuba River in California, who chose an easier way of making a living than by standing all day in the water washing gravel, according to Hittel's History of California. He said that he had managed with great toil and at great expense to get a large cask of whisky to some rich diggings on that river where he broached and commenced retailing it at immense profit. On the next day, however, he noticed that his custom fell off; and, on investigation, he found that another Yankee had also rolled up a cask of whisky and was underselling him higher up the river. As a counter operation, he moved still higher up stream by a circuitous route and reopened; but it was not long before his competitor again supplanted him; and from that time on the two rivals continued running opposition and cutting each other until finally, growing wiser, they formed a combination with the intention of keeping prices up to the highest notch and jointly reaping the profits. But almost as soon as the new concern was started a canvas house went up next door, on which was written, in large letters, "Liquor Store," and the backbone of the monopoly was thereby effectually broken.

Illustrated

The latest report of the Broken Hill Proprietary Co., of Australia, closes with a half-dozen interesting photographs taken about the company's Newcastle steel works. One of these shows H. R. H. the Prince of Wales, K. G., upon the occasion of his visit to the plant last June. Another is a view of the blooming mill. Reports of this sort are far more readable when illustrated in this fashion. The extra cost is negligible.

The Optimist in Mining

Bonanzas are not altogether things of the past in the United States. A prospectus has recently come to hand of a company claiming to hold property in the Black Hills of South Dakota, the manager of which "conservatively estimates" the "probable ore tonnage" at 1,000,000 tons of mica, 2,000,000 tons of 3 per cent tungsten ore, 25,000,000 tons of feldspar, and 5,000,000 tons of 2 per cent tin ore, the gross value of all of which is put at $381,000,000. This company is the American Minerals Co., which claims that it is operating at Keystone, S. D., under a declaration of trust dated Aug. 24, 1920. The manager, C. T. Cabrera, says that he feels justified in stating that this estimate is less than one-sixth of the actual tonnage on the company's properties. He does not state, however, whether the balance is tin or tungsten ore, mica or feldspar. Net earnings during the next twelve months, based on single shift operation of the mines and on the operation of the "two mills now under construction," are estimated as follows: Mica, $1,449,420; tungsten, $51,000; feldspar and lithia ores, $50,000; and tin and tungsten, $800,000. The manager says of tin, "The market is steady and regular, running around 60c. per pound with very little variation, and the supply produced seldom equals the demand." Mr. Cabrera is to be complimented for the restraint he places on his imagination and for his conservative statements. One can only wonder what he might have said if he had been feeling real optimistic.

In Memory of the Pilgrims

The new Pilgrim half dollar is now to be obtained, though it may hardly be said to be in circulation. Attractive in design, it shows the figure of a Pilgrim Father on the face. On the back is depicted the Mayflower under full sail. We paid the National Shawmut Bank of Boston a dollar for our copy of this half dollar, and, although we do not quite understand the nature of the transaction, we believe we got our money's worth.

A Recommendation

It is against the general policy of this chronicle of mining engineering progress to recommend one good product in preference to another. However, we cannot refrain, after careful investigation, from recommending the Marcy[1] to millmen. Even so, we must admit that the odds favor Harding.

[1] The latest Arrow collar.

CONSULTATION

Ground Mica

"We herewith take the liberty of asking you whether you are in position to give us the address of any person who has a knowledge of the right way of making mica powder for wallpaper manufacturers?

"We have here in Sweden some mica mines, and from them we can produce hundreds of tons of mica powder. We have made some trials to grind mica but not with a good result."

Both Government and private agencies have found it difficult to obtain information regarding the details of the various processes for grinding mica. Operations are frequently shrouded in needless secrecy, and the processes zealously guarded. However, sufficient information has been published or given out otherwise to make known the general details of the various methods.

A. L. Hall has classified the methods of pulverizing mica into (1) disintegration by heating, (2) abrasion with millstones or metal burrs, and (3) baking at intense heat, followed by pulverization by a blast of steam. As millstones require water to wash out the ground material, and drying is difficult, they are not frequently used as a pulverizing medium. The most modern method, baking and steam-blast pulverizing, has not been widely used. Reliance has mainly been placed upon a mechanical grinding machine or pulverizer in the form of a metal cylinder lined with corrugated cast steel and containing a revolving shaft to which are attached disintegrators or metal heaters. When the shaft is rotated at a high speed (3,000 r.p.m.) and pieces of mica are introduced into the cylinder a pulverized product is made which can be either drawn from the cylinder by an exhaust blower or removed by falling through a screen. A precaution to be observed in using such a machine is that not too much material is fed into the cylinder, as the pieces expand greatly on being ground, and any excess of material may choke the machine.

The ground material is carefully screened, customarily on a set of vibrating screens. Products of 8, 10, 24, 40, 60, 80, 120, 160, and 200 mesh may be made. Separation by means of air currents and gravity has also been used, but how successful such installations have been we do not know. There is a plant at Denver, Col., which employs the pneumatic system of separation, resorting to a special air-tube mechanism, which causes the velocity of the ground material to be so retarded that the material settles in various bins according to its fineness.

In constructing any plant to grind mica provision should be made for the manufacture of ground-mica products other than those for use in the wallpaper industry. This will insure a wider market range through a diversified product. Ground mica has a variety of useful purposes. Thus, it is employed in the manufacture of some lubricants, fancy paints, tiles, and concretes. Rust-preventing paint can be made from a mixture of ground mica and aluminum. Owing to its heat-resisting qualities, ground mica is also used in pipe and boiler coverings and in fireproof paints. The rubber-tire industry uses ground mica as both a tire ingredient and a powder for inner tubes. Some roofing preparations consume quantities of ground mica. In India it is reported to be used even in medicines.

Electrolytic Zinc References

Our company has a complex zinkiferous ore carrying the zinc as sphalerite, copper as tetrahedrite, and good silver values with the tetrahedrite. We are desirous of making a complex concentrate and then treating same by alectrolytic process to eliminate the zinc. We desire to erect a plant to handle only from 7 to 10 tons of concentrates per day. How and where can we get reliable information relative to the electrolytic process and cost data of a small plant?

The following papers treat the subject of electrolytic zinc production in more or less extended fashion, and give up-to-date information on the subject:

"Electrolytic Zinc." By C. A. Hansen, *Transactions* American Institute of Mining and Metallurgical Engineers, vol. 60, pp. 206-242.

"Electrolytic Zinc Extraction at Trail, B. C." By E. H. Hamilton, *Transactions* American Electrochemical Society, 1917, Vol. 32, p. 217.

"The Future of Electrolytic Zinc." By Thomas French, *Transactions* American Electrochemical Society, 1917, Vol. 32, p. 321.

"Some Economic Factors in the Production of Electrolytic Zinc." By R. G. Hall, *Transactions* American Institute of Mining and Metallurgical Engineers, 1918, Vol. 57, p. 709.

"Electrolytic Zinc Plant of the Judge Mining and Smelting Co." By L. W. Chapman, *Chemical and Metallurgical Engineering*, issue of March 24, 1920.

"Electrolytic Zinc Plant of the Consolidated Mining and Smelting Co. of Canada, Ltd." By L. W. Chapman, *Chemical & Metallurgical Engineering*, Aug. 11, 1920.

Chrysotile, Crocidolite, and Amosite

"I am somewhat confused by the difference between several varieties of asbestos, such as a chrysotile, crocidolite, and the rarer form amosite. Will you kindly endeavor to make clear in your "Consultation" page the distinction between these several types?"

The three varieties of asbestos, chrysotile, crocidolite, and amosite, are all commercial forms. Chrysotile is a form of serpentine asbestos, whereas the other two are forms of amphibole asbestos. Chrysotile in Canada occurs in serpentine derived from the alteration of peridotite, and in Arizona from the alteration of limestone. Rhodesia and the Transvaal contain important deposits of chrysotile asbestos of excellent white quality, but which may shade to a pale green.

Crocidolite is a variety that is peculiar to the South African deposits and occurs in the Asbestos Mountains of West Griqualand in cross-fiber veins inclosed in thinly bedded shaly rocks. It is remarkable for its blue color and high peroxide of iron content. Lavender-blue crocidolite is also reported in the area.

Amosite, the third variety of asbestos, is a grayish white monoclinic iron amphibole, which is produced in the Lydenburg and Pietersburg district of the Transvaal. Indications point to large African resources.

THE PETROLEUM INDUSTRY

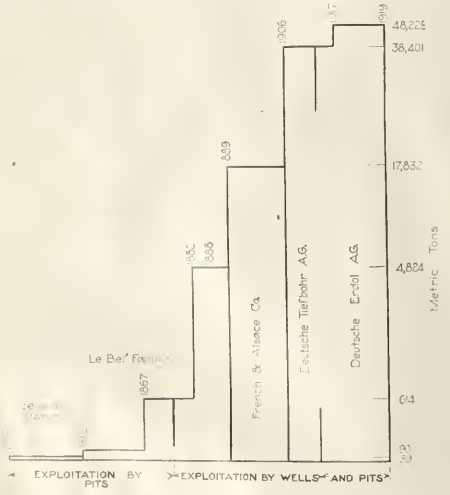
Petroleum Industry in Alsace

BY ANDRÉ SURNY-DE BONNIER

Written for *Engineering and Mining Journal*

In the fifteenth century (1498), an oily matter was discovered[1] in a water well on the spot known today under the name of Pechelbronn, and was used for medicinal purposes. The exploitation of the petroleum began at the end of the eighteenth century, and the accompanying diagram shows the development of the field, which covers about 44,000 hectares. Its length varies between twenty and twenty-seven miles and it is about ten miles wide. Different kinds of oil are found in the various oily sand beds; for instance, from 170 to 200 ft. deep a sort of asphalt is found, and from 230 to 300 ft. there is a heavy oil, and the lighter oils occur at greater depths.

The first exploitations were made by shallow pits, and the sand was washed with hot water to obtain the greasy matter. This method was practiced up to 1875, and was then replaced by underground galleries, from which the petroleum, after being collected, was pumped. Later the plan of drilling by means of the Fauvelle system with water injection was tried with success, and



PETROLEUM PRODUCTION IN ALSACE

today about forty installations of drilling apparatus are in use. About one hundred wells are drilled every year, from 1,000 to 1,200 ft. in depth.

Following the remarkable experiments that Paul de Chambrier made in 1897 to show how large was the quantity of oil left in the sand bed when exploitation was made exclusively by drilling operations, it was decided to not only continue the exploitation by well but to exploit also by means of underground galleries, where the petroleum could collect. It is estimated that from six cubic meters of oil in the ground only one meter can be pumped. To recuperate part of the oil left in the ground and to increase the production during the war, the Germans dug several pits. Three are today in operation, with 3,400 meters of galleries.

The pumping operations are expensive and slow. The average quantity given by wells, of the 500 producing wells of the region, is only 240 liters daily. On the other hand, the time during which petroleum can be pumped is usually long, from fifteen to twenty years. The total production of the field is 50,000 metric tons yearly. This corresponds to 1/1000 of the world production and to one-eighth of the total pre-war importation of oil in France.

The recovery of the Alsace oil field is consequently a great help to France. It is not only a material gain, but makes her, in case of necessity, independent for some of the oil products. The occasion is also propitious for organizing on French soil a practical school of petroleum technology, and for teaching her sons how to take advantage of the hidden treasure contained in her soil and in that of her colonies.

[1]Paul de Chambrier (general-director of the Pechelbronn mines), "History of Pechelbronn, 1498-1918." Attinger Bros., Paris and Neuchatel, 1919.

Prospecting for Petroleum In Queensland

SPECIAL CORRESPONDENCE

Prospecting for petroleum in Queensland has been in progress for a number of years, and early in September, 1919, there was a development which may be pronounced at least encouraging. The locality where the boring has taken place is at Roma, on the Western Railway, 318 miles west of Brisbane, and at an elevation 979 ft. above sea level.

Operations in the search for oil at this place have been attended with many vicissitudes and delays, but the belief is strong among experts and others that the oil is there, although whether in commercial quantity of course nobody can say. An artesian well sunk in 1899 was being deepened in 1900, when at 3,683 ft. natural gas to the extent of about 40,000 cu.ft. per diem was obtained. This gas was allowed to go to waste for over four years, after which, when the quantity was 70,000 cu.ft. a day, a gasometer was built, the township was reticulated and the town lighted; but the gas had been turned on only ten days when the supply so diminished that the lighting scheme had to be abandoned. In 1907 a mineral-oil prospecting company began the sinking of a bore close by, and at a depth of 3,702 ft., in October, 1908, struck a heavy flow of gas, which some people alleged smelled of petroleum, but which was immediately ignited from the boiler fire, and was not extinguished till the following December. In an attempt to sink the bore below the gas zone the tools got jammed in soft "running" strata, and in March, 1910, the bore was abandoned.

After a lot of investigation and obtaining expert advice from abroad the government took the matter in hand, engaged a petroleum engineer from California, and started another bore. This was begun in January, 1916, and carried on by the expert until about the middle of 1918, when, his term having expired, he returned to America, leaving an assistant borer, who had also been secured from the United States, in charge. The depth reached was then 3,230 ft. By May, 1919, the bore was down to 3,705 ft. (about the depth of the gas zone proved in the previous bore), when a weld in the stem broke, leaving the bit and two feet of the stem in the hole. All attempts to remove the tools failed, and the second American borer left for home. In August, 1919, however, while a man engaged in Australia was employed in removing some of the casing with a view, if possible, of boring past the obstruction, a heavy flow of gas, evidently released by the work in hand, was encountered. There had previously been indications in the bailings from depths ranging from 3,610 ft. to 3,700 ft. of gas of a petroleum nature, and the strong flow now struck unmistakably bears evidence of containing oil. When the last mail left officials were engaged in measuring the flow and analyzing the gas.

Recently a license has been taken out to prospect for oil at Goodna, seventeen miles from Brisbane, and the company formed for the purpose has already begun boring operations there.

Petroleum Situation in Rumania

Rumania possesses an area of 20,000 hectares (1 hectare = 2.47 acres) recognized as oil bearing, of which only 2,500 hectares are being worked, according to Consul Edwin C. Kemp in *Commerce Reports*. The total of possible oil-bearing land is estimated at 100,000 to 150,000 hectares. These lands are located in the Carpathians, the principal centers being Prahova, Bacau, Buzeu, and Dambovitza; 90 per cent of the output comes from the Prahova district. The bulk of the production is refined and the residue is used in Rumania for fuel purposes, for which there is an increasing demand.

In 1916 the wells and refineries were destroyed before the invasion of the enemy, who immediately began repairs, and obtained a production of 450,000 metric tons in 1917 and 1,214,000 in 1918, the greater part being used for military purposes. When the enemy withdrew, the re-establishment of the industry was undertaken, but the production in 1919 amounted to only 920,000 tons, and reports for the first six months of 1920 show about 463,000 tons. This decrease in production was due partly to a strike in the oil fields from July 10 to Aug. 20, 1919, but more to the lack of materials for drilling and refining and to lack of storage space.

The decreasing value of the leu and the lack of transportation made it difficult to obtain materials needed for the repair and maintenance of the refineries and wells. This lack of transportation, which included the unrepaired pipe lines, also made it difficult to utilize the storage facilities at the ports and necessitated stopping the flow of a number of wells. Especially is this true of two of the largest producing companies of the Moreni district not in the "Birex" export organization, which had a certain outlet via the Danube to adjoining countries. In 1919 drilling fell to 10,000 meters, as compared to 80,000 to 100,000 meters in a normal year. It has been estimated that material to a value of 1,000,000,000 lei per year will have to be imported for five years to bring the annual production up to 2,000,000 metric tons.

Bureau of Mines To Advise on Petroleum Losses

Engineers, chemists and automobile men throughout the country have been working toward the development of some liquid fuel as a substitute for gasoline to meet the increasing demands. The Bureau of Mines states that the entirely preventive losses in the evaporation of gasoline from crude petroleum from the time the petroleum leaves the wells until it arrives at the refineries reaches a total of more than 300,000,000 gal. each year, or sufficient to keep 1,200,000 automobiles in commission for a year if each car uses 250 gal. of gasoline.

These are merely the preventive losses from evaporation alone and do not take into consideration other losses, many of which in part may be avoided. The total loss from evaporation amounts to more than 600,000,000 gal. of gasoline for the country, according to the investigations of the Bureau, which has calculated that one-half of this, or 300,000,000 gal. of gasoline, may be saved. The Bureau will soon issue careful directions to the oil men as to how this situation may be remedied.

Soviet Russia's Oil Supply

Professor Johan Lomonosov, who, with Krassin, arrived in Stockholm from Reval on July 23, has been appointed by the soviet government as its representative in Sweden to superintend the delivery of the locomotives now on order on Russian account.

In this connection a most important consideration for Russia is that of fuel. Lomonosov has during the past few months been staying in the coal and oil districts of south Russia and the Caucasus, and on that point he is extremely optimistic. There are stored, 500,000,000 poods (1 pood = 16 kg.) of oil, which is being transported as quickly as tonnage is available.

Bureau of Mines Warns Against Fraudulent Representation

A number of instances have recently been brought to the attention of the Bureau of Mines in which reports of analysis made by the Bureau have been used for advertising purposes. General statements made by the Bureau have been used to advertise trade-marked or proprietary preparations. For example, one company submitted a sample of motor fuel to the Bureau of Mines during the war to see if it would be satisfactory as an aviation fuel. Recently, this same company has been advertising a motor fuel under a trade name as having been "thoroughly tested by the Government Bureau of Mines in Washington, D. C., successfully fulfilling every claim made for it by the inventor." On investigation it has been found that the fuel which is being advertised is different in character from the fuel originally submitted for test.

The Bureau wishes to emphasize that analyses and tests are made only when it is a matter of public interest to do so, and no authority has been or will be given to use this information for advertising purposes.

NEWS FROM THE OIL FIELDS

New 100,000-Bbl. Well in Amatlan Field

From Our Special Correspondent

One of the largest wells in the Amatlan field was brought in recently when the Freeport & Mexican Oil Co. struck oil in its well No. 3 on Lot 251 Amatlan. A conservative estimate of the daily production is estimated at 100,000 bbl. The pay was encountered at a depth of slightly over two thousand feet. This well is offset by a well owned by the Cia El Aguila which is producing about 50,000 bbl.

Thompson's well on Lot 114 Chinampa has been drilled in at the depth of 1,986 ft. It is producing about 40,000 bbl. daily. This is the shallowest well in the Chinampa field and seems to be on the summit of the oil dome which underlies this famous lot. A pipe line has already been laid and is being connected to the well.

The Transcontinental Co's well No. 3 on Lot 134 Chinampa has been successfully closed in, after flowing wild for over two weeks. When the broken valve was taken off the casing the well shot the oil over the crown block of the derrick. The well has been flowing 40,000 bbl. since it came in.

Johnson County Prominent Among Kentucky Fields

From Our Special Correspondent

Johnson County, Ky., is rapidly assuming first place in the new fields, as Warren gradually takes its place among those of proven territory. A 15-bbl. well has been found in the corporate limits of Paintsville, the county seat, making it the first Kentucky town to enjoy this distinction. A good well was brought in on the Davis farm, one mile away. The Virginia-Kentucky Oil Co. owns this well, and has also brought in two on the Rice farm, said to be 20-bbl. producers.

A gusher estimated at 500 bbl. daily production was brought in by the Georgia Petroleum Co. on the Lloyd Crowe lease, in Warren County, recently. It came in flowing a stream the size of the casing, over the mast. The depth was 370 ft. The well on the Pete Foster lease is now on the pump, and making 15 bbl. The Stoll Oil Co. is laying a new pipe line in Warren County from wells in the Woodburn vicinity to Rock Quarry loading station.

The Whittaker Oil Co. brought in No. 2 on the Nicoll lease near Bowling Green, good for 75 bbl. Another 75-bbl. well is No. 2 on the Gonce lease, nine miles south of Bowling Green. What may prove a new shallow pool has been found along the Barren River, where a flowing well was brought in on the John Campbell farm. No. 2 on the Whittaker farm was brought in at 478 ft. and showed 204 bbls. in a 24-hour test.

In Lawrence County, a 25 bbl. well has been drilled on the Meredith-Kelley lease. In Powell County, a 1,500-ton shale plant is being built. The Twin Lakes Petroleum Co. reports a 25-bbl. well in Simpson County, near Temperance. Phelps and associates will begin drilling four wells on the Gibson lease in Allen County.

Officials of the High Gravity Oil Co., under indictment for conspiracy to defraud investors, were exonerated in Federal District Court here when the jury was given peremptory instructions to dismiss the case. Sixty-two persons from all parts of the United States were present, claiming to have been defrauded. They besought the District Attorney to "find some other way," but there was none. Principal defendants were William F. Sheridan and two sons, William F., Jr., and Redmon F. Sheridan.

Mining and Metallurgical Society Discusses Petroleum

At a meeting of the Mining and Metallurgical Society on Oct. 27, Van. H. Manning addressed the members upon the petroleum situation at home and abroad, saying in part:

"One of the unfortunate results of the war has been a departure from a friendly spirit of competition in business between some of the nations of the world. A nationalistic tendency has developed. We must expect as a natural result of the war an awakened sense of self-protection. All nations may well give serious consideration to the question of their future supply of raw products, but this must not be at the price of sacrificing principles in international trade which are the very substance of world progress in peace. It is, moreover, not a far-sighted policy to conserve within the confines of any nation the materials which are now essential to civilization and the world's progressive welfare."

After pointing out the actual condition of petroleum as revealed by the latest statistics, Mr. Manning discussed the attitude of the United States toward foreign restrictions, and the attitude of those nations controlling foreign sources of supply.

As confirmed by the subsequent remarks of Dr. Ledoux and Mr. Ralph Arnold, Great Britain and France are keenly desirous of obtaining the participation of Americans, or the United States Government, in their ownership and production of future petroleum supplies, so that there is no reason to exect any great difficulty in arriving at an *entente cordial*.

In closing his remarks, Mr. Manning suggested a plan of action, saying:

"Our diplomats are doing all that is humanly possible to untangle this intricate problem and your help is needed. No greater or more lasting and far-reaching service can be rendered than making possible and effecting the securing by or for American citizens a participation in the development of the world's resources of petroleum. This may be accomplished under the following plan:

1. To make a careful study of the oil resources of the world and the laws and regulations governing these resources.
2. Congress should enact a general reciprocity measure covering all trade relations with foreign countries.
3. To encourage our nationals to acquire and develop and market oil in foreign countries:
   (a) By an assured adequate protection of our citizens engaged in securing and developing foreign oil fields.
   (b) By co-operative action on the part of the industry under Federal charter or otherwise that will permit the industry more effectively to perform its function in seeking out and acquiring oil territory in foreign countries, developing the same and distributing the petroleum produced therefrom.

"When these things have been accomplished, our State Department should begin negotiations to develop an oil entente for all nations. If there could be brought about an association of international relationship between these oil-producing countries working in harmony to furnish the world with power and light, a repetition of a World War would be impossible."

Possibilities for Third Oil Field in Arkansas

From Our Special Correspondent

The Arkansas Natural Gas Co. has had a show of oil at 2,232 ft. in its well in Sec. 1-15-15 Calhoun County, Ark. Casing is being set for a test. If this well develops commercial production it will be the third field in Southern Arkansas, the two already known being the Hunter, near Stephens, Onachita County, and the Constantin, near El Dorado, Union County.

Utah Oil Notes

From Our Special Correspondent

The experimental plant of the Western Oil Shale Co. at Vernal is reported to be doing satisfactory work and the operators are considering enlarging its capacity. The Galloupe process is being used.

The Ohio Oil Co. has been granted an oil leasing permit on lands near Caineville, Wayne County, and is expected to begin work as soon as oil-drilling apparatus and tools have arrived. This company will also start drilling in Garfield County near Circle Cliffs. The company expects to expend considerable money to ascertain the value of the ground it has under lease.

Technical Papers

Mineral Statistics — The Imperial Mineral Resources Bureau is issuing pamphlets containing a statistical review of various minerals during the period from 1913 to 1919. These pamphlets are somewhat like the sections of Mineral Resources published annually by the U. S. Geological Survey. Those so far issued are: "Nitrates," 28 pages, price 9d.; "Arsenic," 19 pages, price 6d.; "Felspar," 16 pages, price 6d.; "Magnesite," 42 pages, price 1s. 3d.; "Borates," 24 pages, price 9d.; "Fuller's Earth," 15 pages, price 6d.; Monazite, 15 pages, price 6d.; and "Chrome Ore and Chromium," 29 pages, price 1s. A bibliography of the important publications on each subject during the last six years is a good feature of each book. They may be obtained from H. M. Stationery Office, Imperial House, Kingsway, London, W. C. 2.

Southwestern Arizona—The future of mining in southwestern Arizona (pp. 5) is discussed by J. C. Anderson in the August number of the *Mining and Oil Bulletin* (Los Angeles, Cal., 25c.). The last two or three years have witnessed a gradual resumption of activity in the district around Tucson and to the southwest.

Kaolin—The Division of Geology of the Department of Conservation, State of Indiana, (Indianapolis Ind.), has published a cloth-bound book of 131 pages entitled "Kaolin of Indiana," which may be obtained for 50c. The geology and development of the deposits in the southern part of the state are described. The principal uses of Indiana kaolin have been in the ceramic industry and in the manufacture of aluminum sulphate.

Ontario Natural Gas—A report on the natural gas situation in Ontario has been published as Part V of the Twenty-ninth Annual Report of the Ontario Department of Mines. (Toronto, Ont., free.) A serious and general shortage of natural gas exists in that province.

South African Iron Ore—A brief description of the occurrences of iron ore and fuel suitable for smelting, in South Africa, occupies fourteen pages in the July *South African Journal of Industries* published by the Government Printer, Box 373, Pretoria, price 6d.

Misfires—"Misfires in Metal Mining" is the title of the U. S. Bureau of Mines *Reports of Investigations*, Series No. 2,156 (three pages), obtainable on request to the Bureau at Washington. Eleven recommendations are given for reducing the number of missed holes to a minimum.

Graphite—The U. S. Tariff Commission, Washington, D. C., has published a very complete little booklet of twenty-eight pages entitled "Information Concerning Graphite." It may be obtained on request. Information is given on the domestic and foreign production, various grades, milling methods, costs, etc., and a list of domestic producers in 1917 is appended.

Oil From Shale—David T. Day has an article in the September *Review of Reviews* in which he discusses the petroleum shortage and points out the development of oil shale as the logical remedy.

Porcupine Goldfield—*The Mining Magazine* for September (Salisbury House, London Wall, London, E. C. 2.; price 1s. 6d.) contains an excellent eleven-page article on the Porcupine goldfield in Ontario. This is considered the most promising gold district in the world. The Hollinger mine is surpassed by only one or two mines in present output and by none in prospects. Mining, milling, and economics are discussed.

Wyoming Oil—Bulletin 716-C of the U. S. Geological Survey (pp. 18) describes geological conditions in the Mule Creek oil field, Wyo.

Tennessee Minerals — The twenty-fifth annual report of the Mining Department of Tennessee, Nashville, Tenn., (free), is at hand. Though mostly devoted to coal, short chapters are included describing the activities among the state producers of barytes, bauxite, cement, clay, copper, gold, silver, iron, gas, mineral paint, oil, lime, phosphate, quartz, sand and gravel, stone, zinc and lead.

Iron Ore in Montana—Bulletin 715-F of the U. S. Geological Survey (pp. 8) describes iron-ore deposits near Stanford, Mont.

Cinnabar—U. S. Geological Survey Bulletin 715-E (pp. 11) is devoted to the geology of the Yellow Pine cinnabar-mining district in Idaho.

Hydrotalcite—The U. S. National Museum, Washington, D. C., has issued an eight-page pamphlet on the chemical composition of hydrotalcite, pyroaurite, stichtite, and brugnatellite. It may be obtained upon request.

Molybdenite—A two-page description of the Standard Molybdenite mine and mill at Everton, Victoria, is to be found in the September issue of the *Chemical Engineering and Mining Review* (Melbourne; price 11d., post free).

Recent Patents

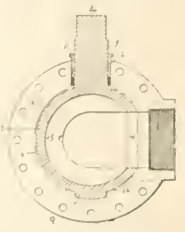
Rock Crusher. No. 1,354,855. John G. Simpson, Knoxville, Tenn.

Mining Drill. No. 1,354,944. Carl Biernat, Glasford, Ill.

Overflow Separating Device. No. 1,355,070. Charles Allen, El Paso, Texas. A form of the Allen cone.

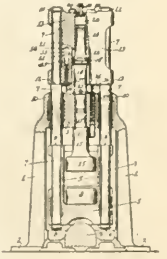
1,352,423. Casing Head. Paul Arbon, Tulsa, Okla. Filed April 21, 1919.

A casing head for gas and oil wells having in combination a shell consisting of sections adapted to be detachably secured together, each section having a nozzle and a semicircular projection forming one-half of a third nozzle and each section having one-half of bearings for trunnions, said bearings being arranged with their axes at right angles to the axes of the respective nozzles, and a rotatable valve having a diametrical passage therethrough and a passage or opening extending at right angles from the diametrical passage and having trunnions with their axes at right angles to the axes of said passages or openings, one of the trunnions extending outside of the shell.



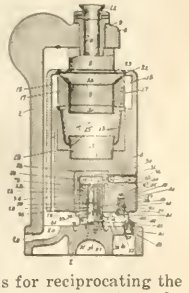
1,353,096. Stamp Mill. James W. Vanmeter, San Francisco, Cal. Filed June 30, 1919.

A stamp mill comprising a fixed frame; a mortar mounted on the frame for reciprocative movement; a stamp fixedly mounted in the frame and over which the reciprocative mortar plays to crush the ore by impact against said stamp; a cylinder connected with the mortar; a piston fitted in said cylinder fixed against reciprocative movement; fluid controlling connections to reciprocate said cylinder on said fixed piston; and means carried by the cylinder and actuated by contact with the fixed frame for operating said fluid controlling connections.



1,353,097. Stamp Mill. James W. Vanmeter, San Francisco, Cal. Filed Nov. 5, 1919.

An ore stamp mill comprising a frame; guides fitted to the frame; a mortar fitted upon said guides for reciprocative movement, and adapted by the removal of one of said guides to be turned outwardly from the frame upon the other of said guides as an axis; a fixed stamp carried by the frame; and means for reciprocating the mortar to crush the ore against the stamp.



ECHOES FROM THE FRATERNITY

McFadden on the Gold Report

Other Points in His Analysis Presented Before the Annual Convention of the American Bankers' Association

(Condensed from Authorized Text)

[*The unfavorable report on the McFadden gold bill, by the committee of the American Bankers' Association, was abstracted on p. 880 of this journal for Oct. 30, and a very brief statement of Mr. McFadden's answer thereto was also given. The following paragraphs present additional points made by him in that reply.*]

In addition to paying the exchange discount, the French Government has imposed a sumptuary tax for the use of gold in the future fabrication of articles (other than money) by law of June 25, 1920, and a further tax on fine gold contained in articles of manufacture since 1873.

The Gold Committee refers to the excise tax proposed as interfering with the free flow of gold into the arts. The excise is to be paid only on the sale of the manufactured article, and not on the bullion, which the manufacturers will receive from the Mint as they always have at the fixed price of $20.67 per ounce. In this way a free gold market is maintained, and there is no interference with the free flow of gold either into the arts or from the arts into the Mint.

The committee's statement: "Increased gold production in a period of low prices and low costs makes it easier for prices to rise again, while diminished gold in periods of high prices and high costs tends to reduce prices and costs again." This is not borne out by the facts. The gold production of the world has declined from $469,000,000 in 1915 to $350,000,000 in 1919, a reduction of 25 per cent in the last four years, and yet prices throughout the world have risen enormously. *The degree of inflation is measured by the ratio of the gold reserve to the volume of the circulating media*, and it must be apparent that *an increase in the gold reserve without an increase in the circulating media would reduce the degree of inflation.* It must also be evident that the effect on prices of the supply of gold in active circulation is relatively small compared with that of the credit currency based on gold which is not "free," but locked up by the Treasury and Reserve Banks and used indirectly as the basis for a larger volume of currency. If this gold were really free and circulating, it could not be so used. The true remedy for inflation is to return the gold to circulation.

The committee has stated that a loss of $22,000,000 occasioned by the increased industrial consumption of gold over the production of new gold is a very small item to the monetary gold stock of the nation. The gold dollar in the vaults of the Federal Reserve Banks may serve as the basis of deposit liabilities of $2.50, and these deposits to the credit of a member bank may in turn serve to enable credit extension by that bank of, say, $19 to $35. With reserves close to the legal minimum, therefore, every million dollars of gold lost to the monetary gold reserve means forced credit contraction of at least twenty millions. The $80,000,000 withdrawn for industrial consumption during 1919 would be equivalent to a contraction in our credit structure of $1,600,000,000. Several of our banks recently pointed out the marked improvement in the money market resulting from the small amounts of gold which have come in from Europe. Is there *some magic difference* between gold imported from Europe and that produced in the United States? These small importations of gold ease our money market but hurt French and British exchange.

In 1915 the United States produced 21.5 per cent of the total world's gold output, and the British Empire 63.7 per cent. In the United States no assistance has been rendered the gold-mining industry. The gold producers of all British possessions receive the benefit of an exchange premium since July, 1919. This year the contribution of the United States to the gold production of the world will probably be not more than 12 per cent, about half of that which it contributed in 1915, while the stimulating effect of the exchange premium will probably increase the quota which the British Empire will contribute to 75 per cent. Whereas in 1915 the British Empire produced three times as much gold as the United States, in 1920 Britain will have produced six times as much. Are we to continue to ignore the problem of gold production in the United States, thus permitting the British Empire to gain an unquestioned supremacy?

Scientists Discuss the Divining Rod at the Victorian Royal Society

The layman's interest in the divining rod is perennial. It was expressed by Dr. Griffith Taylor, who was responsible for a discussion before the Royal Society of Victoria recently published in the *Queensland Government Mining Journal.*

Dr. Taylor described his investigations of experiments in water-divining at Canberra, whose site lies at the lower end of a valley of a small stream. On either side the valley is a ridge 900 ft. high. At a spot on one side indicated by the diviner a 50-ft. well collected 400 to 800 gal. per day. At a point on the other side the diviner also "divined" an underground stream, but the well driven there proved an absolute duffer. An ordinary hole put down in the middle of the valley by one of the Government engineers drew a plentiful supply for the whole neighborhood. Dr. Taylor doubted only the good sense of the water diviner; ordinary intelligence would have recognized that the valley in a district having an annual rainfall of twenty inches was ideal country for underground water.

Dr. Taylor had the actual divining rod used and demonstrated the way in which the diviner held it. That, in the hands of the diviner, it had "dipped" was beyond question. The rod had creaked in the hands of the big burly miner who held it. His idea was that the divining rod was a subject for investigation on the part of the psychologist rather than the geologist.

In conclusion, Dr. Taylor recalled the famous tests at Guildford, England, in which six diviners failed to discover water, even when standing over: (1) a well-known spring; (2) a sewer; and (3) a small reservoir from which the water was running beneath their feet.

In the discussion Dr. Gilruth and Mr. Carey told of a clergyman in Auckland, New Zealand, who used no rod but asked that no one address him, walked with short steps and held his arms rigid until suddenly affected by some force, when he would act as if he had grasped the terminals of a battery. At this spot he would instruct his client to dig. On two Government dairy farms he had found water twice on three tries.

Mr. Kenyon, of the State Rivers Department, was the only member who admitted that any scientific principle was involved. He pointed out that underground water exists (a) in sheets —sometimes narrowed to channels—not far below the surface, and (b) at greater depth as "artesian" water. Where (a) occurs the atmosphere on still, warm days is so disturbed that a surveyor cannot read his staff at any distance.

It is in this kind of country that the diviner flourishes, and Mr. Kenyon suggested that the atmospheric conditions might possibly affect the supersensitive kind of person who used the divining rod. In country where there was no under-surface water the diviner met failure. In Italy the farmers sought well sites by means of balanced poles or earthenware vessels on which the water condensed overnight. This seemed to give some scientific principle on which to base divining.

The general opinion of the meeting was with Dr. Taylor, that 99 per cent of the diviner's art was related to psychology, and 1 per cent to science—the geologists denying even the 1 per cent, and the "pure" scientist scorning both.

MEN YOU SHOULD KNOW ABOUT

J. O. Lewis is resigning his position as petroleum technologist, U. S. Bureau of Mines, to enter private employment.

W. J. Uren, general manager of the Seneca Mining Co., Calumet, Mich., is on a visit to New York City.

Harris & Ewing Photo

A. W. AMBROSE

A. W. Ambrose, who will become chief petroleum technologist of the Bureau of Mines on Nov. 15, was born at Lockeford, Cal., in 1889, where his early education was obtained. His high school course at Lodi, Cal., was followed by a course in the College of Mining of Leland Stanford, Jr., University, from which he was graduated in 1913.

After leaving college, Mr. Ambrose spent three years in the California oil fields. His work had largely to do with the study of the relation of geology to drilling and production. Later, he spent a year in private employment in the Louisiana and Texas oil fields. He joined the staff of the Bureau of Mines in 1917, and for two years served in Washington as assistant to the chief petroleum technologist. On June 1, 1919, he was sent to the Bartlesville, Okla., station as petroleum engineer. On Feb. 1, 1920, he was made superintendent of that station. He has been summoned from that position to take charge of the Bureau's petroleum work.

C. W. Purington, mining engineer, returned to Hakodate, Japan, from the Sakhalin and Okhotsk districts on Sept. 30.

John G. Flynn, recently with the Miami Copper Co., Miami, Ariz., has resigned to accept a position as mine superintendent with the El Oro Mining & Railroad Co., El Oro, Mexico, Mexico.

Fred Searls, Jr., who was in Reno, Nev., Oct. 23, left for his San Francisco office the same evening.

George O. Bradley, of the engineering firm of Bradley, Bruff & Labarthe, is seriously ill at the Lane hospital, San Francisco, Cal.

Hewitt O. Fearn, mining engineer, of Oyster Bay, N. Y., is now at Anyox, B. C., after a summer spent in prospecting in the Northwest.

Frank G. Stevens, mining engineer, who has been connected for some years with northern Ontario mining enterprises, is moving to Tepic, Mexico.

A. J. McNab, general manager of the Mason Valley Mines Co., left Reno, Nev., for his New York office on Oct. 21, after a visit to the company's properties in Nevada.

Jesse C. Scobey, mining engineer, has resigned his position as assistant to the president of La Luz & Los Angeles Mining Co., of Delaware, but will remain in New York City.

Dr. Ragnar Liden, of Stockholm, Sweden, geologist of the Swedish government railroad, is making a study of the clay occurring in the Cobalt district, Ontario, in connection with railway construction.

Robert Mond, general manager of the Mond Nickel Co., at Clydach, Wales, recently visited the company's properties in Ontario. He will take a holiday of several months in Canada and the United States, visit the Pacific coast, and later sail from New York City.

P. K. Lucke, consulting mining engineer, of Mexico City, D. F., Mexico, left that city for Europe about Oct. 19, and expected to return to Mexico at the end of December. While abroad, his address is care of Institution of Mining & Metallurgy, 1, Finsbury Circus, London, E. C. 2.

COL. C. S. BINCKLEY

Col. George Sydney Binckley, who has been on the editorial staff of *Ingeniera Internacional* since November, 1919, resigned his position on Nov. 1, 1920, to resume private practice as consulting civil and hydraulic engineer in Los Angeles, Cal. Col. Binckley commanded the 519th Engineers at home and for a year in France with the American Expeditionary Forces. He plans to resume certain scientific investigations interrupted by our entry into the Great War in 1917.

William Dunn, for some time with the Dome Mines Co., is now at the Simon Silver-Lead mine at Mina, Nev., in charge of the construction of the new mill.

SOCIETIES

The American Petroleum Institute will hold its annual meeting on Nov. 17, 18, and 19, 1920, in Washington, D. C. The headquarters and the sessions will be at the New Willard Hotel, 14th St. and Pennsylvania Ave., N.W.

American Engineering Council of Federated American Engineering Societies will hold its initial meeting on Nov. 18, 19, and 20, at the New Willard Hotel, Washington, D. C. The full program of this important meeting was published Sept. 25 on p. 633 of this journal.

The Mining & Metallurgical Society of America will give a dinner to E. A. Cappelen Smith at the Hotel Commodore on Nov. 10, at 7 p.m. The occasion is the presentation to Mr. Smith of the society's gold medal for distinguished service in the art of hydrometallurgy. Members of the society, the ladies of their families, and their guests are specially invited to attend. Reservations ($5 per plate) are made with C. A. Rose, 120 Broadway, New York City.

OBITUARY

George M. Richards, mining engineer, of 28 West 46th St., New York City, died at New Brunswick, Canada, on Oct. 12. He was buried at Woodlawn Cemetery, New York, N. Y., on the 17th.

Richard Lamb, consulting engineer, of 90 West St., New York City, died in hospital on Oct. 18 after a short illness, at the age of 61. He was a native of Norfolk, Va., a graduate of Brown University, and a member of several engineering societies, notably of the American Road Builders' Association. He was an authority on highway engineering and the engineer of a number of notable works. In the mining field Mr. Lamb took the leading part in opening the Virginia Copper Co. mine at High Hill, Halifax County, Va., erected its plant, and designed a plant for the electrical extraction of copper from ore. Mr. Lamb also designed an electric testing plant on the Erie Canal. He was buried at Brooklyn on Oct. 20.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

WEEKLY RÉSUMÉ

It is reported that Henry Ford will open the Imperial iron mine on the Marquette Range in northern Michigan that he recently acquired by purchasing the holdings of the Michigan Iron & Land Co. Minnesota and Wisconsin iron country men are said to be interested in the newly organized Milton Development Co. that has been formed to develop certain iron ore lands discovered in Columbia County, Ore. Control of the old Ohio & Colorado smelter at Salida, Col., has been obtained by Everly M. Davis, of New York, who, it is said, intends to reopen and operate this plant on local ores. On the Comstock Lode in Nevada the management of the North End Mines has announced that beginning Jan. 1 wages will be cut to $5 per day, which will permit operation of the mines of the company, all of which excepting the Con. Virginia are at present shut down.

In Canada, the employees of the Asbestos Corporation in Quebec have struck for higher wages and recognition of their union. Power shortage continues to hamper operations in Cobalt. La Rose's head frame and shaft house were recently burned at this Ontario camp. In British Columbia, Granby Consolidated is reported to have dropped its option on the Estall copper property.

Henry Ford To Operate Imperial Mine on Marquette Range

Property Included in Holdings Recently Acquired—1,000,000 Tons Blocked Out—Shut Down Since 1911

Henry Ford is to open the Imperial mine at Michigamme, Mich., on the Marquette Range, which recently came into his possession when he purchased the large holdings of the Michigan Iron & Land Co. Mr. Ford looked over the property a few days ago with his mining engineer and metallurgist and a decision was made to commence mining at once. The Imperial was first opened in 1882 and was closed down last in 1911. It was formerly operated by the Cleveland-Cliffs Iron Co., the latter concern surrendering its lease on April 1, 1919. The mine is well equipped with a steel head frame, engine and boiler houses, shops, change house and coal dock. The workings are quite shallow, being only 200 ft. in depth, and it will require but a short time to unwater them. The state tax commission estimates 1,000,000 tons of ore developed, but it is certain that much more than this exists on the property. The ore is a limonite, carrying from 50 to 52 per cent iron, low in sulphur and high in phosphorus. The moisture is very high. This is Henry Ford's first entrance into the iron mining business, but he has other mineral lands which might hold iron ore, and his work will be watched with interest by the mining men of the Lake Superior district. At present there are no active mines in the Michigamme field.

Governors of Zacatecas and Durango Define Attitude Toward Mining Industry

"Durango Perfectly Safe," Says Castro; Favors Erection of New Smelters—Governor Moreno for Taxation of Mines in Proportion to Output

SPECIAL CORRESPONDENCE

Jesus Augustín Castro, governor of the state of Durango, Mexico, and Donato Moreno, governor of Zacatecas, were recently interviewed by the correspondent of *Engineering and Mining Journal*. Both executives freely discussed the mining situation within their respective states and told of the steps contemplated to aid this important industry.

The state of Durango is perfectly safe today, in Governor Castro's opinion. "Any delay in resuming the operation of mines is not justified," he said. Upon being asked if he was disposed to use his influence to facilitate railroad transportation of machinery and supplies to mining camps he replied:

"I have so decided and have already taken up the matter. I have called the attention of the Federal Government to the resumption of traffic between the state of Durango and the United States via the old International Railroad, thus getting through communication from here to San Antonio, if necessary, without the long and tiresome detour by Saltillo and Monterrey."

Governor Castro said that his policy will be to facilitate the installation of as many smelters in the state as may be necessary to permit the miners to sell their products under non-prohibitive terms. He was asked if he thought it well to call upon foreign investors, in view of the national lack of capital for large mining ventures, with the understanding that all investments made in the country shall be subject to the laws of Mexico. He replied:

"I believe that an active propaganda should be started in order to evidence the unlimited mineral resources of the state of Durango, practically undeveloped up to the present time. My idea is to establish a statistical mining department in the state, to work either alone or in conjunction with the industry department of Mexico City; mining and geological explorations will be thus conducted all over the state, the results to be published for the sake of information to all mining investors.

"The government of the state of Durango is entirely disposed to grant all necessary protection and facilities for mining exploration and exploitation within the statutory provisions."

Asked as to the construction of railroads to mining camps, Governor Castro said: "The government of the state should never hesitate to co-operate in the reorganization of all railroad schemes already existing or that may be proposed in the future."

In regard to mining taxes in Durango, he said:

"I have no definite plan as regards the tax on mineral extraction; but referring to taxation, in general, my idea is to try a better distribution of the burden among the tax payers, so as to be able to diminish the taxes to a just amount."

The question was asked the Governor whether he favored the organization of a Chamber of Mines within the state. He replied:

"As I understand that a mining chamber would have for its object to promote, safeguard and harmonize all mining interests, it would thus co-operate with the Government, and, of course, I should support it."

VIEWS OF THE GOVERNOR OF ZACATECAS

"Zacatecas is one of the richest mining states in the Republic," said Governor Moreno, "developed for years only in its northern part. Operations were conducted on a large scale at a time when old treatment processes were still in use; the low silver price made possible the extraction only of high-grade ores, and as these were not found in depth, operations had to be shut down. Lack of transportation facilities and high freight rates also contributed to the suspension of work in the mines; but now that mining and treatment processes have improved some plans have been outlined for the resumption of operations in properties where enormous tonnage of low-grade ores is found. Under this scheme old dumps could be worked and treated. Following this general plan, operations have already been started in Fresnillo, Ojocaliente, Zacatecas, Sombrerete, Pinos, Nieves and Mazapil."

As to encouraging mining operations, Governor Moreno said:

"First, I will grant the mining companies the maximum facilities falling within the jurisdiction of the state, and at the same time I will take up with the Federal Government all matters

bringing a benefit to the mining industry. This would be easy to accomplish in view of the political solidarity already existing between the states and the Federal Government. Furthermore, I am discussing right now with the Geological Institute of Mexico City and with the Department of Industry and Commerce, the creation of a permanent Geological Survey Commission in the state, which will supply both the mining companies already operating and prospective mining investors with important information at no cost; this commission will start working on the exploration of southern Zacatecas.

"Few of the mining companies in Zacatecas are working now but they are all of importance. The country has just entered upon a period of peace indispensable for the prosperity of the Republic. Some well known mining investors in the state are feeling enthusiastic about the situation, and this Government has reasons to hope that within a year mining operation will reach their maximum activity."

As to mine taxation Governor Moreno said:

"This government, not only in regard to taxes on mineral extraction, but also to taxation in general, intends to follow a scheme of proportionate rates; in this manner the small and large producers will bear taxes in just proportion to their output, and the exploring outfits would not have to pay any taxes until they enter into a stage of production."

Governor Moreno is disposed to facilitate the study, location and construction of mining railroads. He said:

"Necessary influence will be exercised with the federal government for such a purpose; something about it has already been discussed by the representatives of Zacatecas in Congress, who support our projects and who are assisted by the attorneys for the state in Mexico City. Both in regard to this matter and to mining operations, this government intends to give fair assistance to all concerned with a view to securing the general prosperity of the state and nothing else."

The Governor was further asked what was the program of the Government as to the matter of assisting mining, principally in cases where operations are paralysed owing to internal difficulties of the corporations. He replied:

"If I understand this question, I might say that, referring to shut downs caused by troubles between capital and labor, this government has just enacted provisions creating the labor department with representatives in all the mining camps of the state. This department will conduct an intense propaganda against the nefarious activity of agitators, and at the same time will attempt to harmonize the tendencies of all parties following a program outlined by this government. So far, we have been successful, and I am sure that mining operations will not be hindered by conflicts between labor and capital; due to the importance of this matter it has deserved our preferred attention."

The government of Zacatecas is disposed to use all its influence so that the railroad companies would grant all necessary transportation facilities to the miners in the state. "This matter is of such a capital importance," said Governor Moreno, "that it has already been taken up with the President of the Republic; also the President-elect, Mr. Alvaro Obregón, knows about it, and I presume that all effort is being made in order to supply the National Railroads with necessary rolling stock, the lack of which is causing a crisis in the country and has been a decisive factor in the increasing high cost of living.

"The state government will encourage the organization of a mining chamber in Zacatecas," said Governor Moreno. "The organization of chambers, either of commerce, of agriculture or mining is considered by us as of essential significance, provided they accomplish their end; namely, the regulation of production, of imports and exports, the supply of working capital and implements, and even the regulation of minimum salaries in all centers of production."

Mexican Coal Strike Threatens To Close Large Companies

Eight Thousand Men Involved—Neither Side Giving Way—Arbitration Refused—No Violence

The particular cloud now on the mining horizon in Mexico is the labor muddle in the coal fields of the north. The strike for an increase of from 100 to 300 per cent in wages, recognition of the unions and a dozen other demands has reached an acute stage and the pumps and fans in several of the more important mines have been stopped and the properties are filling with water. Efforts on the part of the government to induce the men to return to work pending the appointment of an arbitration board have been fruitless. Neither side appears disposed to give ground. About 8,000 men are concerned in the strike and as they have no funds a great deal of suffering is already reported. The government has undertaken to supply the men and their families with the necessities of life. The trouble seems to have been started by professional agitators outside the coal fields, mostly foreigners, soviets and I. W. W. representatives from the United States. Dodgers are being circulated urging the men to seize the properties and work them on their own account. Unless a settlement is reached there will necessarily be a general closing of all mining and industrial plants in the north, as well as railway transportation, as they depend almost exclusively on the native coal output. Minerales y Metales and the American Smelting & Refining Co. have notified the government that they will not be able to keep their smelters and mines operating longer than a week unless they get coal. No violence of importance has been reported, and the fields are in charge of Federal troops.

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ARMY AIRPLANE ARRIVING AT NOME, ALASKA, AFTER TRANS-CONTINENTAL FLIGHT

E. & M. J. Receives First Letter Brought by Airplane From Alaska

The accompanying photograph of the army airplane finishing its great transcontinental flight at Nome, Alaska, on Aug. 23, was brought to New York by the same airplane on its return flight in a letter mailed to the *Engineering and Mining Journal* by Donald E. Campbell, mining engineer of Nome. The letter to the *Journal* is therefore the first to have been brought by airplane from Alaska to New York. It left Nome Aug. 25 and owing to various delays on the homeward trip did not reach New York until recently. With it came two copies of the *Daily Telegraph Bulletin*, published at Nome.

Cie du Boleo, Baja California, produced 440,720 lb. copper in September.

Asbestos Corporation's Employees in Quebec Called Out

Recognition of Union and Wage Increase Demanded—Business Conditions Changing

The asbestos industry in Quebec is experiencing a period of intensity which has been absent during the prolonged period of rising prices and labor inactivity. The culminating issue has apparently been projected when by reason of contracting business conditions the companies have been unable to meet the ever increasing demands of labor. An embryo managers' association had been formed to meet like emergencies, but evidently the original instinct characteristic of the operators in the camp prevailed and a single operator has been allowed to bear the onus of the combined attack of the labor forces. On Oct. 11 a strike was declared by the National Union against the two mines of the Asbestos Corporation, demanding recognition of their union and a wage increase of 12½ per cent. The corporation pointed out their inability to comply with the request, but in spite of their representation and the efforts of the Labor Delegate from Ottawa, the strike was declared against the corporation alone, although all the other members of the Managers' Association were working under precisely similar conditions. No issue is at stake, save the unrest inherent in labor due to the recent abnormal wage earnings, and the Federal Conciliation Board will, undoubtedly, ultimately straighten out the present tangle.

Business conditions in the camp are feeling a reaction from the buoyancy experienced during the past three years. The European markets have been looked upon as the absorber of our increased production but the continued inability of foreign countries to adjust their most basic industries increases the probability of these expected markets being deferred for some time to come; in the meantime, however, the present avenues of consumption are fully capable of maintaining the industry on a sound basis of production. For the present year shipments have been steady and should make a substantial increase over last year's total of 135,000 short tons of asbestos.

The Weiser interests are contemplating the erection of a 350-ton mill on their "Reed Mine" property. H. R. Lynn has been engaged to build the plant. The Bennett-Martin Mines at Vimy Ridge, Coleraine, are pushing the construction of the six-mile siding connecting their mines with Coleraine Station on the Q. C. Ry.

Herr Becker of the firm Becker & Haag, Berlin, Germany, importers of raw asbestos, made his initial visit since the termination of the war. Thomas Lloyd, for the past seven years with Bell Asbestos Mines, has resigned to accept a position as superintendent of the B. C. mines of the Asbestos Corporation, Limited, in the Black Lake district.

Oregon Iron Lands Taken Over by Milton Development Co.

Two Deposits Found in Columbia County—Minnesota and Wisconsin Men Interested

Two deposits of iron ore are reported to have been found in Columbia County, Ore., six miles apart on properties controlled by C. A. Finley and others, of Portland. J. L. Washburn, president of the Northern National Bank, of Duluth, and John Z. Williams, a Duluth attorney, have become interested in these, together with Henry Turrish, of Eau Claire, Wis., interests who own and operate a logging railroad and conduct logging operations in that district. The Milton Development Co. has been incorporated with a capital stock of $200,000 for the purpose of taking over the holdings of the interests headed by J. L. Washburn and Henry Turrish and to determine the extent of the formations through development work. Investigations of the deposits have been made during the last year by J. W. Flannery, of Cleveland, Ohio, and A. M. Martin, of Chicago, who, it is claimed, are satisfied that the deposits are of considerable extent. The ore is claimed to be in blanket formation and richer in brown hematite than the average Minnesota deposits were at the same stage of their development. They have been shown to run from 52 to 59 per cent in iron and, although somewhat high in phosphorus, contain a small amount of manganese. The explorations were confined mainly to a point three miles north of Bunker Hill and at one place it was reported that the orebody was found to be 60 ft. thick and of an undetermined length and breath.

North End Mines on Comstock To Reduce Wages Jan. 1

The wage scale now in effect at the North End Mines in Virginia City, Nev., will be reduced to $5 per day on Jan. 1, 1921, according to an announcement made by Alex Wise, superintendent. When the miners went on "vacation" Sept. 5, following a demand for $6 a day, the North End Mines were the only ones to accede. In notifying the men that the advance was to be withdrawn Mr. Wise said:

"The old wage scale in vogue at the North End Mines prior to Sept. 5 must be put into effect as soon as possible in order that other properties under my management, other than the Con. Virginia, may be placed in operation again, which under the present scale is not possible; also that other properties along the lode may be able to resume work.

"In view of the general conditions throughout the country showing a downward trend of all commodities entering into the cost of living, I believe the new wage scale to be put into effect will work a hardship on no one, and create at least four or five times the present opportunity for employment along the Comstock lode."

Queensland State Mining Ventures Suffering Checks

Proposal To Erect Iron and Steel Works at Bowen, Costing £3,000,000, Gets a Setback

From Our Special Correspondent

Brisbane, Sept. 6—The State enterprises of the present Queensland (Labor) Government, as far as they relate to mining, are suffering some checks, and the failure of the Premier to get a loan from the British capitalists, intended largely to prosecute these enterprises, is to result in a general election, which is expected to take place in October. The biggest thing that has received a setback is the proposal to erect State Iron & Steel Works at the northern port of Bowen, at a cost of something approaching £3,000,000. A good deal of money has been already spent in preparing for this venture, and at the present time the government are testing a large deposit of iron ore on the northwest coast of western Australia, over which they hold an option (that cost £3,000) to purchase at £30,000. As this option will expire in October, and as it is doubtful whether the Queensland iron ores alone are good enough or extensive enough to warrant the carrying out of the big works, the government must be in a quandary as to just what they can do.

The State Battery at Bamford, in the far north, that was established to assist in the mining of the rare metals, is now closed down owing to the fall that has taken place in the price of molybdenite and wolfram. As the battery is now equipped for the treatment of tin also, and as the market value of this metal is keeping up, the suspension is not likely to last long.

The Chillagoe State Smelters, which together with the Chillagoe and Ethridge Railways and some mines, were purchased by the Government from the Chillagoe Co., have shown a small profit for six months' work, but a much better showing would have been made had it not been for an insufficient supply of ore to keep the works going at their full capacity. This was really the trouble when the Chillagoe Co. closed down several years ago, but there is no doubt the mining industry of the district suffered much while the works were lying idle.

As far as the Government's coal prospecting or coal mining ventures are concerned, they are looking promising. There is no question they have a splendid coal area on the Bowen field, 60 miles inland from Bowen, and the colliery will be ready for a large output as soon as the railroad being built from the port reaches the field. This coal will be a great benefit to the northern parts of Queensland, and is of course also intended for the iron and steel works if they are ever built. Some 300 miles further south, at the Styx River on the coastal railway, the Government has proved by means of boring and a shaft some of the best coal in Australia, and are selling enough to pay the cost of prospecting.

The shaft got into very faulty country, but further prospecting has disclosed a more settled locality, where profitable operations are now likely to be carried on. On the Dawson River, inland from Rockhampton and Mount Morgan, the first coal mined proved, on trial, to be unsatisfactory, but a 7-ft. seam of exceptionally good quality has now been struck. This field is connected by rail with both Rockhampton and Mount Morgan; from the former place it is inland about 60 miles.

On the whole, the coal mining industry of Queensland has of late been showing signs of expansion. Last year's output was nearly 1,000,000 tons, and that for the first half of the present year was greater than that for the like period of 1919. The value at the pit's mouth ranges from 12s. 6.6d. per ton in the south to 17s. 8d. in the north.

New Railroad To Be Constructed to Guanaceví, Durango

Contract With State Also Provides for Erection of Smelter

Officials of the state government of Durango, Mexico, recently signed a contract with Smith Bros. for the construction of a railway from Santa Catarina Tepehaunes to the mining camp of Guanaceví, and the erection of a smelter in the latter camp, at a total cost of $20,000,000. The government guarantees 6 per cent interest on bonds to be issued for this work, for a period of twenty years. Surveys are to be completed within ninety days and the entire work must be finished, according to contract, within two years. Immediately upon signing the contract the representatives of Smith Bros. left for the City of Mexico to secure the approval of the Federal congress and President.

Delinquent Mining Claims in Ontario Declared Forfeit

In a recent issue of the *Ontario Gazette* was published a list of 1,900 mining claims which reverted to the crown because of the non-payment of the acre tax under the Mining Act of Ontario. Under the Mining Act a tax of 5c. per acre per year is levied against all mining property in an unorganized district. Through oversight, or possibly in part, on account of negligence in the Mines Department, a large number of companies and claim owners had neglected this tax, and the special order-in-council throwing the claims open for re-staking came as a big surprise.

Included among the properties thrown open was the Teck-Hughes in Kirkland Lake, on which over $1,000,000 has been spent, and which has a 100-ton mill. There was a big scramble to restake this property, together with other properties which were believed to be valuable, but fortunately, at the last moment, a number of the more important properties were withdrawn by the government from re-staking.

Will Reopen Salida Smelter To Treat Colorado Ores

Everly M. Davis, of New York, Secures Control of Plant—Another Project To Ease Smelting Situation

Confirmation of the conclusion of the negotiations by which the old Ohio & Colorado smelter at Salida, Col., has passed into the control of new interests, represented by Everly M. Davis, of New York, a prominent mining operator, identified with the financing and development of the Rawley mine at Bonanza, Saguache County, has just been received at Salida. The smelter, which is equipped with a lead stack, after being owned by various interests, passed to the control of the American Metal Co. and was operated by it for several years. Owing to the reported shortage of the available supply of suitable ore, the smelter was closed down about two years ago and was subsequently sold at auction to Morse Brothers, of Denver, for the purpose of wrecking and dismantling to secure the equipment and material for sale as second-hand material. Plans were made for dismantling the plant when Mr. Davis appeared and made contracts with Morse Brothers, which it is understood will shortly result in the full resumption of operations. As an accessory to the project, it is proposed to build a seven-mile aerial tram from the Bonanza mine to Shirely station on the narrow-gage branch of the Denver & Rio Grande Ry., near Mears Junction, about twelve miles from Salida. The Rawley mine has positively developed, according to the company's report, 89,843 tons, averaging 8.89 oz. of silver, 2.35 per cent copper, 8.98 per cent lead, and 189,810 tons, averaging 10.9 oz. silver, 3.25 per cent copper, 0.3 per cent lead. The probable ore is estimated at an additional amount in excess of 560,000 tons. The company has been carrying on an extensive development for a number of years, the total footage amounting to 13,843 ft. Various plans to realize on this work have been delayed by financial conditions and the excessive cost of equipment and of operation. It is proposed to use the ore of the Rawley mine as a basis for the supply for the smelter and also to provide capacity to take care of additional Colorado ore which has been going to other Colorado smelters or to Salt Lake City. A considerable tonnage of low-grade ore is known to be available, which was not profitable to ship to other points than Salida. The increase in freight rates has further limited the shipment of ore from Leadville, in the San Juan district, and will result in increasing the supply for the Salida plant. This is considered the most important transaction affecting mining which has taken place this year.

Another project to ameliorate the smelting situation in Colorado and to meet the present conditions is being developed in connection with a power project on the Gunnison River above Lake City, in Hinsdale County. Denver and New York interests have secured an option from the Reynolds-Stearns Co. on the water power rights on the South Fork and propose to establish at Lake Cristobal a plant which will provide from 8,000 to 10,000 minimum horsepower. The estimated installation cost is about $125 a horsepower, which would permit of the surplus power being utilized for electrical smelting of the zinc-lead ores of Hinsdale County at a cost which, it is expected, will be much less than the prevailing smelting rates plus the present freight rates. This power and smelting project is being developed by L. F. Hulen, a Denver capitalist, who was identified with the western Nebraska potash developments during the war, and who recently has taken an option on the Golden Fleece mine, at Lake City, and has spent a large amount of money in exploration work and development thereon. Investigations of the methods of electrical smelting are now being made, and the consideration of the situation as regards actual and prospective ore supply. The general plan contemplates participation by mine-owning interests, which matter is now being worked out. If electrical smelting is found practical in this locality it is likely that other similar development in the San Juan district and elsewhere in Colorado will be undertaken.

Drilling Contest Held at Baxter Springs, Kan.

A. Abbott and A. E. Mitchell, representing the Hunt Mining Co., captured the championship of the Tri-state district for drilling in an annual contest staged at Baxter Springs, Kan., on Oct. 20. Using a Denver Turbro drill they drilled through a concrete block 6 ft. in thickness in 4 minutes, 26½ seconds, this time including the set-up and knock-down of their machine. They won a prize of $100 and the temporary ownership of a $75 loving cup.

Harold Miles and Fred Vickery, representing the Premier Mining Co., were second and only one second behind the winners, and there was some questioning of the judges' decision as to whether the winning team had completed the knocking down of their tripod when time was called. Miles and Vickery were the winners a year ago.

The contest was well attended, especially so on account of the shutdown of mines which made it possible for almost all the miners to be on hand.

Northwest Mining Association Elects

The Northwest Mining Association elected as its new board of trustees: Frank A. Ross, Frank C. Bailey, F. M. Smith, G. B. Dennis, Oscar Cain, Lehigh Nicholas and W. H. Linney. A communication urging support of efforts being made to obtain a readjustment of freight rates on bullion was received from the Colorado Metal Mining Association. The secretary was instructed to reply that the Northwest Association would give all possible aid.

Special Utah Power Contracts Declared Void

Order of State Public Utilities Commission Effective from Oct. 22—Companies To Appeal to Federal Courts

Special contracts between large users of power in Utah and the Utah Power & Light Co. that were entered into several years ago, in fact before the creation of the Utah public utilities commission, have been declared by the commission to be void, and such users of power placed by the commission, beginning noon, Oct. 22, on the standard rates prevailing in general. The commission has for some time been going into the matter of rates, and has held hearings at which companies protesting against increased rates and the abrogation of contracts have been appearing to plead their cases. These companies have been taking the position that the commission has no jurisdiction, and that contracts, lawful when made, should under the state and Federal constitution be held inviolable against interference by legal authority. Protesting companies have indicated that the matter will be taken to the Federal courts. A large number of mining companies are naturally effected by the ruling of the commission. The Utah Copper is the largest single user of power in the state, in some years having taken more than fifty per cent. of the power generated by the Utah Power & Light Co.

To Hold Flotation Conference at Denver

At the Twenty-third Annual Convention of the American Mining Congress to be held in Denver, Nov. 15-19, 1920, the committee on flotation will make a report covering the activities of the American Mining Congress and the Federal Trade Commission during the past twelve months, in the inquiry now being made relative to the contests between Minerals Separation, Ltd., and the users of flotation. The committee will include: George E. Collins, mining engineer, Denver, Col.; Philip Argall, metallurgist, Denver, Col.; T. A. Rickard, editor of the *Mining and Scientific Press*, San Francisco, Cal.; E. E. Paxton, president of the Engels Copper Co., San Francisco, Cal.; R. M. Henderson, president of the Wellington Mines Co., Breckenridge, Col.; J. M. Callow, president of the General Engineering Co., Salt Lake City, Utah; and G. W. Lambourne, president of the Daly-West Mining Co., Salt Lake City, Utah.

Good Weather Facilitates Lake Superior Ore Shipments

Iron ore shipments from the Lake Superior districts during 1920 will total 58,000,000 tons, according to estimates given by *Iron Trade Review*. Shipments to Nov. 1 were approximately 52,953,000 tons, and with the continuation of favorable weather conditions it is expected that an additional 5,000,000 tons will be shipped during November.

Prospective slackening of furnace operations has dissipated the fears which several of the operators expressed regarding the possibilities of their being able to make adequate deliveries. Ore contracts will not be filled, but the demand is less urgent. While two leading furnace interests in the East had but a few weeks' supply on hand a month ago and then were seriously concerned, especially in regard to the lack of cars to haul ore from the Minnesota open-pit mines to the docks, general improvement in shipping facilities, coupled with the present outlook in the pig iron market, is responsible for a more assuring attitude.

Power Shortage at Cobalt, Ont., Causing Mines to Curtail

Owing to a shortage of hydro-electric power, due to an exceptionally dry season, most of the Cobalt mines are curtailing their operations to some extent. So far this is mostly in the cessation of re-treatment of sands and work which could be cut off without interfering with production to any extent. Unless conditions materially improve, however, further reduction in power consumption will be necessary. So far this year there has only been 19 in. of rainfall compared with 35 in. for the corresponding period of the previous year, and the water in all the lakes and rivers is lower than has ever been known before.

The shortage of power applies equally to Kirkland Lake and Porcupine and the operators in the Sudbury district are also suffering.

Baja California Vanadium Deposits To Be Developed

The Baja California Vanadium Co. has been recently organized to develop and operate certain calcium vanadate deposits of Lower California. These deposits are situated five kilometers from tide water at Angeles Bay on the Gulf of California. They consist of large lenses of gypsum and calcium vanadate in a reddish shale.

Picked specimens of the calcium vanadate analyze from 40 per cent to 45 per cent vanadium pentoxide. The general tenor of the material in the lenses is a little over 5 per cent vanadium pentoxide. The lenses vary considerably in size. The principal one is 900 m. long and 450 m. wide. The deposit has not been explored to any extent vertically. The deepest shaft is but 25 ft. deep. Practically all work has been done in open pit thus far. In addition the enclosing shales contain up to 2 per cent vanadium pentoxide. The red shales cover a large area.

Tests for metallurgical adaptability have been conducted in the rare element laboratory of Will Baughman, of Los Angeles. The ore does not contain phosphorus, arsenic or other detrimental element and lends itself readily to extraction methods.

The deposit was discovered last spring by Leland Devine, who with A. I. Meyers succeeded in interesting backers for the project, and if present plans mature the company will commence operations this winter.

Bounty on Canadian Iron Ores Again Asked

The Canadian Tariff Commission at a sitting in Fort William recently received memorials from the Fort William and Port Arthur Board of Trade favoring the payment of a government bounty for fifteen years on all Canadian iron ores mined and marketed. The Port Arthur Board of Trade asked for a bounty of 50c. per ton but the Fort William petitioners thought that anything less than $1 per ton would be of little use in inducing proprietors of iron mines to develop their properties. It was agreed by all that the bounty should be paid to the producer of the iron ores and not to the smelters, as the latter system had been tried and proved a failure.

At the sittings of the commission at Sault Ste. Marie, Ont., on Oct. 18, the Board of Trade of that city asked for a bounty of $1 per ton on iron ore produced in Canada for fifteen years. President W. C. Franz of the Algoma Steel Corporation expressed the opinion that considerable development would take place if such a bounty were given to the miners. He thought that further prospecting of the iron ranges would bring to light other deposits of merchantable iron ore, which could go directly to the blast furnaces without previous treatment.

Indian Office for Miami, Okla.

Cato Sells, Indian Commissioner, has announced the establishment of an Indian office at Miami, Okla., to supplement the office that has been maintained for a number of years at Wyandotte, Okla. Mr. Sells states that it is impossible to carry on the work of the district at the Wyandotte office with the efficiency desired, owing to the vast amount of added work that has come about through the discovery of zinc and lead on the lands of the Quapaws, near Picher, Okla.

Blue Sky Law Proposed

A brief on blue sky legislation has been prepared by the mining bureau of the Spokane (Wash.) Chamber of Commerce, of which F. W. Smith, smelter director of the Bunker Hill & Sullivan Mining & Concentrating Co., is chairman. Although opposing the state blue sky legislation contained in the Frawley bill, the brief advocates the enactment of a Federal law providing that full information shall be filed in the originating state of the corporation and at Washington, D. C.; also it provides for the automatic opening of all states to a promotion when it has been passed on by Federal authorities at Washington.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

To Expand Co-operative Work of Bureau of Mines

Investigations Conducted for State Institutions and Private Companies Yielding Good Results

Owing to the favorable results following the co-operative agreements entered into by the U. S. Bureau of Mines with state institutions and private companies it is intended to encourage this kind of work. In fact, a very important development along those lines is expected. At present the Bureau's appropriation is supplemented by more than a half million dollars annually. It is believed that this amount can be greatly increased to the advantage of private industry and to the public. An example of the co-operative agreement with private companies is that with the Northwest Magnesite Co. The purpose of the co-operation in this case is to conduct an investigation as to the best method of producing high-grade caustic-burned magnesia. The work is to include a study of the calcination of magnesite from the property of the Northwest Magnesite Co. with a view to determining the most favorable conditions as to time and temperature of calcination for the production of caustic magnesia yielding the best hydrochloride cement; a similar study of magnesite from various California and other properties; and a study of the various methods for judging the quality of caustic magnesia for the production of oxy-chloride cement.

The advantages to the public of the investigation would be that if domestic magnesite is found suitable as a plastic flooring material it will make the United States independent of foreign supplies, particularly from Greece, Mexico and Venezuela. It will tend to cause the development of this natural resource on a larger scale and may lead to the larger use and conservation of magnesium chloride, which is an essential ingredient in making plastic flooring cement. Magnesium chloride is produced in connection with the manufacture of salt by solar evaporation, but now goes entirely to waste.

The advantages to the Bureau are that it will increase its first-hand knowledge of the quality and the possibilities of domestic magnesite. It will give the Bureau certain fundamental but little known data. It will bring the Bureau in touch with an important group of mining men on the Pacific coast and is likely to convince them that the Bureau of Mines is able to attack practical problems and to assist in their solution. Since the Federal Government does more construction work than does any other single agency in the United States, it has a very direct interest in this cement which is being adapted so successfully to the construction of floors.

Typical of the co-operative agreements with state institutions is that with the University of Idaho and the Idaho Bureau of Mines and Geology. The purpose of the co-operation in this case is to disseminate further information with a view to improving conditions in mining, metallurgical and other industries, safeguarding life among employees, and preventing unnecessary waste of resources.

Due to their complexity, the treatment of ores from the Cœur d'Alene district has long presented a metallurgical problem. The Bureau of Mines has recognized the importance of devising ways and means for recovering a larger percentage of the values from those ores. Through co-operation with the state institutions and with the operators of the Cœur d'Alene district, the Bureau has been able to carry on an investigation which would have been impossible otherwise, owing to lack of funds. Through the co-operation with the University of Idaho, the Bureau of Mines has had the advantage of office room, laboratories, milling machines and other facilities, gratis. This co-operation has been in progress for nearly four years and has opened the way for much more extensive work.

At present the Bureau of Mines has in effect co-operative agreements in which the outside agencies contribute a total of $512,800. These agreements are with the following agencies: Sewalls Point Coal Exchange, Trent Process Corporation, Miami Copper Co., Monongahela Valley Traction Co., Panhandle Oil Co., American Society of Heating and Ventilating Engineers, Southern Pacific R.R., Sinclair Refining Co., Puget Sound Traction, Light & Power Co., Pope-Shenon Mining Co., Ocotillo Products Co., Northwest Magnesite Co., National Tube Co., The Koppers Co., Erie City Iron Works, Mid-West Refining Co., Welsbach Co., Vanadium Corporation of America, Chamber of Commerce of Bartlesville, Okla.; War Department, Bureau of Standards, Carnegie Institute of Technology, Colorado School of Mines, Primos Chemical Co., Salt Lake City and University of Utah, Illinois Geological Survey, University of Illinois, University of Arizona, University of Washington, University of Idaho, Idaho Bureau of Mines and Geology, University of Minnesota, Cornell University, Colorado School of Mines, Ohio State University, New York-New Jersey State Bridge and Tunnel Commission, State of New York, Industrial Commission of Utah, State of New Jersey, Pennsylvania Geological Survey, Oregon Bureau of Mines and Geology, State of Oklahoma, State of Colorado.

Survey's Copper Specialist Back from Western Trip

H. A. C. Jenison Reports Labor Problems To Be Serious in Various Copper Mining Districts

H. A. C. Jenison, the copper specialist of the U. S. Geological Survey, has returned from a visit to several of the copper-producing areas in the West. In addition to the depression due to the poor copper market, Mr. Jenison finds that copper mining in the West is struggling against a very serious labor problem. Even with the high wage scale now in effect the mines are finding it impossible to compete with Eastern industries. The greatest difficulty is being experienced in securing skilled operators. The increase in freight rates has added materially to the difficulties of the Western copper producers, Mr. Jenison says. He reports that plans are now well advanced looking to the shipment of concentrates and metal to the Pacific coast for transshipment through the Panama Canal to the eastern seaboard; in fact, shipments have already been made by the Granby and Anaconda copper companies.

Standardization Committee Will Meet in New York

With the idea of evolving something more definite in the matter of standardization of mine practice and equipment, the American Engineering Standards Committee is planning a meeting in New York Nov. 11. It is expected to formulate a report which can be presented at the convention of the American Mining Congress in Denver. The American Institute of Mining and Metallurgical Engineers, the American Mining Congress, the Mining and Metallurgical Society of America, the National Safety Council and the Bureau of Mines have been asked to name two representatives to form a sub-committee to assist in the work.

War Mineral Awards

Awards in war minerals relief claims made during the week ended Oct. 23 have been announced as follows (the name of the claimant, the mineral, the amount recommended, and its percentage relationship to the amount claimed, are shown): Benjamin F. Steacy, chrome, $640.12, 32 per cent; Carolina Chrome Co., chrome, $5,376.46, 25 per cent; A. H. Jarman, chrome, $70,288.45, 51 per cent; United States Manganese Co., manganese, $21,157.64, 15 per cent. In the claim of John Crisle, which had been disallowed, an award of $469 was recommended. This was 93 per cent of the amount claimed.

NEWS BY MINING DISTRICTS

Special London Letter

Coal Strike Affecting All Industry—Tin Mines of Cornwall in Bad Straits

London, Oct. 19 — Virtually the sole topic of conversation in all circles is the coal strike, which began on Saturday. The very threat that the miners would "down tools" had an unsettling effect upon industry, and now that the strike is an actual fact works of all descriptions are closing down, throwing thousands of men and women out of employment, holding up shipping and causing the cancellation of orders in all directions. As the miners refuse to increase production, and the profit on export coal about which they are squabbling is rapidly vanishing, the economic position is becoming decidedly serious. One reflex influence of this intolerable attitude is to be seen in the Cornish tin mining industry. Never having been able to lay in stocks of coal owing to lack of financial ability and insufficient transport, the mining companies will shortly be compelled to face the question of ceasing operations. Some of the tin mines are very wet, and in the event of the fuel supplies becoming exhausted, and the workings flooded, the condition of the properties will be parlous. Seeing that they may be prevented from getting production away from the mines, and further that they may have to finance it for a considerable period, the smelters are refusing to purchase. This naturally is a great disadvantage to the companies, especially in view of the persistent fall in the price of the metal.

Not so very long ago tin was selling at £350 a ton; it is now only £238 5s. There seems to be a daily drop, and no means of stopping the dry rot. The explanation partakes of a dual character. Just when it was hoped and believed that the demand for the metal would expand and the price advance, some 2,000 tons were dumped upon the market from the East. This came as a distinct surprise, for the statisticians had previously held the opinion that they knew the exact quantity in port, afloat and abroad. To a certain extent this affected the problem of stabilizing the price, for it was surmised that other secret stores existed. Now that factories and engineering works are fast closing down the demand for tin has fallen away very considerably. In the event of any of the older Cornish mines being abandoned on account of the expense of dewatering, attention will be directed to reopening the silver lead mines which were worked about sixty or seventy years ago in Cornwall and Devon. Although there were about sixty such properties operations were not on a large scale. The idea would be to ascertain whether the lodes persist laterally and in depth, and if so whether the metal content could be profitably extracted in present conditions.

With the public really standing out of the markets, business is at a very low ebb. And yet funds are less scarce, because being unemployed in industry they are available for Stock Exchange purposes, or other financial operations. One or two mining companies are taking advantage of this state of affairs to arrange an issue of capital. Terms suggested are rather high, but as in the ordinary way there would be difficulty in obtaining money, they are cheerfully complied with.

CANADA

British-Columbia

Granby's Option on Ecstall Property Dropped—To Protect Against Worthless Stock

Anyox—The Ecstall copper property, for several years bonded by the Granby Con. M. S. & P. Co., which did much drilling and other development, has returned to the original owner, the company's option having been allowed to lapse. The general manager of the company is quoted as saying that the property no doubt would be worked eventually but not for the copper. Sulphur and iron are found in the ore but its copper content is not as high as in the product of the Hidden Creek Mines.

Victoria—The protection of the guileless public against the designing salesman of worthless mining stock is the subject of a recent pronouncement by the British Columbia Minister of Mines. He says: "The Minister of Mines has been given wide powers (under the Mineral Survey and Development Act), as any statement in regard to any company made by him is absolutely privileged. This is a policy intended primarily, and, in fact, solely for the protection of the investing public. The Resident Mining Engineers, being in the field and in close touch with actual mining operations and development, are in a position to know whether statements made by stock mining companies for the inducement of the sale of shares are accurate, or if they do not can readily confirm such statements. British Columbia in the past has been afflicted with too many flotations designed to 'mine the public.' The Department of Mines is determined that the issuance of worthless mining stock shall cease. Hence the legislation by which the government mining engineers are charged with the responsibility of assisting the Minister in seeing that the statements made by mining companies in prospectus or any documents issued for stock selling purposes are strictly in accordance with the facts. In the last few years there has been occasion more than once to apply the terms of the act with results of value to the public and the same policy will be continued, it being the intention that all money invested in mining shall be spent in legitimate mining development."

Ontario

McKinley Darragh To Shut Down Savage Mine for Winter—La Rose Shaft House Burns

Cobalt — The McKinley-Darragh Mines of Cobalt has decided to shut down the Savage mine for the winter on account of the shortage of power and labor. The retreatment of old tailings has also been stopped.

Fire completely destroyed the head frame and shaft house of the main La Rose shaft, which was one of the historical landmarks of the camp. The vein on which the shaft was sunk was the original discovery of the district, and the shaft house was the first one erected in the camp.

Crown Reserve has taken an option on the North Cobalt mine, which it will unwater in order to make an examination.

The Coniagas and the Mining Corporation have stopped the retreating of old tailings for this season, and the Dominion Reduction Co. will stop early in November.

Kirkland Lake—The Ontario Kirkland has issued a statement that they expect to have a 100-ton mill in operation by September, 1921. Construction work will not be started until spring.

Porcupine—Labor conditions in Porcupine are expected to improve through the importation of men by the Hollinger and Dome from Europe. These two properties are able to absorb about 1,000 men, but it is not expected that they would be able to obtain this number before a considerable time. The men coming from Europe will have a very beneficial effect on the labor situation.

It is understood that 200,000 shares of the Vipond-North Thompson stock is to be taken up at 30c. a share. This money will finance the company and permit of its being reopened.

At the North Davidson annual meeting the president stated that three diamond drill holes gave an average of $25 per ton over very big widths.

COLUMBIA

Amalfi—E. A. Probst, manager of La Viborita Mining Co. in Amalfi, Department of Antioquia, inspected the mine El Comstock Antioqueño early in September. This property is in charge of Gustavo White, of Amalfi, who states that the company is working but one of the three veins on the property and has in sight 1,200,000 tons of $10 ore. There is 1,200 tons on the dumps. A mill is needed with proper financing.

MEXICO

New Cyanide Plant Built by Melchor, Ocampo y Anexas—Silver's Decline Gives Concern

Durango—The mining agency here has just given out some interesting figures. In 1918, twenty-eight new mining denouncements were made in the state. In 1919, thirty-nine denouncements were made and this year ninety-one denouncements have already been filed, with the probability that the total number will pass the one hundred mark considerably before the end of the year. At the same time over 1,000 pertenencias have been allowed to lapse because the owners refuse to pay back taxes of several years. It is probably the intention in many cases to redenounce many of the properties, in isolated parts, thus escaping the taxes altogether.

Twenty-eight denouncements were recently made in the name of, or by agents of General Francisco Villa. One of these properties, it is reported, is very rich and the General has already refused a large sum offered by American capitalists.

The Melchor Ocampo y Anexas Co. in the Tejamen district has just constructed a new cyanide plant with the capacity of 100 tons daily.

City of Mexico—The rapid and continued decline of silver naturally threatens to throw the principal mining industry out of wear. Most of the important companies are holding their bullion, hoping that the fall is purely temporary and the smaller concerns are fighting from hand to mouth buoyed up by the same expectations. Silver cannot be mined profitably in Mexico under 80c. an ounce and if the price of the white metal continues down permanently, or for any great length of time there will, of course, be a general shutting down and a mining panic. The National Chamber of Commerce and Industry has already called upon the secretary of the treasury for relief in the shape of reductions in the mineral export tax and also a lessening of the general mining taxation. The secretary has the matter under examination, but, it is understood, is inclined to believe that the decline is only a flurry and that an advance can be expected at any time. At this date the actual working situation remains about the same. That is, the new work which has been inaugurated has not been suspended, nor is there any indication of any let up in the general output at this time.

ARIZONA

Hardshell Company To Resume Development Soon

Patagonia—A promising shoot of high-grade sulphide ore has been opened during the last few months in the Hardshell mine above the 325-ft. level. Several carloads have been shipped to the smelter and the returns range from $50 to $75 a ton in silver and lead. Interesting features of this orebody are that it is surrounded by carbonate ore in a leached and oxidized zone not far above present water level, and its lateral and bottom limits have not been determined by existing development. The orebody is being developed and mined by lessees Gardiner & Young, whose lease expires on Dec. 23, 1920, after which date the ground will be operated on company account. The company plans to resume development operations through its 435-ft. shaft in the near future. A crosscut will be driven to cut the Hardshell vein, and a drift will be advanced to connect with the bottom of the old inclined shaft. The company is in the market for fuel oil and equipment to unwater the shaft. The company's Bender properties have been leased and manganese-silver ore is being developed. The Hardshell properties are under the management of Howard K. Welch.

Tombstone — The Mellgren Group, consisting of 55 claims in the western part of the district have been purchased by a New York company, of which F. W. Clark is president. Enough work has been done on these claims in the past years to show a large amount of silver ore of milling grade. It is planned to erect a 250-ton mill. This company which is incorporated as the Tombstone Silver Fields, has also taken over the Old Guard mine and the Merrimac group and will start development work at once. All work is under the supervision of Frank Cavanaugh, an engineer of New York.

The Solstice Mining & Milling Co., composed of local business men, have purchased four claims in the State of Maine district, three and one-half miles south of Tombstone. A three-drill I.-R. compressor, a 30-hp. gasoline engine and gasoline hoist are on the ground ready for installation, a two-compartment shaft has been started and will be sunk 500 ft. before drifting is started. The company intends to erect a small mill to concentrate a large amount of 10-oz. silver ore on the dump. W. T. Boyd is president and M. M. Bludworth secretary. Both are Tombstone business men.

Two hundred names were drawn Oct. 27 for jurymen in the famous Bisbee deportation case which is scheduled to start Nov. 8.

NEW MEXICO

Hecla Divide Bringing in Machinery at Pinos Altos—Wentworth & Goodrich Add to Fluorspar Holdings

Lordsburg—Wentworth & Goodrich, of Battle Creek, Mich., who recently took over the Great Eagle fluorspar property north of Lordsburg, are reported to have taken over a fluorspar prospect in the Franklin Mountains about 25 miles north of El Paso. Development work will be conducted under the general supervision of Alfred Roos, mining engineer.

Pinos Altos—The Hecla Divide Mining Co. that recently took over the Langston mine, five miles north of town, have been doing considerable substantial road work preparatory to bringing in machinery and supplies.

CALIFORNIA

Yuba Gold Resumes Normal Dredging —Soulsby Mines Co. Incorporated

Hammonton—The lifting of power restrictions has permitted the resumption of normal gold-dredging operations on the Yuba River.

Kennett — The Mammoth is now working steadily with night and day shifts as a result of the lifting of the power ban.

Sonora—Articles of incorporation of the Soulsby Mines Co. have been filed in the county clerk's office in Sonora, which will be the principal place of business. D. Miller and D. Coleman, of San Francisco; W. H. Bourke, of Oakland; J. O. Gillice, of Berkeley, and Eric Sergerstrom, of Sonora, are directors. The capital stock is $500,000 with shares at $1 each, and the company is incorporated under the laws of California. J. O. Gillice, former superintendent, will be in charge.

Downieville—L. A. Thatcher, of San Francisco, who has purchased the machinery at the Gold Point mine here, is shipping it to his holdings in other parts of California.

Grass Valley—The Idaho-Maryland Co. has a 15-stamp mill ready to operate, although no ore has been taken from the mine and the lower workings are still filled with water. The stamps formerly used at the Union Hill plant have been installed at the Idaho-Maryland. The company has painted all buildings in the group surrounding the shaft a dark green and has improved its office building.

NEVADA

Ely District Quiet—Cyanide Mill Planned for Nivloc Mine—Operations at Tonopah

Silver Peak — The Nivloc Northern Mines Corp. has completed plans for installing a 100-ton cyanide mill at the Nivloc mine near Silver Peak. The plans call for the extension of the electric power line eight miles to the mill. A large tonnage of ore that is said to run over $10 in silver and gold is blocked out in the mine.

Winnemucca—The Silver State Chemical Co. has bought ground on which it plans to erect a plant of 35 tons daily capacity to treat silver-lead-zinc ores.

Simon—The U. S. Smelting & Refining Co. is reported to have advanced the funds for the new mill which the Simon Silver-Lead company is erecting, and also to have contracted for both the lead and zinc concentrates to be produced by the mill. Development work at the mine has recently been confined to the 7th level, which is 565 ft. deep.

Goldfield—The concrete collar at the shaft of the Goldfield Deep Mines company has been set, a wooden headframe erected and the 75-hp. hoist put in place. This will be used to the 800-ft. point, when an 80-ft. steel headframe and a 250-hp. hoist will be installed, the foundations having been prepared.

Tonopah—Recent shipments of bullion indicate a gross production from the mines of the Tonopah district for October of about $500,000. The last shipments reported, which represent the cleanup for the first half of October, were Tonopah Belmont $89,100, West End $46,000, and Tonopah Extension $49,000.

Divide—In the Tonopah Divide mine the crosscuts on the 800 and 1,000 levels are being driven ahead rapidly in a southeasterly direction. Developments on the upper levels have proven the ore shoot to have a rake to the southeast so these crosscuts are being driven toward the projected position of the ore shoot and not to cut the vein at the nearest point. Regular development work was performed on the upper levels with no important changes reported.

Important work for the entire western portion of the Divide district is being done through the Kernick Divide shaft from the 900 level. Financial aid has been arranged with the Revert Divide, Western Divide, Annex Divide and Hasbrouck sufficient to perform at least 3,000 ft. of crosscutting.

Active work is being prosecuted at the Alto, Hercules, Silver and many other properties throughout the Divide district.

Ely—The Ely district is quiet, only a small tonnage of copper ore being handled at the Nevada Consolidated mill at McGill, which is running at half capacity. The rich copper ore opened up recently at the Ruth mine has added new interest to the area adjacent to the strike and among other companies that plan to do increased work is Ely Calumet company, controlled by Al. D. Myers.

The lead mines at Ward, near Ely, will discontinue shipping to the Salt Lake Valley smelters pending adjustment of the freight rates which having been increased twice during the last three years are now prohibitive. A small force of men will be retained on development.

The milling plant at Taylor is now running exclusively on dump ores from the mines, the principal value being silver with some gold.

Pioche—Ore shipments from the Pioche district for the week ended Oct. 21 totaled 2,710 tons and came from the following shippers: Prince Consolidated, 1,925 tons; Virginia Louise, 505 tons; Combined Metals, 150 tons; Bristol Silver Mines, 90 tons; and Columbia Trust Co., 40 tons.

COLORADO

Vanadium Strike Near Telluride—Thermit Corp. Buys Vanadium—Uranium Property

Denver—The demand for zinc oxide has fallen off, and the zinc oxide plants at Leadville and Canon City are experiencing some difficulty in marketing their product. The light demand is chiefly due to the fact that it is used in the manufacture of automobile tires, which in turn are in poor demand on account of the falling off in the automobile business. Thus the slackening up of automobile manufacture has indirectly affected the price of zinc ores. Unless the price of zinc advances in the near future many of the small zinc ore producers in the Western states may have to discontinue operations, especially in view of the increase in freight rates. In the Leadville and Aspen districts the freight rates have not been advanced, and the zinc ores will move as formerly to the Leadville and Canon City oxide plants provided these plants can market their product.

Telluride—The discovery of vanadium-bearing rock in the white cliffs about one-half mile north of the city has created some local excitement and several new claims are being located. The Colorado Vanadium Corporation is interested in several of the new claims.

Mesa County—The Kunkle group of vanadium and uranium claims, at the head of Kirks Canon, in the Gateway district, has recently been sold to the Thermit Corporation, of New York, which will operate the properties for the vanadium ore, which is the principal product of the deposits.

UTAH

Increased Power Rates Expected To Work Hardship—Iowa Copper Elects

Salt Lake City—It is feared that the increased power rates stipulated by the Utah Public Utilities Commission for all users of power supplied by the Utah Power & Light Co., even for those holding especial contracts entered into some time ago, in fact before the creation of the commission as a body, will work hardship to the mining industry, already struggling under adverse conditions. In this regard, the Judge Mining & Smelting Co. on Oct. 23, the date on which the new rates became effective, closed its electrolytic zinc plant, giving as reason the low price of zinc and increased mining and refining costs. As already stated in these columns, the interests affected by the new ruling of the commission are planning to bring the question before the courts for adjudication.

Park City—Iowa Coper held its annual meeting Oct. 19, electing L. R. Perry president; D. G. Scott vice-president and manager; R. T. Kimball, secretary and treasurer; D. L. King and John Carson additional directors.

MONTANA

The Philipsburg Manganese Co. Shuts Down—Flohart Silver Resumes

Butte—Barnes King's North Mocassin mine will be closed so far as company operations are concerned because of a dwindling ore supply of the grade sufficient to afford a profit with gold mining costs at their present high level The mine will be turned over to lessees. This is the second property to be closed by the Barnes-King, the Piegan-Gloster having suspended about sixty days ago.

Philipsburg—Mines of the Philipsburg Manganese Co. have been closed, rendering about 500 men idle. According to officials the suspension is only temporary. The Philipsburg company chiefly has been producing manganese ore, with some silver, the former ore being shipped to Pacific Coast concerns, principally for battery use.

Neihart District—Mining operations have been resumed by the Flohart Silver Mines. Ore bins are being prepared for storing second-class milling ore. Ore is being mined in No. 1 tunnel and a shipment will be made soon.

MINNESOTA

Cuyuna Range

Feigh Suspends Shipping for Season—Shipment From Ironton Mine Also Stopped Temporarily

Ironton—Owing to inability to secure railroad cars the Cuyuna-Duluth Iron Co. has been forced to suspend shipments from its Ironton mine temporarily. The ore hoisted is being stocked and the operators expect to load it out before close of navigation. Shipments are behind schedule.

The Feigh mine, operated by M. A. Hanna & Co., has shipped 32,000 tons from stockpile and suspended shipping for the season. The underground force has been laid off temporarily to allow moving the boilers and hoisting equipment to new quarters in a concrete engine and boiler house which is now nearly completed. The property will probably be unable to resume mining operations for several weeks. The Feigh has over 50,000 tons of ore still in stock, which will hold over to next season.

MICHIGAN

Seneca Shaft Concreted to 5th Level

Calumet—Concreting of the shaft of the Seneca Mining Co. is completed to the bottom of 5th level. The crosscut will be driven to the vein and drifting started as soon as the forms can be removed within a week or ten days.

The 4th level south drift has reached the boundary and the north drift is 725 ft. from the shaft. The management continues to ship small quantities of rock (ore) to the Baltic stamp mill. At the Gratiot shaft of the Seneca drifting continues on the 13th level and the south drift will reach the limit of the property or Mohawk Mining Company's boundary in about two weeks. The 5th level crosscut has just cut the lode.

Menominee Range

Iron Mountain—The Oliver Iron Mining Co. has found it necessary to start up its auxiliary steam plants at the Aragon and Chapin mines, the water supply in the Menominee River being insufficient to develop enough current to keep the company's mines in operation. There are steam turbines at both the Aragon and the Chapin. Many of the other mining companies in the Michigan field are experiencing the same troubles, the streams and lakes being lower now than for many years.

THE MARKET REPORT

Daily Prices of Metals

Oct.	Copper, N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y	Lead St. L	Zinc St. L
28	14 85	39. 50	40.00@40.50	6 75@7.00	6 60@6.85	6.90
29	14.85	39.25	40.25@40.75	6.75@7 00	6.60@6.85	6.85@6.90
30	14 85	39.25	40.25@40.50	6 75@7.00	6.60@6 85	6 85
Nov. 1	14.75@14.85	39.00	39.75@40.00	6.75@7.00	6.55@6.80	6.85
2	....	....	....	....	....	....
3	14.60@14.85	38.50	39.25@39.75	6.75@7.00	6.55@6.80	6.80@6.85

*These prices correspond to the following quotations for copper, "delivered": 15.00, 15.00, 15.00, 14.90@15.00 and 14.75@15.00c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Oct.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
28	89	88½	97	265½	267	36½	35⅞	38¾	39⅛
29	89	88½	97	267¼	269⅛	36¼	35¾	39	39⅛
30	....	....	....	....	....	....	....	....	....
Nov. 1	91	89⅞	96	266½	267	35⅞	35½	38	39⅜
2	91½	90¼	96	264¾	266½	35⅞	35⅜	37⅞	39¼
3	91½	91	97	262	264⅜	35¾	35¼	37¾	39¼

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Oct.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Nov	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
28	346	99½	79⅞	52	1	343	99½	80⅛	52⅞
29	345½	99½	80½	52⅜	2	....	....	....	52⅜
30	343	99½	80	52½	3	343½	99½	82⅛	53¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Nov. 3, 1920

The feeling in the market has been better during the last week, with the increased stability of prices. Copper, tin, and zinc are relatively so cheap that further declines are not expected, and lead seems to be firm at present prices, even with a weak demand. The chief interest during the week, of course, centered in the election. The result, however, being almost exactly as expected, is hardly likely to cause market changes of importance. The unanimity of opinion, as expressed by the voters, that the Republican party should now assume control, is considered a better omen for settled conditions than if the election had been close.

Copper

There is no doubt that 15c. copper has stimulated buying, and we are reliably informed that large tonnages have been marketed at current levels. Some of the reports, however, are exaggerated. Demand for modest quantities has been rather widespread, and producers generally consider that business has been fairly satisfactory. Metal for delivery early in the year, principally January and February, is desired by most inquirers, and some outside agencies are reported to have cut under the 15c. price slightly on prompt deliveries. A report is also current that some sales of forward metal were made today at 14¾c., delivered, to tempt the largest possible amount of buying. No general tendency further downward has yet manifested itself, however, and the feeling among both buyers and sellers is that no mistake will be made in contracting for the next few months' supplies at present prices.

An interesting feature of the copper market is the auction sales which have taken place on the Metal Exchange during the last month. These sales have in general been made by agencies whose sales contracts for metal at high prices have been cancelled. They resort to an auction sale to establish their actual loss, with the idea of later carrying the matter to the courts. In some instances also the seller has been the buyer.

Lead

No change has been made in the A. S. & R. official New York price of 7¼c. for metal sold on contract. This continues to be above the market, which is dull but steady, at practically the same prices which obtained for last week. German and French lead continues to come in, but is not a factor in the market, for it was sold into consuming hands some time ago. The weak demand is a result of reduced current requirements on the part of consumers, and the lack of ability to finance stocks for future use, rather than to a feeling that the price is likely to fall.

Chemical lead of good quality continues at a premium of about ¼c. over the price asked for the desilverized product. Few inquiries are reported, however.

The London price has receded gradually during the week, but remains above New York parity.

Zinc

The zinc market continues featureless. The tendency continues downward, but only a slight total loss for the week is noted. Sales have been small and many producers continue out of the

Monthly Average Prices for October

Copper:	
New York Electrolytic	15.934
London Standard	93.327
London Electrolytic	104.905
Lead:	
New York	7.070
St. Louis	7.018
London	35.238
Silver:	
New York, foreign	83.480
New York, domestic	99.500
London	54.197
Sterling Exchange	346.460
Zinc:	
St. Louis	7.150
London	39.756
Tin:	
99 per cent	39.310
Straits	40.555
London	258.190
Antimony	6.723
Quicksilver	67.200

market at current levels. Production promises to decrease, and the Republican victory, with the accompanying possibility of a tariff increase, should tend to arrest further recession.

Tin

The consuming demand has improved slightly, but the traders still are the major factor in a narrow market. Metal for forward delivery is selling at such a premium that if the necessary financial arrangements can be made it will pay one to buy spot metal and assume the carrying charges.

Straits tin for future delivery: Oct. 28th, 42@42.75c.; 29th, 42@42.50c.; 30th, 41.75@42c.; Nov. 1st, 41.75@42c.; 3d, 41.25@41.75c.

Arrivals of tin in long tons: Oct. 27th, London, 50; 29th, Straits, 925; China, 175. Total for October, 2,900.

Silver

Since our last report the silver market has remained fairly steady until today, when a sharp advance to 53⅜d. occurred in London, with a consequent rise in the New York rate. Buying on the part of Indian bazaars is reported as responsible for the improvement. Fundamental conditions remain unchanged, with China the only possible substantial buyer, although Indian exchanges will have an effect upon the course of the market.

Mexican Dollars—Oct. 28th, 60½; 29th, 60⅞; 30th, 60⅞; Nov. 1st, 61¼; 3d, 62½.

Gold

Gold in London: Oct. 28th, 117s. 11d.; 29th, 118s. 1d.; Nov. 1st, 119s. 2d.; 2d, 119s. 2d.; 3d, 119s. 2d.

Foreign Exchange

The European exchange market was dull during the last week. Italian exchange reached the lowest figure it has ever known. German marks continue to recede, as is to be expected. Today, francs are quoted at 6.25c; lire, 3.62c.; and marks, 1.26c. New York funds in Montreal, 9¾ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33.1c.; 98@99 per cent, 32.90c.

Antimony — Chinese and Japanese brands, 6¾@6¾c.; W. C. C. brand, 8c. per lb. Cookson's "C" grade, 12½@13c. Chinese needle antimony, lump, nominal at 6@6½c. per lb. Standard powdered needle antimony[1] (200 mesh), 9c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 9½c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $400@$450 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$85 per oz. Dull.

Platinum—Firm at $95@$100 per oz.

Quicksilver—Market quiet; $60 per 75-lb. flask. San Francisco wires $60@$62.50. Market steady.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 75@85c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore[1]—60@70c. per unit, seaport; chemical ore (MnO_2) $70@$80 per gross ton, lump; $80@$90 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 65@70c. per lb. of contained sulphide. New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $5@$5.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$2 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 30—Zinc blende per ton, high $48.10; basis 60 per cent zinc, premium, $41; Prime Western, $40; fines and slimes, $37.50@$35; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $44.30; calamine, $38.34; all zinc ores, $44.14.

Lead, high, $104.85; basis 80 per cent lead, $65; average settling prices, all grades of lead, $82.47 per ton.

Settlements were made for zinc as high as $45 basis and for lead $100 basis.

Shipments for the week: Blende, 10,462; calamine, 286; lead, 1,708 tons. Value, all ores the week, $572,900.

Shipments for ten months: Blende, 491,363; calamine, 8,836; lead, 76,858 tons. Value, all ores ten months, $31,795,670.

All the mines in the closing movement held the full two weeks, with a number that will remain closed until after the election. It is estimated the two restriction movements this year reduced the production around 36,000 tons. There is rumor of another losing movement of one or two weeks at the year-end. The shipment this year already exceeds last year over 15,000 tons of zinc and 15,000 tons of lead.

Platteville, Wis., Oct. 30—Blende, basis 60 per cent zinc, $45 base for high grade. Lead ore, no sales reported. Shipments for the week: Blende, 1,175; calamine, 30; lead, 30 tons. Shipments for the year: Blende, 57,071; calamine, 2,504; lead, 4,428; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 2,019 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for 320 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content.

Gravel—No analysis guarantee, f.o.b. Roseview, Ill., $25 per ton; gravel suitable for acid, chemical or enameling purposes, $60.

Gypsum—Plaster of Paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1½-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30. The foregoing domestic prices obtain also in the Chicago district.

[1]Monazite — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 13@14c. per lb.; sulphide, powdered, 16@18c. per lb.,

Nitrate—Soda, $3.25 per cwt., ex vessel, Atlantic ports. Market quiet.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$250 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18½@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 19@20c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $170@$175, freight allowed; $170, f.o.b. seaboard bases; English, $165, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75@$80, f.o.b. furnace.

Ferromolybdenum[1]—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b works, $60@$65; 50 per cent, $76@$80; 75 per cent $150@$160.

Ferrotungsten[1]—Domestic, 70 to 80 per cent W, 75@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8 per lb. of V contained, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 25½c. per lb.; wire, 19c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 10½c.; cut lead sheets, 10½c. in quantity, mill lots.

Nickel Silver—Unchanged at 36½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 23½c.; sheathing, 23½c.; rods, ⅝ to 3 in., 20½c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Nov. 2, 1920

The volume of business in steel products obtainable, even by cutting prices, continues limited. The Steel Corporation continues to operate as fully as physical conditions permit, the corporation being still short of coke at some points. Steel production on the whole is at fully 10 per cent less rate than in August or September.

The 2.35c. price on merchant bars, made recently by one independent, has been withdrawn, and quotations usually do not run below 3c. Plates continue to sag, and the common quotation of 3c. is shaded on particularly desirable business. Black sheets are down to a range of 6.25c. to 6.50c.

The American Sheet & Tin Plate Co. will probably not open its order books for the first half of next year until December, as it will carry over about three months of rolling. Its prices will probably be Industrial Board prices, as heretofore.

Pig Iron—Bessemer has been offered at $45, Valley, $2 under the former quotation. Foundry remains at $45 and basic at $40, Valley. Further declines are expected as inquiries develop, predictions being that the market will eventually find a stable level at between $30 and $35.

Semi-finished Steel—Prices remain nominal at $55@$60 for billets and $65 for sheet bars. Steel Corporation prices, as recently advanced $5, are $43.50 for billets and $47 for sheet bars.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16.50@$17; foundry, $18.

COMPANY REPORTS

Oriental Consolidated Mining Co. Shows a Small Profit

Gold: Korea

The result of the operations of the Oriental Consolidated Mining Co., an American enterprise operating in Korea, for the year ending June 30, 1920, is summarized in the following table.

The tonnage and value of the ore milled were lower than during the previous year (250,868 tons, of a value of $1,464,830.70 was produced in 1918-1919) whereas operating costs were increased, so that net profit compares unfavorably with that of last year. Owing to a drought in Northern Korea during the summer and fall of 1919 and the spring of 1920, a heavy advance in the cost of foodstuffs, wages, and transportation occurred, and the use of hydro-electric power was curtailed, and steam used instead, adding further to the high expense of operating.

A salient feature of the operations was the inability of the company to take advantage of the high premium on gold in China, because the Japanese government prohibits the export of gold.

The production of the active mines which furnished ore for the mills during the year was as follows:

Name of Mine	Tonnage	Total Value of Ore	Value per Ton
Tabowie	128,405	$822,139.40	$6 40
Taracol	97,647	460,990.93	4 72
Chintui	4,811	23,012 66	4 78
Tongkni	2,460	50,893 48	20 69
Total	233,323	$1,357,036.47	$5 82

A total of 25,541 feet of development work was performed. Profit and loss account for the year ending June 30, 1920, follows:

DEBIT

	Cost per Ton	
To mining costs	$2.10	$490,002 08
Milling costs	.66	154,442 74
Concentrates expenses	.25	58,801 34½
Transportation of ore	.01	1,660.19½
General expenses	.65	152,060.64½
Total operating and general expenses	$3 67	$856,967 00½
Depreciation	1 07	250,000 00
Depletion 5 per cent of output	.24	56,610 08
Total debits	$4 98	$1,163,577 08½
Profits for year to balance sheet	.11	25,052 30½
	$5 09	$1,188,629 39

CREDIT

	Cost per Ton	
By bullion from mills	$2 44	$569,198 68
Concentrates	2.41	563,002 96
Store profit	.962	16
Interest and other receipts	.24	55,465 59
	$5.09	$1,188,629.39

The profit for the fiscal year amounted to $25,052.30½ after deducting depreciation and depletion charges. Dividends were paid during the year in July, 1919 ($107,347.50), and March, 1920 ($214,695), out of an accumulated profit to June 30, 1920, of $859,001.80. A United States income tax of $16,266.03 was also paid. Surplus profit on June 30, 1920, amounted to $520,693.27.

The company has $4,293,900 in capital stock outstanding, of a par value of $10 for each share.

OPERATING RESULTS OF THE ORIENTAL CONSOLIDATED MINING CO.

	1919–1920	1918–1919
Total receipts for the year were	$1,188,629 39 or $5 09 per ton	$1,282,085 80½ or $5.11 per ton
Total operating costs for the year were	856,967 00½ or 3 67 per ton	842,978 38½ or 3 36 per ton
Total operating profits before reserves	$331,662 38½ or $1 42 per ton	$439,107 42 or $1.75 per ton
Reserves for depreciation	$250,000.00	
Depletion	56,610.08	
	306,610 08 or 1 31 per ton	310,266 51 or 1.24 per ton
Net profits after deductions for reserves	$25,052 30½ or $0 11 per ton	$128,840 91 or $0.51 per ton

Broken Hill South, Ltd., Reports No Production During 1919

Zinc, Lead: New South Wales

Productive operations of the Broken Hill South, Ltd., were entirely suspended during the fiscal year ending June 30, 1920, according to a statement of the company, due to the continued strike of underground employees and the destruction by incendiarism of a large portion of the plant. The company is interested in the operations of the Electrolytic Zinc Co. of Australasia Proprictary, Ltd., to the extent of 120,000 fully paid £1 shares. It is estimated in the report that by the end of September, 1920, the output of refined zinc of this company will be raised from 15 to 25 tons per day. Additional units under consideration assure a further increase to 50 and 100 tons per day.

British Australian Lead Manufacturers' Proprietary, Ltd., is another company in the operations of which Broken Hill South is interested. The company has been established for the purpose of manufacturing white lead, paints, and lead products.

October Mining Dividends

The following is a partial list of dividends paid by mining companies during October, 1920:

U.S. Mining and Metallurgical Companies	Situation	Per Share	Totals
Am. Smelt. Sec., pf. A	U. S.	$1.50 Q	$255,000
Am. Smelt. Sec., pf. B	U. S.	1 25 Q	39,855
Caledonia Mining Co., la	Idaho	0 01 Q	26,050
Daly-West Mining	Utah	0 25 Q	62,500
Electric Point, I	Wash.	0 15 Q	119,062
Eagle-Picher Lead	Okla.—Mo.	1.50 Q	15,000
Inspiration Consolidated, e	Ariz.	1.00 Q	1,181,967
Phelps Dodge	U. S.	2 50 Q	1,125,000
Portland Gold Mining	Col.	0 015 Q	45,000
Tonopah-Belmont, s. g	Nev.	0 05 Q	75,000
Tonopah Extension, g. s	Nev.	0 05 Q	64,140
Tonopah Mining, g. s	Nev.	0 05 Q	50,000
United Eastern Mining, g	Ariz.	0.15	204,455
U. S. Smelting, Refining and Min	U. S.—Mex.	1.50 Q	526,673
U. S. Smelting, Refining & Min., pfd	U. S.—Mex.	0 875 Q	425,555
Vanadium Corporation Amer	Col.—Peru	1.50 Q	560,001
Canadian, Mexican, Central and South American Companies			
Alvarado Mining & Mill, g. s	Mexico	$0.50 Q	$17,500.00
Asbestos Corp., Can., Ltd	Can.	1.50 Q	45,000.00
Asbestos Corp., Can., Ltd., pfd	Can.	1 75 Q	70,000.00
Con. Mining & Smelting, Canada	B. C.	0 625 Q	263,342.50
Dome Mines, S	Ont.	0 25 Q	100,000.00
Hollinger Consol. Gold	Ont.	0 05 BM	246,000.00
Howe Sound, e	B. C.—Mex.	0 05 Q	99,208.00
Kerr Lake Mines	Ont.	0 125 K	75,000.00
Lake Shore Mines, g	Ont.	0 02 K	40,000.00
McKinley-Darragh-Savage, Ltd., s	Ont.	0 05 Q	67,431.00
N. Y. & Honduras, Rosario, s. g	C. A.	0 50 QX	100,000.00
Nipissing Mines, s	Ont.	0 50 QX	600,000.00

Q, quarterly; X, includes extra; BM, bi-monthly; K, occasional.

Calumet & Hecla Mining, Osceola Consolidated, and Wolverine Copper mining companies all found the metal market too low to justify declaring dividends. Caledonia Mining Co., previously paying monthly dividends, has now changed to quarterly; its last payment was 1c. in July. Daly-West Mining paid on Oct. 1 the quarterly dividend announced in our table for September; Electric Point reflects its prosperity by distributing an extra dividend of 12c. Tonopah-Belmont Development and Tonopah Mining companies both resumed dividends, and Kerr Lake Mines on Oct. 15 broke a silence that had lasted since its capital distribution of September, 1919.

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York			London		
	1918	1919	1920	1918	1919	1920
January	88 702	101 125	132 827	44 356	48 438	79 846
February	85 716	101 125	131 295	42 792	48 027	85 005
March	88 082	101 125	125 551	43 620	48 171	74 194
April	95 346	101 125	119 779	47 215	48 886	68 848
May	99 505	107 135	102 585	48 980	52 104	60 010
June	99 500	110 430	90 957	48 875	53 896	51 096
July	99 625	106.394	91 971	48 813	54.133	53.736
August	100 292	111 370	96.168	49 077	58.835	59 875
September	101.125	114 540	93.675	49 500	61 668	93 6 5
October	101.125	119 192	83.480	49 500	64 049	54.197
November	101.125	127 924	.....	48 969	70 065	.....
December	101 125	131.976	.....	48.492	76.432	.....
Year	96.772	111.122	.....	41.516	57 059	.....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		(b) Electrolytic	
	1919	1920	1919	1920	1919	1920
January	(a)	18 918	92.238	118 095	106 619	123.238
February	16 763	18 569	78.700	120 188	95 700	126.950
March	14 856	18 331	76 821	109 533	82 071	118 348
April	15 246	18 660	77 300	103 025	82 200	111 500
May	15.864	18 484	77.767	96 750	81 227	109 700
June	17 610	18.065	83 062	87.864	85.900	101.909
July	21.604	18 576	99.576	90.148	103.046	106.455
August	22 319	18 346	97.300	93.935	106.429	111.143
September	21 755	18 144	100 767	96.381	.....	111.905
October	21 534	15.934	103.418	93.367	.....	104.905
November	19 758	.....	98 894	.....	.....	.....
December	18 295	.....	103.708	.....	.....	.....
Year	18.691	.....	90.796	.....	.....	.....

(a) No market. (b) See note on page 927.

Lead

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	5.432	8.561	5.316	8.300	37.227	47 095
February	5.057	8.814	4.784	8.601	28 675	50.256
March	5 226	9 145	4.992	8 894	27 952	46 054
April	4.982	8 902	4 722	8.618	24 888	39 225
May	5.018	8 576	4 773	8 352	23.852	38 488
June	5.340	8 323	5.070	8 169	22 544	34.330
July	5.626	8 338	5 408	8.283	23 457	34.960
August	5.798	8.687	5 583	8 725	25.330	36.304
September	6.108	8 177	5.853	8 160	28 473	35 452
October	6.487	7.070	6.249	7.018	34.731	35.238
November	6.808	.....	6.649	.....	41.202	.....
December	7.231	.....	6.955	.....	.....	.....
Year	5.759	.....	5.530	.....	28.590	.....

Tin

	New York				London	
	1919		1920			
	99%	Straits	99%	Straits	1919	1920
January	67 702	.....	61 596	.....	248.557	376 512
February	66.801	.....	58 466	59 932	223 963	395 750
March	67 934	.....	61 037	61 926	236.843	369 489
April	72 508	.....	61 120	62 115	225 275	345 450
May	72 500	.....	53 230	55 100	234 398	294 813
June	71 240	.....	46 125	48 327	238 263	250 614
July	68 000	.....	45.798	49 154	253 272	261 598
August	57 226	.....	43.856	47.620	273 625	274.048
September	54 482	.....	41.940	44.465	280 102	270.120
October	54 377	.....	39.310	40.555	279.239	258.190
November	53 807	.....	.....	.....	283 556	.....
December	53.870	.....	.....	.....	314 113	.....
Year	63.328	.....	.....	.....	257.601	.....

Zinc

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	7.272	9 483	6.922	9.133	56 045	58 643
February	6.623	9 058	6.273	8 708	46 150	61 338
March	6.500	8 881	6.150	8 531	38.500	53 467
April	6.465	8 534	6.114	8 184	36.118	47 388
May	6.429	7 938	6.079	7 588	35 477	45 088
June	6.901	7 815	6 551	7 465	36.763	41.193
July	7.873	8 070	7.523	7 720	41 815	41 886
August	7 789	8.185	7.160	7 835	39 338	41 220
September	7 510	7.717	7.473	7.661	40 955	39.690
October	7 823	.....	7.827	7.150	43 630	39.750
November	8 177	.....	8 350	.....	46.588	.....
December	8 700	.....	8 350	.....	53 101	.....
Year	7.338	.....	6.988	.....	42 879	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer ‡		Basic ‡		No. 2 Foundry	
	1919	1920	1919	1920	1919	1920
January	$33 60	$40 47	$31 40	$39.88	$32 40	$39.86
February	33 60	42 95	31 40	42 61	32.40	43.40
March	32 54	43 40	31 40	42 90	29 12	43.40
April	29 35	43 72	27 15	44 22	28 15	43.90
May	29 35	44 00	27 15	44 88	28 15	45.36
June	29 35	44 89	27 15	45 41	28 15	46.40
July	29 35	47.21	27 15	47 42	28 15	46.56
August	29 35	48 90	27 15	49 88	28 15	49.35
September	29 35	50 46	27 15	50.46	28 15	51.96
October	29 35	49 21	27 15	44 38	28 30	48.58
November	31 60	.....	31 56	.....	32 16	.....
December	36.57	.....	35 32	.....	36 86	.....
Year	$31.11	.....	$29 26	.....	$28 35	.....

‡ As reported by W. P. Snyder & Co.

Antimony, New York; July, 7.500c., August, 7 177c., September, 7 113c. October, 7.75c.

Quicksilver, New York; July, $90.333, August, $85.355, September, $75.000, October, $67 200.

Monthly Copper Production

The crude-copper content of blister copper of the principal producers, in pounds, for June-September, 1920, follows:

MONTHLY CRUDE COPPER PRODUCTION, 1920

	June	July	August	September
Alaska shipments	7,213,820	5,797,645	5,762,551	1,635,677
Arizona:				
Arizona Copper	3,000,000	3,000,000	3,000,000	3,000,000
Calumet & Arizona	4764,000	4,232,000	5,200,000	4,292,000
Cons. Ariz. Smelting	9,40,000	750,000	975,000	950,000
Inspiration	7,300,000	6,500,000	7,200,000	6,500,000
Magma	755,601	865,774	556,760	663,219
Miami	4,400,000	4,549,298	4,630,725	4,549,140
New Cornelia	3,664,000	3,522,000	3,842,000	3,314,000
Old Dominion	2,999,000	2,640,000	2,802,000	2,600,000
Phelps Dodge	6,125,000	5,955,000	5,875,000	6,381,000
Shattuck Arizona	198,327	166,938	194,003	166,513
Ray	4,520,000	4,500,000	4,505,000	4,502,000
United Verde	5,880,000	5,085,140	5,125,000	4,837,000
United Verde Extension	2,828,020	3,304,878	5,805,568	3,327,644
Michigan:				
Calumet & Hecla	9,022,879	8,312,025	7,520,107	7,278,215
Other Lake Superior	6,200,000	6,200,000	6,000,000	6,000,000
Montana:				
Anaconda	12,700,000	11,700,000	11,800,000	11,100,000
East Butte	1,396,140	1,537,880	1,566,800	1,634,260
Nevada:				
Nevada Cons	4,650,000	4,650,000	4,650,000	4,650,000
New Mexico:				
Chino	4,010,069	4,360,932	4,000,140	5,161,894
Utah:				
Utah Copper	10,000,000	8,500,000	4,820,000	8,420,000
Eastern Smelters	1,600,000	1,600,000	1,600,000	1,600,000
Total reported	104,166,856	97,729,510	101,430,654	92,562,562
Others, estimated	12,000,000	12,000,000	15,000,000	13,000,000
Total United States	116,107,856	109,729,510	116,430,654	105,562,562
Imports: Ore and concentrates, etc	35,911,009	3,937,824	11,040,057	.....
Imports in blister, etc	15,619,398	26,553,600	20,320,824	.....
Grand total	167,638,263	140,220,934	147,791,535	.....
British Columbia:				
Granby Cons	2,079,000	2,400,000	2,471,200	2,239,174
Mexico:				
Boleo	802,474	781,613	618,390	440,720
Cananea	3,750,000	3,500,000	3,500,000	3,500,000
Phelps Dodge Mexican properties	1,427,000	2,402,000	2,490,000	1,617,000
Other foreign:				
Cerro de Pasco	3,944,000	3,652,000	4,440,000	4,360,000
Chile	7,500,000	9,904,000	10,640,008	9,496,000
Katanga	4,323,721	.....	.....	.....
Backus & Johnston	1,382,000	1,458,000	1,580,000	1,560,000

Domestic copper production for 1918, 1919, and part of 1920 follows:

	1918	1919	1920
January	165,431,568	135,733,511	121,903,744
February	160,011,364	111,649,512	117,450 000
March	185,525,168	102,040,460	120,309,316
April	163,207,096	98,808,998	116,078,871
May	181,070,350	92,652,975	114,964,207
June	166,723,599	95,856,570	116,107,856
July	159,329,031	100,369,247	109,729,510
August	165,550,799	107,994,040	116,430,654
September	157,992,487	108,703,675	105,562,562
October	168,638,775	115,143,143	.....
November	159,217,588	117,289,735	.....
December	161,801,916	102 997,633	.....

MINING STOCKS

Week Ended October 30, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston			*60	
Ahmeek	Boston	55	54½	54½	Sept. '20, Q .50
Alaska B.C.	N. Y. Curb	⅛	⅛	⅛	
Allouez	Boston	24	23¼	23⅞	Mar. '19, 1 00
Anaconda	N. Y.	51	49⅝	50¼	Aug. '20, Q 1 00
Ariz. Com'l	Boston	9⅛	9	9¼	Oct. '18, .50
Big Ledge	N. Y. Curb	⅛	⅛	⅛	
Bingham Mines	Boston	9¼	9⅛	9¼	Sept. '19, Q .25
Calumet & Ariz.	Boston	54½	53½	54	Sept. '20, Q 1.00
Calumet & Hecla	Boston	252	24	252	June '20, Q 5 00
Canada Copper	N. Y. Curb			½	
Centennial	Boston	9¼	9¼	9⅛	Dec. '18, SA 1 00
Cerro de Pasco	N. Y.	39½	37½	38⅜	Sept. '20, Q 1.00
Chief Consol	Boston Curb	3⅛	3¼	3⅜	Feb. '20, Q .10
Chile Copper	N. Y.	14½	13¼	13⅛	
Chino	N. Y.	26	24⅜	26	Sept. '20, Q .37½
Columbus Rexall	Salt Lake	*36	*34	*35	
Con. Ariz.	N. Y. Curb			½	Dec. '18, Q .05
Con. Copper M.	N. Y. Curb			*61	
Copper Range	Boston	34	33½	33½	Sept. '20, Q .50
Crystal Copper	Boston Curb	*70	*44	*55	
Davis-Daly	Boston	7½	7	7	Mar. '20, Q .25
East Butte	Boston	10	9¾	9⅞	Dec. '19, A .50
First Nat'l	Boston Curb	*90	*80	*90	Feb. '19, SA .15
Frankl'n	Boston	2⅜	2⅛	2⅛	
Gadsden Copper	N. Y. Curb			*70	
Granby Consol.	N. Y.	29½	28	28	May '19, Q 1.25
Greene Cananea	N. Y.	27⅞	26½	27½	Aug. '20, Q .50
Hancock	Boston	4	4	4	
Houghton	Boston Curb	*45	*45	*45	
Howe Sound	N. Y. Curb			1½	Oct. '20, Q .05
Inspiration Con.	N. Y.	43⅞	42⅜	43⅜	Oct. 20, Q 1.00
Iron Cap	Boston Curb	8	7	8	Sept. '20, K .25
Isle Royale	Boston	24	24	24	Sept. '19 SA .50
Kennecott	N. Y.	23	22	23⅛	Sept '20 Q .50
Keweenaw	Boston	1⅛	1⅛	1⅛	
Lake Copper	Boston	2⅜	2⅛	2½	
La Salle	Boston	2¼	2	2	
Magma Chief	N. Y. Curb			*71	
Magma Copper	N. Y. Curb			17	Jan. '19, Q .50
Majestic	Boston Curb	*15	*15	*15	
Mason Valley	Boston			1⅜	
Mass. Con.	Boston	3⅜	2⅜	2⅜	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	4⅜	4	4⅛	
Miami	N. Y.	19	18½	17	Aug '20, Q .50
Michigan	Boston	3	3	3	
Mohawk	Boston	56	54½	55	Aug. '20, Q 1.50
Mother Lode (new)	N. Y. Curb	5⅞	5⅛	5⅞	
Nevada Con.	N. Y.	11¼	10½	11¼	Sept. '20, Q .25
New Arcadian	Boston			2⅜	
New Baltic	Boston Curb			3	
New Cornelia	Boston	18⅜	17⅛	17⅜	Aug '20, .25
Nixon Nev.	N. Y. Curb			*9	
North Butte	Boston	14¼	13½	14¼	Oct. '18, Q .25
North Lake	Boston			*25	
Ohio Copper	N. Y. Curb			1/16	
O'bway	Boston			1¼	
Old Dominion	Boston	22½	27⅛	2 ⅛	Dec. '18, Q 1.00
Osceola	Boston	32	30	June '20, Q .50	
Phelps Dodge	Open Mar.	†190	†170		Oct. '20, Q 2.50
Quincy	Boston	42	41	41	Sept. '20, Q 1.00
Ray Con	N. Y.	14½	13⅜	14½	June '20, Q .25
Ray Hercules	Boston Curb			*50	
St. Mary's M. L.	Boston	35½	35	35	June '20, K 2.00
Seneca	Boston	19	17⅞	19	
Shannon	Boston	1¼	1⅛	1⅛	Nov. '17, Q .25
Shattuck Ariz.	N. Y.	7⅛	7	7⅛	Jan. '20 Q .25
South Lake	Boston			2	
South Utah	Boston	*9	*6	*6	
Superior Copper	N. Y.	4	4	4	Apr. '17, 1.00
Superior & Boston	Boston	3	2⅛	3	
Tenn. C. & C.	N. Y.	9⅜	9⅛	9⅛	May '18, I 1.00
Tuolumne	Boston	*55	*47	*53	May '13, .10
United Verde Ex.	Boston Curb	*29	*29	*29	Aug '20, Q .50
Utah Con	Bostoo	5⅜	4	4	Sept '18, .25
Utah Copper	N. Y.	58⅛	56⅞	58⅛	Sept '20, Q 1.50
Utah M. & T.	Boston	1⅜	1⅛	1⅛	Dec. '17, .30
Victoria	Boston	2	1⅜	1⅛	
Winona	Boston	*35	*30	*30	
Wolverine	Boston	11⅛	10	11	Jan. '20, Q .50
LEAD					
Hecla Mining	N. Y. Curb	4⅜	4⅛	4⅛	Sept '20, QX .15
St. Joseph Lead	N. Y.	14⅝	14⅛	14⅛	Sept '20, QX .50
Stewart	Boston Curb			*13	Dec. '15, .05
Utah Apex	Boston	2⅛	3	3⅛	Nov. '18, .25
ZINC					
Am. Z. L. & S.	N. Y.	11⅛	10	10	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	43	40	40	Aug. '20, Q 1.50
Butte C. & Z.	N. Y.	7	6⅞	7	June '18, I .50
Butte & Superior	N. Y.	1⅛	15⅛	15⅛	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	8⅛	7⅛	7⅛	June '20, Q .50
New Jersey Z.	N. Y. Curb			169	Aug '20, Q 4 00
Success	N. Y. Curb	3	2⅛	3	July '16, .03
Yellow Pine	Los Angeles	*90	*90	*90	June 20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1⅜	1⅜	1⅜	
Alaska Juneau	N. Y.	2	1⅛	1⅜	
Carson Hill	N. Y. Curb			22⅜	
Cresson Consol. G.	N. Y. Curb	1⅛	1	1⅛	June '20, Q .10
Dome Ex.	Toronto	*43	*42	*42⅜	
Dome Mines	N. Y.	11⅛	11⅛	11⅛	Oct. '20, Q .25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept '20, Q .02
Goldfield Con.	N. Y. Curb	*10	*8⅛	*9⅛	Dec. '19, .05
Helley	Boston			4⅛	June '19, .10
Hollinger Con.	Toronto	5.65	5.50	5.55	Oct. '20, BM .05
Homestake	N. Y.			45	Sept. '19, .50
Kirkland Lake	Toronto	*47	*42	*42	
Lake Shore	Toronto	1.05	1.05	1.05	Oct. '20, K .02
McIntyre-Porcupine	Toronto	2.01	1.94	1.94	Sept '20, K .05
Porcupine Crown	Toronto	*23	*23	*73	July '17, .03
Portland	Colo. Sprgs.	‡		*60	Oct. '20, Q .01½
Reorgan. Booth	N. Y. Curb	*5	*4	*5	May '19, .05
Silver Pick	N. Y. Curb	*7	*5	*5	
Teck Hughes	Toronto			*8¾	
Tom Reed	Los Angeles	1.49	1.44	1.44	Dec. '19, .07
United Eastern	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '20, Q .15
Vindicator Consol.	Colo. Sprgs.	‡		*18	Jan. '20, Q .01
West Dome Consol.	Toronto	*⅛	*5½	*5½	
White Caps Min.	N. Y. Curb	*9	*7½	*8	
Yukon Gold	Boston Curb	1⅛	1⅛	1⅛	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*24	*17	*20	Apr '20, M .03
Beaver Con.	Toronto	*38	*37½	*37½	May '20, K .03
Coniagas	Toronto	2.37	2.37	2.37	Aug '20, Q .12½
Crown Reserve	Toronto	*20	*20	*20	Jan. '17, .05
Kerr Lake	Boston	3⅜	3⅛	3⅜	Oct. '20, K .12½
La Rose	Toronto	*30	*30	*30	Apr. '18, .02
McKinley-Dar.	Toronto			*50	Oct '20, Q .03
Mining Corp.	Toronto	1.75	1.70	1.75	Sept. '20 Q .12½
Nipissing	N. Y. Curb	9	8⅛	8⅛	Oct. '20, QX .50
Ontario Silver	N. Y.			5	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅜	⅜	⅜	Jan. '12, .10
Peterson Lake	Toronto	*11⅛	*11⅜	*11⅛	Jan. '17, .01½
Temiskaming	Toronto			*32	Jan. '20, K .04
Trethewey	Toronto	*27½	*24	*25	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*1⅜	*1	*1⅛	
Barnes-King	Butte	‡		1.11	Aug. '20, Q .05
Bost. & Mont.	Boston			*63	
Cashboy	N. Y. Curb	*7	*5	*6	
El Salvador	N. Y. Curb	⅛	⅛	⅛	
Jim Butler	N. Y. Curb	*19	*16	*18	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*7	*5	*6	June '16, .05
Louisiana Con.	N. Y. Curb			1/16	
MacNamara M.	N. Y. Curb			⅛	May '10, .02½
N.Y. Hond. Rosar.	Open Mar.	†12	†10½		Oct. '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	1⅛	1⅛	
Tonopah Ex.	N. Y. Curb	1	1	1⅛	Oct. '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '20, SA .05
West End Con.	N. Y. Curb	1⅛	1	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*19	*17	*18	July, '20, M .01
Consol. M. & S.	Montreal	23	22	23	Oct. '20, Q .62½
Daly Mining	Salt Lake	2 40	2 40	2.40	July '20, Q .10
Daly-West	Boston	4⅛	4⅛	4⅛	Oct. '20, Q .25
Eagle Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q .10
Electric Point	Spokane	*14⅛	*14	*14⅛	May '20, SA .03
Fed M. & S	N. Y.	10	10	10	Jan. '09, I 1 50
Fed M. & S pf	N. Y.	31⅛	31⅛	31⅛	Sept. '20, Q 1.75
Florence Silver	Spokane	*25	*25	*25	Apr '19, .01½
Grand Central	Salt Lake			*37⅛	June '20, K .03
Iron Blossom	N. Y. Curb	*25	*25	*25	Apr. '20, Q .02½
Judge M. & S.	Salt Lake	3.90	3.82½	3.82½	Sept. '20, Q .12½
Marsh Mines	N. Y. Curb	*1⅛	*10	*11	
Prince Consol.	N. Y. Curb	*25	*14	*25	Nov. '17, .02½
Rambler-Cariboo	Spokane	*8	*6	*8	Feb '19, .01
Rex Con.	N. Y. Curb	*6	*5	*6	
South Hecla	Salt Lake			*85	Sept. '19, K .15
Stand. S. L.	N. Y. Curb	⅛	⅛	⅛	Oct '17, .05
Tamarack-Custer	Spokane	2.20	2.20	2.20	Dec. '19, K .03
Tintic Standard	Salt Lake	3.07½	2.92½	3.00	June '20, Q .10
Wilbert Mining	N. Y. Curb	*4⅛	*3⅜	*4	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	18	17⅛	17⅛	Mar. '19, .50
Internat'l Nick.pf.	N. Y.	83	83	83	Aug. '20, Q 1.50
QUICKSILVER					
New Idria	Boston			5	Jan. '19, 25
TUNGSTEN					
Mojave Tungsten	Boston Curb	*10	*5	*5	
VANADIUM					
Vanadium Corp.	N. Y.	65⅞	61⅛	63⅛	Oct. '20, Q 1.50
ASBESTOS					
Asbestos Corp	Montreal	94	88	91	Oct '20, Q 1 50
Asbestos Corp. pf.	Montreal	100	98	98	Oct. '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	60⅛	57⅜	6 ⅛	Sept '20, Q 1 00
Am. S. & R.pf.	N. Y.	91	90⅛	91	Sept. '20, Q 1.75
Am. Sm. pf A.	N. Y.	78	77	77	Oct '20, Q 1 50
U. S. Sm. R. & M.	N. Y.	55	52⅛	54	Oct. '20, Q 1.50
U S S.R.& M. pf.	Boston	44⅛	43⅛	43⅜	Oct. '20, Q .87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly.
SA, Semi-annually. BM, bimontbly. K, Irregular. I, Initial X, includes extra.

INDUSTRIAL NEWS

New Type of Air Drill Perfected

Said To Be Simple in Construction and Light of Weight

The development of pneumatic mining and quarrying tools has been so rapid, and their performance latterly so efficient, that it is but natural they should now be regarded as having reached such a state of perfection that radical changes or improvements are, generally speaking, no longer expected.

And yet, notwithstanding this popular notion, The Denver Rock Drill Manufacturing Co., which has for quite a number of years been in the forefront of rock drill progress, has recently developed a new type of light mining and quarrying drill which, it is claimed, marks an advance in the progress of air drill manufaeture.

This new type of drill is built in three models, known respectively as Models NA-90, NRW-93 and NRD-95; the first named being a "dry" auger drill, specially designed for work in coal, iron and other soft formations; the second, a combination "wet" and "dry" rock drill efficiently serviceable in all kinds of rock and under all conditions, either above or below ground; and the last named, a "dry" rock drill particularly adapted to work in wet shafts or where out-of-door conditions prevail.

All three drills are quite light, can be easily carried about, and each requires but one man to operate it. They are built throughout of the very best steels compounded and with the utmost precision. While most Waugh drills are of the valveless type, the "Nineties" are equipped with an entirely new type of spool valve, having a positive efficient action. The rotation mechanism is of exceptionally strong design in which stresses in both teeth and pawls are reduced to a minimum. Lubrication is effected by pulsations of air which gradually feed the oil from a reservoir at the side of the cylinder into all parts of the machine.

Motor Trucks and Future Plans

Leo L. Robinson, chief of the Transportation Section of the Council of National Defense, contributes to *The Commercial Car Journal*, where he says, in part: "Records of the Highways Transport Committee of the Council of National Defense not only furnish concrete evidence of the number and character of transportation crises which may develop, but suggest methods for remedying many of them. These methods suggest first the greater utilization of the highway and its twin agency, the motor truck, as potential mediums for emergency service, as well as for that day-to-day performance upon which plans for the future may be built."

Advertising in the Vernacular Brought Trade

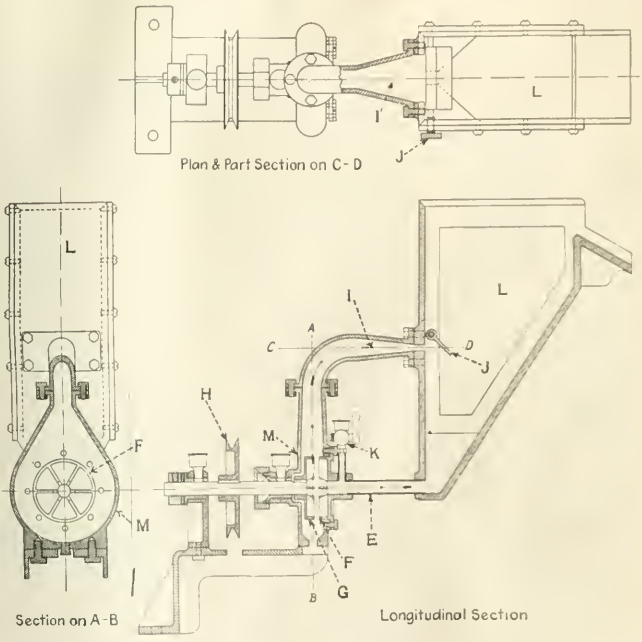
Major H. A. Chisholm, Canadian Trade Commissioner in Havana, Cuba, reports that previous to this year Cuba bought her building plaster from the United States. Firms in New Brunswick and Nova Scotia shipped crude gypsum to the United States. It was there manufactured into building plaster and shipped to Cuba, but now Nova Scotia and New Brunswick firms are shipping building plaster direct to Cuba. One Nova Scotia company recently received an order for 60,000 barrels of building plaster from Cuba. This latter firm advertised extensively in Spanish. The Canadian government trade commissioner in Cuba has interested himself in an endeavor to divert this trade into Canadian channels.

Water Screens.—The Link-Belt Company, 910 South Michigan Avenue, Chicago, recently published an illustrated twenty-four page book covering its traveling water screens.

Colburn Flotation Machine Gives Agitation at Low Pressure

The Colburn vacuum flotation process comprises a flotation machine of the multi-cell type through which the pulp flows from cell to cell. The pulp is first received in a compartment connected with the vacuum inlet of the first agitator, and this discharges against a baffle in the spitzkasten of the first compartment. The froth rises to the surface, where it overflows over a baffle to the concentrates launder. The portion of the pulp which settles to the bottom of the spitzkasten chamber is drawn into the second agitator and discharged into the next spitzkasten, and so on throughout the series. Discharge level is maintained by a baffle at the end of the machine and by openings between the cells.

The agitator consists of two plates, one stationary and the other rapidly rotated. The interior construction of the plates is identical, except that the stationary plate is provided with an inlet at the center. The interior of each plate is provided with twelve radial baffles, which are alternately long and short as shown in Fig. 2. The plates are adjustable, and the width of the



Drawing of Laboratory Cell

E Suction
M Agitator
F Stator or stationary plate
G Rotor or revolving plate
K Air and oil valve
H Pulley
I Discharge
L Spitzkasten
J Adjustable Baffle

FIG. 1. SECTIONS OF THE COLBURN LABORATORY FLOTATION MACHINE

peripheral discharge is approximately $\frac{3}{32}$ in. The inlet to the stationary plate is of smaller diameter than the outlet of the agitator. The outlet of the agitator is flattened so as to discharge a thin, sheet-like stream against the baffle in the spitzkasten. The sectional view of the laboratory machine, shown in Fig. 1, makes this clear.

Connected with the suction inlets are vertical pipes which terminate in small valves placed well above the pulp level in the machine. By regulating the opening of these valves, any desired vacuum within somewhat less than $\frac{1}{4}$ to $\frac{1}{2}$ the maximum can be obtained. The rotating plate is speeded to between 1,200 and 1,300 r.p.m. in the 50-ton commercial machine. A 10-hp. motor is used on this machine, but actual figures on power consumption are not available. Pulp flow is due to the regular flow of pulp through the machine and is induced or accelerated by the action of the agitator. It is evident from the construction of the plates and the high speed of rotation that there is intense agitation under a low vacuum in the chamber between the plates. The regulation of the amount of vacuum is readily accomplished and enables the size of the bubbles and the degree of flotation to be adjusted with greater precision than hitherto.

It appears that the machine has considerable promise in the field of differential flotation as well as in the flotation of certain ores which have yielded only indifferent results when experimentally tested by flotation under other conditions. Several machines have been installed, and at present a single unit is being placed in the mill of the Leadville Mines Co., Washoe County, Nev. The results of these installations should be of considerable interest to those interested in flotation.

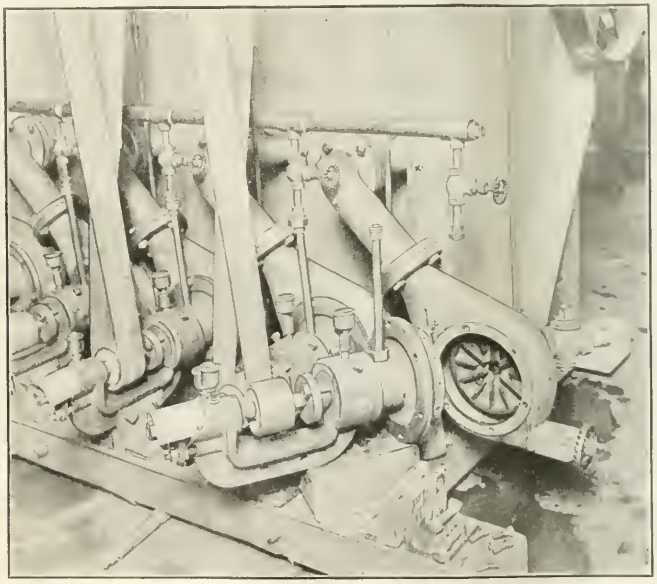


FIG. 2. GENERAL VIEW OF COLBURN VACUUM FLOTATION MACHINE

The Armstead Snow Motors Co., Talache, Idaho, of which H. H. Armstead is president and H. W. Sanders is secretary, anounces that it has effected co-operation with the Premier Motors factory, Indianapolis, Ind., for the construction, in quantity, of snow motors (an automobile which functions on any depth of snow). This machine was thoroughly tested out last winter on the road between Klockmann and Porthill, Idaho, by hauling concentrates from the Idaho-Continental mine. Mining and mechanical engineers, who have seen the car operate, say that Major Armstead has solved the winter transportation problem; and the manufacture of snow motors at the Premier factory, Indianapolis, will be one of the growing new industries of the United States. Next year the Armstead Snow Motors Co. expects to manufacture also in Canada and Russia.

The Chicago Chapter of the American Welding Society has issued a pamphlet "Keep the Guess Work Out of Welding." Copies of this booklet may be had by addressing the secretary of The American Welding Society, 608 South Dearborn St., Chicago, Ill.

The executive committee of this society (New York) has recommended forming a New York Section to operate separately from the parent organization.

TRADE CATALOGS

Screens—The W. S. Tyler Co., of Cleveland, Ohio has issued an attractive catalogue descriptive of the Hummer inclined screen. Unlike any other screen, the vibration is produced by electro-magnets and is applied directly to a drumhead tension screening surface. The intensity of vibration can be regulated easily by turning a small hand wheel at the top of the vibrator. The mechanism is placed on top of the screen, out of the way of the falling material. Screens of this type will no doubt find extended application, as they represent a marked advance over the old and slower methods of mechanical vibration.

Conveyors—Portable Machinery Co., Passaic, N. J., has issued a twenty-four-page catalog entitled "Portable Conveyors." This is complete with illustrations showing the various uses of the scoop conveyor and other portable conveyors manufactured by the company, and describes the labor, time-, and money-saving features of the machine in storing, reclaiming, loading, and unloading material, such as coal, coke, ashes, sand, gravel, crushed stone, fertilizer, cement, and chemicals. Copies will be sent free on request.

Ventilating; Heating—Buffalo Forge Co., Buffalo, N. Y., has published a very useful illustrated catalog of 115 pages, well arranged, on its fan system of heating and ventilating. Much space is devoted to the principles and the methods of check and control of air conditioning. Part III, or but eighteen pages of the whole, is devoted to the apparatus in particular. The numerous tables, graphs, and formulas of this catalog, No. 700, make it one of the most helpful issued on the subject.

Wood Pipe—Continental Pipe Mfg. Co., Seattle, Wash., recently issued Bulletin No. 16, "Continental Creo-Wood Flume," which describes the several features of that product. It is stated that this type of flume will carry more water for a given diameter than any other, preserves its semicircular shape, permits of reasonably sharp curvature, will not crack, disintegrate, or rust, and will not expand in hot weather nor contract in cold. Several installations are illustrated.

Sectional Buildings—The Steel Fabricating Corporation, Harvey, Ill., is distributing a large illustrated folder showing the many uses for sectional steel buildings and their economy. The illustrations suggest many ways in which these handy and easily moved structures could serve the mining and quarrying industries, a subject specially interesting to the corporation's free advisory service. A catalog will be sent any applicant who submits particulars of his needs.

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Volume 110 New York, November 13, 1920 *Number* 20

Combinations in Restraint of Trade

IT IS REPORTED that the farm organizations may call on the farmers of the country to hold up crops in order to sustain the market; and representatives of organized labor have advised the farmer organizations that they would support them in the fight for higher prices.

The miners, representing the other great basic industry of the country, mining, will watch the farmers curiously to see how they fare. The operation of the law against combination in restraint of trade has never been enforced against the greatest combination of all, organized labor, on account of a popular and possibly sound prejudice. That there is one law for the rich and another for the poor, as the agitators say, is true; but it is the supposedly poor who are favored by the discrimination. Also, the socialists' plea in their platform that the "burdens of taxation should be borne by the rich," is true at present, should the gentlemen pause to observe. Income taxes, inheritance taxes, excess profits taxes, all prune the plutocrat.

Millions of wage earners whose annual earnings have been between two thousand dollars and five thousand dollars never dream of paying an income tax; and no attempt is made at collection. On the other hand, we knew a retired mining engineer who complained that taxation cut his income in half; and we heard of another case (for we do not move in such circles) where a man was trimmed out of 85 per cent of his income, in a lucky year. Another pathetic instance was of a man who had nothing and who made half a million in speculation one year and lost it the next. Also, the next year he had to pay his income tax on the year before, and as the tax amounted to a snug little fortune, and not only his cash but his banking credit was exhausted, he was somewhat embarrassed.

This inequality between the supposedly rich and the supposedly poor—which, however, often means taxing the white-collared class who earn less and exempting the horny-handed class, including the makers of watch fobs and perfumery, who earn more—is one which all classes look upon with tolerance: the wage-earning class, of course, do not complain of it, and the other class are either confident of their ability to hand it on to the ultimate consumer or they are good sports. They realize the right of the crowd to pelt them with whatever is handy while they try to climb the pole; if they cannot stand the gaff, let them join the crowd and give the next man a chance to try.

But we question whether the farmers who are thinking to combine in restraint of trade are poor men—we suspect that they belong to the wealthy or capitalistic class. Certainly they are not wage earners. Therefore, with the dual consideration of law and sentiment—how far can they go? As miners, we should like to know. Take the gold-mining industry, for example. We believe it will be admitted that at present all gold miners fall into the class of poor men. Can they—may they—combine to withhold their produce until relieving legislation shall be passed? They are told that would be unpatriotic, but a poor gold miner of our acquaintance wants to know why it should be more unpatriotic than a farmer withholding his wheat, or a labor-unionist his productive work. Will the labor unions support the miners if they combine in restraint of trade, in a fight for higher prices?

The World's Petroleum Problem

THE world situation regarding petroleum is set forth clearly and comprehensively in a recent article in the *Saturday Evening Post* by Mark L. Requa, formerly oil administrator in Washington. He quotes the communication of the Department of State to the Senate on May 17, 1920, concerning the restrictions by foreign countries, especially Great Britain and France, on alien development and ownership, including that by Americans. Concerning this discrimination, the State Department note says: "In the absence of prohibiting treaty provisions, this form of discrimination would seem to be justifiable from the viewpoint of international law, *however impolitic it might be as regards reciprocity and international comity.*" Concerning this, Mr. Requa remarks: "It would seem the part of wisdom that the United States negotiate at once treaty provisions giving our nationals the same freedom that foreign nationals enjoy in America."

Mr. Requa further quotes at length the agreement between the two governments of Great Britain and France, signed at San Remo in April by Sir John Cadman and M. Phillippe Berthelot. "This agreement," the document runs concerning itself, "is based on the principles of a cordial collaboration and reciprocity in the countries where the petroleum interests of the countries can be amalgamated to advantage. The present memorandum refers to states or countries as follows: Rumania, Asia Minor, territories of the former Russian Empire, Galicia, the French colonies, and the colonies of the British Crown." This agreement is, in effect, a pooling of interests regarding present and future requisitions of petroleum. In regard to Russia, for example, Article 6 states that "*the two governments will give their joint support* to their respective nationals in their common efforts, with a view to obtain petroleum concessions and facilities for export, and to assure the delivery of petroleum supplies." Mesopotamia is parceled out between England and France. In the British Crown colonies, French nationals are accorded rights of exploration and exploitation similar "to those accorded to British subjects in the French colonies." American citizens have not these rights, whereas the citizens of France and the "subjects" of Great Britain

enjoy the same rights in American territory as do our own citizens.

Mr. Requa remarks that a careful reading of this agreement "should convince any but the most skeptical that if United States oil companies are to make any headway whatever in the acquisition of foreign sources of supply they must have the same enthusiastic government support and co-operation as that extended to foreign nationals by their respective governments." He discusses the problem for America dispassionately and fairly, pointing out the necessity which Great Britain is under for engaging in a campaign for petroleum resources, and that the only sound policy for the United States Government is actively to conduct its own campaign. He points out that the World War really resulted from the struggle for raw materials, such as the iron of Alsace-Lorraine, and the petroleum and other resources of the Near East; and makes the searching statement that "the sea and air will not be free to all nations for purposes of international commerce unless the sources of petroleum and the petroleum products themselves are made available to all on equal terms and without discrimination."

Mr. Requa concludes that "Adjustment should and can be made by international agreement. No one expects the petroleum companies themselves to arrive unaided at any such understanding. That is impossible. But a properly formulated international agreement, negotiated by governments, defining the rights and limitations under which the different nationals may operate, is not only possible, but necessary, if we are to maintain lasting peace. And that agreement must be founded on a very simple principle: equal justice to all concerned."

This situation as treated by the former oil administrator has been ventilated thoroughly in these columns —in fact, we believe that it was first published there. Subsequently the new British Ambassador, Sir Auckland Geddes, informed the American people that the report was unfounded, and circulated by those desiring to disturb the good relation between the two countries; and the bulk of the American press fatuously quoted Sir Auckland and approved. Also, the remedy proposed by Mr. Requa is the one that has been suggested by us editorially—an amicable understanding among the nations which need the world's petroleum as to how the available supplies are to be rationed.

Recently there has been much friction between England and France over their petroleum agreement, the French believing they have been given altogether the worst of the deal.

No more important problem awaits diplomatic and legislative attention on our part, in order to protect ourselves and insure the future peace and prosperity of the world, than the matter to which attention is here directed; and action on it should be one of the first evidences of a new domestic and foreign policy.

The Future of Mining In South America

THERE can be little doubt on the part of the student of economic geology that the mining industry of South America is destined to increase in scope and importance. The same great mineral belt which covers our Western States sweeps down uninterruptedly through Mexico and Central America, and is represented in South America from Panama to Cape Horn; and there are also the important mining districts of the eastern part of the continent, corresponding roughly, perhaps, with our important mining districts east of the Rockies. But with all her mineral wealth, South America, taking it altogether, is deficient in the one mainspring of industry—coal—so that even the immense iron deposits of Brazil remain a problem as to utilization.

We in this country are already seeing the dawn of the gradual forsaking of coal and petroleum for power purposes, wherever possible, for electrical power—preferably hydro-electric power. The Super-Power Survey, which is being made under the guidance of the U. S. Geological Survey, has as its object the establishment of a connecting network of power lines from Boston to Washington, with the object of maximum development and efficiency of existing electric power possibilities.

Something of this same thought has been communicated to South America, where it is, of course, especially necessary. In another column we abstract some information gathered by the Guaranty Trust Co. of New York concerning this movement. The report is mentioned that an international power plant, with a capacity of 150,000 hp., will be erected jointly by the governments of Argentina, Uruguay, and Brazil, at the falls of the Iguazu, in Brazil. An electric smelting plant and steel mill, the first of its kind in South America, will, it is reported, be built in the Province of Sao Paulo. In Bolivia, an initial expenditure of $10,000,000 for power plants is planned. The plans of the Guggenheim Brothers for the development of their tin mines in Bolivia include the building of a hydro-electric plant, and possibly an electric smelter. In Peru, also, electrical development is not only spreading throughout public utilities and extending itself to the railroads, but is being employed at the mines. The Cerro de Pasco mines, as well as the Vanadium Corporation of America, are constructing hydro-electric plants.

Altogether, we are evidently on the verge of a new era for South America, when the development of her vast hydro-electric power will permit the exploitation of her mines on a scale never before possible, by providing not only the power for the working of the mines but the neressary transportation facilities.

The Utah Consolidated-Utah Apex Lawsuit

IT IS A DELICATE MATTER to take sides in a dispute, however amicable, between friends, especially when one's knowledge of the question in dispute is limited and perhaps inadequate: yet we cannot forbear registering our approval, according to our lights, of the decision of Judge Johnson in the great Utah Consolidated-Utah Apex lawsuit. The sums at stake run up into the millions, and the best legal and geological talent was secured on both sides. The sole point at issue, according to our correspondent, was as to whether certain limestone formations, known as the Highland Boy and the Yampa, which were ore-bearing formations, were the lodes in the legal sense, or whether the almost vertical veins which cut them at nearly right angles were the lodes. Orebodies were shown by the evidence to have occurred frequently at the junction of the vertical veins with the limestone. The cropping or "apex" of the limestone formations was in Utah Consolidated ground: the cropping of the vertical vein-fissures in that

of the Utah Apex. To which party belonged the ore at the junction?

This would appear to be a classic example of the absurdities of geological and legal interpretation and definition which arise from the desire to twist the apex law to one's own protection or profit. To prove that black is white has long been considered the function of the legal brotherhood; and now the geologists take up the task of proving that the country rock is the vein. We note two encouraging circumstances, however: First, from the report of the testimony, the distinguished geologists who were retained by the country-rock advocates seem to have limited their testimony very conscientiously to the facts: and the second that the learned judge proved able to distinguish black from white after the geologists and the attorneys were through with the argument. Possibly the latter encouraging circumstance resulted from the former.

We do, however, file our objections to the definition of a lode proposed by Mr. Horace V. Winchell on behalf of the country-rock advocates: namely, that "a lode or vein is mineralized rock or rocks which contain such indications of valuable minerals as to justify development with the expectation of finding ore. As soon as quartzite over a considerable distance becomes mineralized, then it becomes a lode. Just as soon as either of the other rocks can produce and do produce ore, or contain indications which lead the experienced miner or prospector of judgment to develop it with the expectation of finding ore, then it becomes a lode."

We have all seen or heard of broad lodes: but this definition would establish the record for breadth. As the quartzites which lie between the limestone in Bingham Canyon also are ore-bearing, as was shown by abundant testimony at the trial, they are also lodes; and there is no country rock "whatever" in the district. And as there is no country rock, there are no walls to the different lodes, and, therefore, all the formations become, technically, geologically, and legally, one vast lode. The Bingham Canyon lode, we take it, therefore, is limited above by the pure air of Utah, in depth by the volcanic fires, on the north by the international boundary, on the south by Palm Beach, on the west by the sunset and on the east by Wall Street; and its apex passes into a problem of the fourth dimension.

An early explorer in Alaska traveled on the theory that there was one continuous lode from Alaska to Cape Horn; and the mineral discoveries which he made in Alaska proved to him the truth of his theory. There is a simplicity in this conception which reminds one of the "One Big Union"; at any rate, it would make mine reports easier for the mining engineer.

How To Pronounce Bauxite

THE diverting discussion as to the proper pronunciation of bauxite has run itself out in our open forum, the "What Others Think" department, with the result that there remain, as before, two opposing parties, more deeply confirmed in their previous views than ever. We hardily closed the discussion by remarking that as for us we pronounced the word *boxite* (probably nearer *bawxite*, for the orthography has doubtless a subtle influence in tempting us to prolong the vowel), following custom and intelligibility, and we justified our choice on the principle of the Anglicization of foreign words. We are tempted, therefore, to publish the opinion which we have just received from P. B. McDonald, assistant professor of technical English in New York University, confirming our judgment:

"Answering the query of Mr. Minum in your issue of Oct. 2, about bauxite, I would say that in my opinion the pronunciation has become Anglicized. Originally, the French pronunciation was boze-ite, as the dictionaries still give, but the usage of geologists and miners has made it much like box-ite. This is entirely legitimate. In a similar way, Pa-ree has become Par-is, and Roma has become Rome. We pronounce the plural of beau and chateau as though an 's' were added; the French, I believe, ordinarily pronounce the plural like the singular. To say boze-ite might suggest booze-ite, which Nevadans might confuse with hootch-ite."

We resent, however, the fling at the Nevadans. Nevadans, like Kentuckians, are judges of fine distinctions.

So then, boys, it's all settled. All together, one, two, three, now! *Bawxite! Bawxite!*

The Price of Basic Commodities

EACH month the National Bank of Commerce publishes a list of the wholesale prices of representative commodities, comparing present figures with those before and during the war. From the latest issue of its publication, "Commerce Monthly," we extract the following information:

Commodity:	Price July, 1914	Price High 1914-1920	Price October, 1920	Present Per Cent of Pre-War Price
Beef cattle, cents per lb	9 10	16 80	14 70	161
Anthracite stove coal, dollars per ton	3 80	8 00	8 00	211
Bituminous coal, dollars per ton	1 30	11 00	9 00	692
Corn, dollars per bushel	0 70½	1 94	0 95	135
Cotton, cents per lb	13 31	41 50	20 25	152
Calfskins, cents per lb	20	90	18	90
Hogs, cents per lb	8 90	22 1	14 9	167
Crude petroleum, dollars per bbl	0 75	3 50	3 50	466
Para rubber, cents per lb	68½	86	24½	36
Silk, dollars per lb	3 26	21 57	8 03	246
Wheat, dollars per bushel	0 89	3 30	2 22½	253
Wool, dollars per lb	0 68	2 35	1 30	191
Copper, cents per lb	13 5	32 0	16 25	120
Lead, cents per lb	3 9	10 75	7 60	195
Zinc, cents per lb	4 85	21 00	7 30	150
Iron, dollars per ton	13.00	53.00	46.00	354

This table of course represents prices which were current last month, and some changes have occurred since then, but it is no less interesting. On the whole, it would appear that metal producers as a class are suffering no more than other producers of basic supplies.

There is no general relation between present prices and those obtaining before the war. Some commodities, such as bituminous coal, petroleum, iron, wheat and sugar, are still altogether too high, and production has evidently not caught up with demand. Fuel seems to be especially scarce. On the other hand, leather and rubber are cheaper than before the war. Copper is now relatively cheap, and is not likely to drop much farther, and, of course, gold has remained unchanged in price. If prices are to readjust themselves on the old comparative basis, it would appear that iron and lead are due for a considerable fall.

American silver producers, of course, are provided for during the next three of four years unless the Pittman Act is repealed. Zinc producers, it would seem, can hardly expect higher prices for their product, but can look for lowered costs through decreased prices for fuel, labor, and other commodities which they require.

Gold Mining in the Southern States

Recent Development of Mines in That Section Hindered by Absence of Mining Code, Lack of Mining Experience, and Failure to Recognize Limitations—Under Efficient Direction Some Properties Should Be Successfully Operated

By H. A. Megraw
Written for *Engineering and Mining Journal*

THE Southern States contain a vast amount of mineral wealth, much of which is being developed. This is no new fact to most of those familiar with the country. Iron, copper, zinc, lead, and other important minerals are being produced profitably, and the list is constantly widening. Few, however, know that the first authentic record of the presence of gold in that part of North America now included in the territory of the United States was on June 4, 1513, when Ponce de Leon, aboard one of his vessels off the coast of Florida, was told that a cacique, not far away, contained some gold. In 1516 and 1519, Diego Miruelo y Pineda found gold while cruising along the west coast of Florida. In 1527 Panfilo de Narxaez reported the presence of gold, and in 1539 Hernando de Soto found it in what is now the State of Georgia. Not many know that the first experienced miners in California came from Georgia, and that after them came the more highly skilled men from Cornwall. These facts make it evident that deposits of gold really have existed in the Southern States. Also, they, as a matter of fact, still exist.

Mining has not taken a more prominent place among the industries of the South, for several reasons. The early settlers, first of all, were not from a class accustomed to mining, and it probably did not occur to them to look for minerals. Gold does not and never did exist largely in the South in the form of highly concentrated, bonanza deposits. The ores were of comparatively low grade, particularly so considering that in that period extraction methods were primitive, laborious, and costly. Therefore the search for metal was not likely to be as assiduously prosecuted by a people so unfamiliar with the art as it might have been had the deposits been rich in virgin gold and easily accessible.

Furthermore, among the people of the South agricultural principles were well known. The land, exceedingly rich and tractable, made large profits easily obtainable through the practice of a familiar art. What need, then, to dig for gold when its equivalent might be obtained in an easier way?

Indian Tribes Resented Exploration

The native Indian tribes put many difficulties in the way of mining, as they had a strongly rooted reluctance to speak of it to foreigners and fiercely opposed all excursions of Europeans into their domains. And as mines occur in the roughest country, search for them placed the explorers in a position to be easily assailed. Consequently the practice received no encouragement.

The spirit of mining lay dormant for many years, until, in about 1799, John Reed found the famous Reed nugget at Meadow Creek, in North Carolina. This nugget weighed about 17 lb., and so slight was the current knowledge of minerals that it served several years as a door stop, prized only for its beauty as a stone. It was not until 1802 that Reed took his nugget to a jeweler at Fayetteville, who told him it was gold and induced him to part with it for $3.50. Many other nuggets were found subsequently, and mining began in the South. From 1804 to 1807 North Carolina provided all the gold produced in the United States, and all of it came from surface washings and shallow placer operations.

Vein mining began probably about 1825, in Montgomery County, N. C., a locality that has since produced much of the gold output of that state. Production was

DAHLONEGA CONSOLIDATED CHLORINATION PLANT, DAHLONEGA, GA. AN EXAMPLE OF OVER-INVESTMENT IN A SURFACE PLANT

begun all over the Southern territory, from Maryland to Georgia, particularly in the Dahlonega district of Georgia, which became one of the most profitable in the South. Here the discovery of gold in 1829 was followed by much excitement. The mineral lands were claimed by the state and were disposed of by lottery.

West Drained South of Miners in '49

Mining in general prospered for the next twenty years throughout the southeastern region. In 1849 the California excitement occurred, and, owing to the numerous and rich deposits that were soon discovered in the West, and because most of the skilled miners left the East for the more profitable fields of the West, mining in the South dwindled, and has ever since been followed in only a spasmodic and unstable manner.

The beginning of the Civil War put a stop to the small amount of serious mining work done up to that time. Only a little mining has been done since then, and much of that has been so colored with reckless speculation and downright chicanery, mostly instituted by adventurers from other parts of the country, that it has been impossible to distinguish the good from the bad. In recent years, however, mining upon a substantial basis has been

instituted in several parts of the South, and some success has been attained; enough, at any rate, to show that profits are possible.

The traveler through the Southern States who has knowledge of mining will find much to attract his attention and provide food for thought, but such a traveler must leave the beaten track of the tourist and delve into the backwoods where the old indications still remain He will, at times, be surprised to encounter a small sandy area in a clay district, and will be at a loss to account for it until investigation shows that a mine and mill once existed there, and that the sand is the only remaining sign of a milling operation. He will find in another place a miniature canyon carved in a hillside, and, his attention arrested by the glimmer of white quartz, he will note that this is the outcrop of a vein that was worked from the surface and that, having reached the ground-water level, its operators found that the character of the ore had changed and that they had to deal with a pyritic rock from which they could not extract the gold, although it still existed in undiminished quantity. Indications of mines and mining abound, and with the knowledge of what has been done it is impossible to believe that the advances of modern times have not made available these sources of mineral wealth that have been so long burdened with a world of misunderstanding.

Extent of Southern Gold Deposits

The gold belt of the Southern States begins in Maryland and runs southwest through parts of Virginia, the Carolinas, Georgia and Alabama. It is of varying width and richness, but its character is much the same throughout. The area is one of crystalline schists, and the ores occur in veins of quartz and quartzite cutting regions of metamorphosed slates.

The most important and extensive gold-bearing area is the great zone of metamorphic schists and slates extending from southern Virginia, through central North Carolina, and into South Carolina. In this area have been located some of the famous producers, among which may be mentioned the Union, Gold Hill, Russell, Hoover Hill, Fentress and also the only large silver mine of the section, the Silver Hill, in Davidson County, N. C., which was in operation before the discovery of the Comstock lode. In recent times some important properties have came into the producing class in this area, notably the Coggins, Iola, Haile, and some others. In Georgia and Alabama other producers have been opened, and throughout the whole geological formation there is possibility of profitable mining.

It would be a futile and useless task to list the mines of the South or to attempt a detailed description of the rocks in which they occur. The geological bureaus of the various states have admirably accomplished this work, and anyone sufficiently interested may readily obtain information from this source. To those who care to study the subject, however, a word of warning should be given. It will be found that in many cases the cessation of former mining operations came about through lack of available metallurgical processes by means of which to treat the pyritic ores economically. There should be no loss of courage through the acknowledgment of this fact. Modern developments in geology and engineering are sufficient to lead to the reopening of orebodies that may have been lost, and modern metallurgy can confidently promise simple and economical methods of gold extraction, even from the most rebellious ores.

Three principal factors have opposed the successful carrying out of extensive gold-mining enterprises in recent years. None of them presents insuperable obstacles, but no success can be attained without recognizing them and adopting methods to overcome them. The first of these factors is the law. The mining code does not exist in the South, where the landowner is also master of whatever is within or beneath it. This discourages prospecting. No one will search for mineral deposits, because, even if he finds them, he has no commercial interest in his discovery except what may be granted through the generosity of the landowner. Prospectors are not prone to depend upon that feeling. The work is of a kind that entails hardships and privations, so that the one who does it is entitled to a proportionately great reward when success crowns his efforts. Such an expectation is entirely without basis in the South, and consequently there is no systematic search for minerals.

The second factor is the lack of acquaintance with mining principles and methods by the general population. The average inhabitant of the South is not familar with mining, and indications that might mean much to one having such knowledge would be quite without effect upon him. When a people have for generations followed specific industrial pursuits, a part of the knowledge concerning them that they possess becomes in a degree hereditary. Add to this the additional familiarity absorbed unconsciously through environment, and a race is produced equipped to attack, with assurance of success, the problems encountered. The people of the South are not so armed. And this fact presents an obstacle to be overcome.

The third factor in opposition is the failure to recognize the limitations of a developed property, a failure which is the common fault of the Southern miner and the Western man who operates in the East. The local operator is likely to run his business on a penurious basis, failing to recognize the just claim of a good deposit to first-class equipment. Also, the local man is likely to be imposed upon by the manufacturer of freak machinery of the sort conceived in a fevered imagination, manufactured solely to sell and bought only by those not conversant either with the industry in general or the needs of a particular property.

Western operators, on the other hand, accustomed to large and continuous orebodies, often make the mistake of overestimating the resources of a Southern mine. A common error is to cut short development and spend large sums on surface equipment. Not a few Southern gold mines have been saddled with surface plants costing from $100,000 to $300,000, a burden that usually precludes financial success. It is rare, indeed, that such equipment has paid for itself.

Veins Discontinuous and Not High Grade

Southern gold-bearing veins are usually narrow, of low or medium grade, and are not of even value over great distances. Either in strike or in depth the ore-body is likely to be cut off abruptly, and the precious-metal content may change constantly. The limitations both as regards extent and grade must be recognized and dealt with in a reasonable manner; if not, there is little hope of profit; but if due regard is accorded to them a substantial return is reasonably assured.

As has been said, all three of the obstacles to mining

in the South may be overcome. The first one, based on the state of the law, must be overcome by the property owners themselves. Each person who has, or believes he has, upon his property a gold-bearing deposit should explore it thoroughly before attempting to interest anyone else in its possibilities. A simple and reasonable way to perform this preliminary development is to open a series of pits upon the vein outcrops where they appear at the surface. If a man will dig such a series of pits about 20 ft. deep, spaced at intervals of about 200 ft. between his boundary lines, he will have done valuable work in leading to a correct appreciation of his property by obtaining a good idea of its continuity and making possible a correct sampling of the rock. Unless a vein has commercially valuable ore and reasonable continuity, it is worth nothing. If the developments show both of these requirements, it is time to enlist the services of an engineer, who will be able to direct further development and also to provide the owner with a good survey.

The only dependable estimate of the gold content of an ore is based on determinations made in the laboratory by a qualified chemist. These, although correct in themselves, are of no value, however, unless they represent a fair average of the orebody under investigation. Careful sampling is a prime requisite, and so much training is required to do it properly that, for the unskilled man, an attempt at it is merely a waste of time and money. The landower can, however, by panning, ascertain superficially what a sample of his ore contains. Almost every one understands the mechanical operation of panning, and if the operator will be careful to compare each result with the showing given by an assayed ore, taking the same amount of rock to pan each time, he will be able to get some idea of how the rock is running. But it cannot be too strongly urged upon the operator that sampling must be done so as to obtain a fair average of the vein sampled, or the work is worthless, or, worse, misleading.

Landowners Favored by Law

If every proprietor would carry out this operation upon his mineral deposit, then utilizing the services of an expert, he would place himself in a position to turn the legal obstacle to mining into a positive asset. This is because the absence of the mining law dispenses with all claims of doubtful ownership such as depend upon the apex laws. With this advantage the owner is himself the final court of estimate. He knows the value of his property and can sell it at a price he knows to be fair, or he can with equal justice offer it as fully appraised, to be balanced with capital invested by others. At this time the mining industry has passed far beyond the stage of wild speculation, and by intelligent people who understand the advances made in geology, mining, and metallurgy, it is recognized as an industry plainly based upon mathematically estimable factors that can be forecast with an uncommon degree of certainty.

By no means, however, is it to be forgotten that mining has one essential characteristic that distinguishes it from all other industrial projects. This is the fact that every pound of ore taken from a mine reduces its total content by just that amount, and every dollar removed from it reduces its total value by just one dollar. In other industries raw material may be produced *ad libitum* through labor, but no amount of labor will produce an ore deposit.

By removing the difficulty that depends upon the absence of mining law, the greater part of the second one, unfamiliarity with mining methods, will also be counteracted. A proper acquaintance with the true value of a mineral deposit does not come as naturally and intuitively as it does in some parts of the West, but is to be gained through application and thorough study of a clearly defined problem. The greatest difficulty, therefore, will come from inability to recognize the signs of mineral deposits. This faculty can be acquired by study and practice, and the mineral industry of the South will improve immensely when the general public begins to understand its principles.

Available Publications Should Be Studied

Probably the best way to get a preliminary idea of the character of any particular part of the country is to study the publications of the U. S. Geological Survey and of the geological department of the state in which the land is situated. Most of the Southern States maintain geological departments, either as a state bureau or as part of the state university system. The publications of such departments are to be relied upon, and may impart extensive and valuable information to serve as a basis for prospecting.

Southern mining companies have been inflicted with an unreasonable amount of incompetent management. Direction and administration have often been in the hands of some man of local importance, often the original owner of the land upon which the deposit occurs, and in spite of his earnest and honest endeavors he is foredoomed to failure through his lack of knowledge of the requirements. In other instances men are taken from totally different walks of life, apparently upon the presumption that anybody can manage a mine.

Another kind of management, equally bad, is typified by the Western man who comes to the South to take charge of a property. He is accustomed to mining, in a broad sense, but fails to estimate properly the value of the ore deposit. He is accustomed to continuity of value, and it does not occur to him that conditions will be different here. He is likely to place too much dependence upon widely separated samples, a course that will never do with the Southern deposits. Nor must it be presumed that the vein value will increase with depth. That is a myth that has been found generally not to be true anywhere, and it is particularly untrue in the South. Here most of the gold-bearing veins will cease to be profitable at depths varying from 300 to 600 ft.

In mining work in the South it is always best to secure the services of a competent engineer, one familiar with the Southern ore deposits; at any rate this should be done in the formative stages of mine development. The money spent for his services will usually be an ultimate saving, and an infinitely better investment than the purchase of machinery of doubtful value through a cheap but inefficient manager.

In conclusion, it may truthfully be said that some of the gold deposits of the South may be of value. They can be made, by wise and careful direction, to render substantial profits to their owners; but management must be skilful and certain, and the allowable investment must be carefully considered. There is no room for mistakes.

The Gold Miners of South Africa

In April, 1920, a total of 225,457 men were employed in the gold-mining industry of South Africa. Of these, 24,068 were white and 201,389 colored or native laborers.

Mexico's Industrial Progress Since Diaz

Nearly All Railroad Construction Now Under Way Planned Under Carranza — Oil Exports Tripled in Seven Years — Metal Output During Revolutionary Period Indicative of Mining Activities

By JOHN E. KELLY

Written for *Engineering and Mining Journal*

INDUSTRIAL progress in Mexico since the time of Diaz has of necessity been interrupted and below normal, but despite the enormous destruction of property during the revolution, Mexico today is on a firmer foundation than she was on Nov. 20, 1910. The government of President Diaz and the strangle hold of the great landowners on the real estate of the nation were artificial, and the former could last only during the lifetime of its founder. It was bound to end in revolution, and the longer that revolution was delayed, the greater the loss of life and property that must inevitably ensue. The debacle threw the component elements that make up Mexico into a tangled heap, and it has taken ten years to settle them down upon a firm foundation once more. But, now settled, and the abuses of the Diaz and Huerta tyrannies abolished, Mexico faces the future with a brighter outlook than ever before.

Resumption of Industrial Activities

The industrial progress of a country is to be measured in relation to the stability of its government and the facility of communication. Progress in no wise remarkable now would have seemed miraculous to the inhabitants of the isolated villages of the Thirteen Colonies, confronted with Indian wars and impassable roads. That there was any progress at all during the years of the Carranza-Villa-Zapata dissensions, with the attendant paralysis of credit and communications, is evidence of the determination and courage of the native and foreign operators. The rise of Tampico to the position of the premier oil center of the world would have been an achievement of the first magnitude in the most peaceful country.

As an example of the progress of Mexican industry during the revolution may be cited the case of the City of Leon, Guanajuato, the scene of the battle that dealt the final blow to the Huerta regime. This city of 85,000 inhabitants is noted for its exports of shoes, shawls, and leather. In 1909, that is, under the Diaz regime, the total value of exports in the articles listed above amounted to 10,000,000 pesos. In 1919 the sum had risen to 23,000,000 pesos, and for the first nine months of 1920, a total of 20,000,000 pesos' worth of manufactured articles have been produced. This is a showing of which a city untroubled by political disturbances might well be proud.

The Railroad Situation

The railroads of Mexico experienced severe treatment during the revolutionary epoch, but, on the other hand, many miles of new track were laid, and other railways projected and contracts for their construction awarded. Apart from the delays caused by the constant burning of bridges by bandits, and the deterioration of roadbed and rolling stock for want of repairs, owing in part to lack of funds and, later, during the Great War, to the embargo on steel beams and parts, several roads were obliged to suspend operations completely, or at least to run bi-monthly. These included the Mexico Northwestern Ry., the operation of which was rendered exceedingly difficult because of the destruction of the Cumbre tunnel, several branches of the Mexican Ry., and all of the roads within the territory controlled by Zapata and Chavez Garcia.

Credit must be given the Carranza government for its attempt to restore the railways to their former condition, and even to construct needed additions. Nearly all the construction now under way was planned under Carranza, and the important Durango-Mazatlan and Sierra Mojada-Cuatro Cienegas projects were under construction when that government ceased to function. Colonel Paulino Fontes, promoted to be Director-General of the National Lines from his former post as Director of the Mexican Ry., bought over $2,000,000 worth of rolling stock, including forty locomotives, during the last few months of his administration.

The Mexican Ry. has been returned to its owners, the National Lines are either to be returned to, or bought from, the American stockholders, and the Tehuantepec railway is to be acquired by the Mexican government and double-tracked.

New Construction

New railroads, under construction or soon to be, include the following: The extension of the Southern Pacific of Mexico from Tepic to Guadalajara; the completion of the links of the Kansas City, Mexico & Orient from Creel to Estacion Fuerte, and from Falomir to Presidio, Tex., making this road upon completion the shortest route to the Orient, via the port of Topolabampo. A concession has lately been granted for a line that will join Tampico and Matamoros, where it will have connection with the Gulf Coast lines. An electric interurban is to traverse the oil fields between Tampico and Tuxpam; the valuable hardwood forests of Quintana Roo are to be tapped by a new line; the completion of the Durango-Mazatlan line is being rushed, and it is hoped to run the first train by the first of the year. A line starting at Casas Grandes, Chihuahua, will connect with the Nacozari line, giving, in connection with the K. C. M. & O. and the Durango-Mazatlan route, three railroads across the divide and opening up very rich regions. Mexicali will be connected with San Felipe Bay, below the mouth of the Colorado River; Toluca and Zitacuaro will have rail connection; and a new road will be run from the city of Zacatecas to the prosperous towns of Jerez, Villanueva, and Tultenango. In addition, the great bridge on the Pan-American railway at the Guatemalan boundary is under construction. When completed, there will be physical rail connection between northernmost Canada and Nicaragua, and, with only a few miles missing, to the Panama Canal.

More than any other section, Yucatan has suffered from the revolutionary epoch, not so much from the revolution itself as from the ambitious schemes of one of its leaders, and industrial progress may be considered to have practically ceased since 1914. Cut off from easy communication with the rest of the republic, and depending for its prosperity on the sisal harvest, Yucatan has been temporarily ruined through the attempt to implant a new social order modeled somewhat after the first French Revolution; the control of the sisal sales by the formation of the Comision Reguladora del Mercado de Henequen, and the practical monopoly of other commerce by the Compañia de Fomento del Sureste. These companies were permitted to issue bonds in payment of their purchases from the producers, and when, through mismanagement, they both failed, bankruptcy became universal throughout the peninsula. The Comision Reguladora was founded to regulate the price of sisal in favor of producers, as the name indicates, but the arbitrary attitude it assumed toward foreign purchasers, and the lack of a sound financial foundation, doomed it to failure. As the sisal producers were bound to deliver their fibre to the Reguladora and to accept its bonds in payment therefor until such time as the fibre should have been sold, the failure of the enterprise found them with the bonds on their hands, and dragged them down along with it. The Mexican government is now attempting to relieve matters, and has taken over the fleet of steamers owned by the Reguladora in exchange for the government's redemption of the Reguladora's paper.

Yucatan has not only been the victim of bankruptcy, but of the high cost of labor. The leader of the revolution who founded the Reguladora preached the doctrine of Bolshevism and the supremacy of the manual laborer. Socialism has never enjoyed any considerable hold upon the rest of the Mexican people, who are strongly individualistic, but in Yucatan the experiment has been tried—with disastrous results. The *socialistas* forced the scale of wages beyond all reason, a porter demanding a peso for carrying a trunk two blocks, and other labor asking from six to ten pesos for work that paid two to three pesos on the mainland.

The result might have been foreseen. The market was dull, the planters could not redeem their paper, labor was out of sight, and there followed bankruptcy, starvation, and emigration. The socialists found that a supremacy that permitted them to starve was of no value, and thousands have emigrated to the mainland, where the capitalist may rule, but pays.

Mining During the Revolutionary Period

In periods of political upheaval, mining is, from the isolated location of a large number of mining camps and from the nature of the industry itself, more liable to suspension but less susceptible to complete destruction than other enterprises imperilled by the same revolution. A stock of goods or a factory may be looted, the torch applied, and save for the possibility of insurance, the loss is total; a ranch may be raided, buildings destroyed, and cattle driven off—the disaster is almost as complete. A mine's surface structures may be demolished, workings flooded, *gambucinos* or local revolutionary leaders may rob the rich pockets (Zapata worked several mines to secure metal for his coinage), the shaft may be dynamited, but though any or all of these occurrences may cause extremely heavy loss, the great bulk of the property's values remain intact. Upon the return of peaceful conditions their existence may serve as security for a loan to replace the damaged structures. In the cases outlined above, however, the merchant or factory owner has no such asset. Governmental indemnification for losses sustained during revolution having remained to date in the theoretical stage, industries must absorb their losses and progress, suspend, or cease to exist in proportion to their ability to rehabilitate themselves through their earnings or assets.

The location of factories in or near large towns presumably well garrisoned permits them to operate safely and to secure supplies and an outlet for their products after the outlying regions that contain many important mining camps have been cut off. It is the history of Mexico that revolutions have their birth in the mountains, and the miners swell the rebel ranks, paralyzing the mines and making the mining camps the scenes of the first skirmishes. The original army of Don Miguel Hidalgo y Costilla was composed largely of miners from Guanajuato, and the revolution that overthrew Diaz started in the mountains of Puebla and in the foothills of the Sierra Madres, at Guerrero, Chihuahua. Villa was a miner, and a good one, having worked at Sta. Eulalia, and General Manuel Dieguez, a prominent figure in the Carranza regime, joined the Madero revolution from the mines at Cananea.

New Government Encourages Mining

Hundreds of mines have been abandoned throughout the republic as a result of conditions existing during all or part of the last decade, but it would be incorrect to claim that no progress has been made in mining during that period. The millions of dollars' worth of metals that have been exported in that time are proof of that progress. Many properties were worked with only slight interruption, new deposits were discovered, and the attitude of the present government is most encouraging. To give impetus to the re-establishment of mining, especially in the remoter regions that have lain almost idle under the sway of bandit leaders, the laws entailing the loss of property through non-payment of taxes have been suspended, so as to give the owner protection against the claim jumper looking for rich properties delinquent in taxes. A report issued by the Departamento de Minas shows that thousands of owners have availed themselves of this ruling, and mines are being reopened in every section.

Prospecting and denouncing of new tracts never ceased even during the most disturbed periods. In September, 1918, at a time when Villa still prevented operations in most of Durango and Chihuahua, when Paleaz, Arrellano, de la Llave, and Felix Diaz kept the east in a turmoil, and when the pacification of Morelos and Guerrero had not reached a point guaranteeing the safety of prospectors, 1,897 hectares were filed on, covering land in twenty states. The following month 2,010 hectares were denounced.

Since 1913 the export of Mexican oil has tripled, Tampico now occupying second place among the ports on the American continent in point of tonnage. This is a remarkable example of progress, the more so when the constant quarrels between the oil interests and the Mexican government are taken into consideration. The oil situation and controversy are too well known to require discussion here. To what point the exports

would have risen had there been no friction with Mexico City since 1913, only those on the inside can estimate.

The known gusher territory in the Huastecas is constantly being expanded, a supposedly wild-cat well in the southern extremity of the field having recently come in with a volume of oil equaling the largest of those already in exploitation. Since oil has become so important a factor in the life of industry, explorations have been pushed in every part of the republic, and it is announced that concessions amounting to more than 7,000,000 acres have been granted in Lower California, Sonora, Sinaloa, Tamaulipas, Chiapas, Coahuila, and Vera Cruz. Discoveries of seepages and other promising indications are reported from the lower Conchos River country, the southern part of the State of Chihuahua, Campeche, Jalisco, and some of the islands off the west coast.

The cost of producing oil has increased during the last decade but not as much as in other countries. Mexican products bring a high price in the world's markets, and as labor is still cheap by comparison with the United States, the operator finds the future offering a promise of recompense for the losses of the past. Statistics collected by one of the leading Mexican papers show that the cost of common labor, taken throughout the republic, averages only slightly in excess of one dollar gold per day, ranging from 30c. in Colima and Chiapas, and 75c. in Mexico City (the latter figure is paid by the Secretariat of Communications and Public Works for road laborers), to the highest figures in the north and in the oil fields.

Industry has made surprising progress during the period since the fall of Diaz, considering the difficulties and in some cases the hostility of the momentary rulers that it has had to endure. The perseverance displayed by the owners and operators during the most hopeless times will find its reward in the period now opening, for the election of General Obregon seems to ensure an "era of good feeling" in Mexico and augurs well for that country's future.

Gold Production of India

Although September was only a thirty-day month, the production of the Indian gold mines for the period, 35,497 oz., shows a further falling off of 1,878 oz. as compared with the August output. The production of gold in fine ounces for 1916 to 1920 follows:

	1916	1917	1918	1919	1920
January	45,214	44,718	41,420	38,184	39,073
February	43,121	42,566	40,787	36,834	38,872
March	43,702	44,617	41,719	38,317	38,760
April	44,797	43,726	41,504	38,248	37,307
May	45,055	42,901	40,889	38,608	38,191
June	44,842	42,924	41,264	38,359	37,864
July	45,146	42,273	40,229	38,549	37,129
August	45,361	42,591	40,496	37,850	37,375
September	45,255	43,207	40,088	36,813	35,497
October	45,061	43,041	39,472	37,138	..
November	45,247	42,915	36,934	39,628	..
December	48,276	44,883	40,149	42,643	..
Total	541,077	520,362	485,236	461,171	340,068

The individual Indian results for August and September, 1920, are as follows:

	August		September	
Company	Ore Crshd., Tons	Gold Prod., Oz.	Ore Crshd., Tons	Gold Prod., Oz.
Balaghat	3,300	2,363	3,200	2,468
Champion R	12,503	6,404	11,623	5,016
Mysore	20,120	13,193	18,485	12,851
N. Anantapur	800	962	800	952
Nundydroog	8,736	6,004	8,450	5,753
Oorgum	12,900	8,449	12,700	8,457

Japanese Copper Smelters

The following list of some of the more important Japanese copper-producing plants, together with names of officials, was recently sent us by a correspondent:

Kuhara Kogyo Co. (Kuhara Mining Co.)
- Mines at Ibarakiken, Tagagori, Hidachimura, Japan.
- Refineries at Oitaken, Kitauruibegari, Saganoseki, Japan; Chinnanpo, Korea, and at Hyogoken, Shikamagari, Yejima, Japan.
- Largest production in Japan. Highest chimney in the world.

Sumitomo Besshi Kogyosho.
- Mine at Ehimeken, Umagori, Besshiyamaura, Japan.
- Refinery at Ehimeken, Ochigori, Miyakubomura, Tomura, Japan (Generally called "Shikajima").
- Second largest production in Japan (20,000,000 lb. per year.)
- Owned by Baron K. Sumitomo. "Chief of Mine," K. Ohira.

Furukawa Mining Co.
- Mine and smelter at Ashio.
- Refinery at Nikko, Japan.
- Third largest production in Japan. (Has other plants besides the above.) Owned by Baron Furukawa. Head office at Tokyo. Chief Engineer at Tokyo, Kumatoro Nakai, M. E.; assistant chief engineer, at Tokyo, S. Hayashi, M. E. Superintendent at Ashii, Isdzu Sugimoto; assistant manager at Nikko, Juruku Kaku.

Kosaka Kozan. (Fujita Mining Co.)
- Mines and smelter at Akitaken Kazunogori Kosaka. Japan.
- Fourth largest production in Japan.

Hidaira Dozan.
- At Miyazakiken, Higashi, Usukigori, Kitakatamura, Japan.
- Owned by Viscount S. Naito. Chief engineer, Y. Kasahara.
- Production about 6,000,000 lb. per year.

Homanzan Kozan.
- At Shimaneken, Katarugori, Hatsakomura, Japan, and at Shimaneken, Yatsukagori, Iwasakamura, Japan.
- Owned by T. Hori. Chief engineer, O. Kuwabara.

Kinoshima Seirensho.
- At Hiroshimaken, Takeharakogai, Kinoshima, Japan.
- Head office at Osaka, Japan. General manager, M. Matsui. Manager at Kinoshima, M. Tsugaki.
- Production about 3,000,000 lb. per year.

Kunitomi Kozan. (Tanaka Kogyo Co.)
- At Hokkaido, Shiribeshi, Iwanaigori, Ozawamura, Japan.
- Chief of Mine, K. Tamura.
- Production, 3,000,000 lb. per year.

Yoshioka Kozan. (Mitsubishi Kogyo Co.)
- Mine at Okayamaken, Kawakamigori, Fukiyamashi, Japan.
- Refinery (Osaka Seirensho) at Osaka Kitaku Shinkawasakicho.

Note: Kozan = Mine; Kogyo = Mining; Kaisha = Company; Seiren = Refine; Seirensho = Refinery.

This list is not complete, nor is its accuracy guaranteed.

Ontario's Lead Production From One Locality

The entire output of pig lead in Ontario during the first half of 1920 came from the mine and smelter near Galetta, on the Ottawa River, operated by the Kingdom Mining, Smelting & Manufacturing Co. The product was consigned to the James Robertson Co., Ltd., of Montreal, manufacturer of plumbing supplies. A small recovery of lead from the silver ores of Cobalt is treated in the United States refineries, returns of which are received at the end of the calendar year.

Roman Mining in Wales

Wild Country No Barrier to Development of British Mineral Wealth Two Thousand Years Ago—Lead and Silver the Particular Objects—Little Known Regarding The Work Except From Remains

By W. B. Paley
Written for *Engineering and Mining Journal*

THE exact causes of the Roman invasion of Britain, perhaps the greatest event in British history, will probably never be known with certainty, but modern researches make it fairly clear that possession of its mineral wealth was a principal object sought. It is difficult to conjecture for what other reason the Romans immediately drove a road from the nearest part of Kent right across the country to the west coast of Wales at Carnarvon. The distance, by the route they took, was about 300 miles, and considering the absolutely wild state of the country, densely wooded, with choked-up overflowing streams, it was a remarkable work, worthy of the great people who undertook it. It brought them into a wonderfully rich mineral country where virgin ore lay on the surface ready to be gathered up by the first hand that wanted it. Branch roads were soon added, linking up the mining centers. Many portions of these roads, in the wilder parts of Wales, remain to this day.

The mineral traffic was conducted by pack-horses, carrying one or more "pigs" of metal. These were

THE PORTAL OF A ROMAN MINE

dropped, or lost in the snow perhaps, from time to time, but wherever they are found a Roman road is close by. That the lead mines of north and mid Wales produced them is shown by the name of a tribe called the Cangi, Ceangü, or Kiangi, cast upon them. This, with the sounding titles of the Emperor, giving the date, proves where they came from, as the Cangi are known to have inhabited a large district thereabouts.

The lead must have been smelted in the district, but the ashes of the furnaces are found more often than the furnaces themselves. The Roman furnaces of all kinds, however, were very small, probably often of a temporary character, so that their remains can be traced only in comparatively few places. Possibly fresh ones were set up as the source of wood fuel receded.

Charcoal was chiefly used. There was wood enough and to spare, but the mining operations of the Romans were continued to the end of their domination, and in 350 years a sensible clearing of the forest land must have been effected in some places. Lack of sufficient mechanical power to produce a strong blast, however, led to imperfect extraction of the metal, so much so that in the seventeenth and eighteenth centuries the beds of Roman slag were found well worth smelting over again. Some of these beds are of great thickness and extent, especially along the river Wye, where it separates England and Wales. The neighboring Forest of Dean contains plenty of coal, much of it in thin seams cropping out on the hillsides. To what extent, if at all, this coal was used in smelting the iron ores is difficult to say. Surface coal is generally poor stuff, but it is certain that the Romans used it as house fuel at several places where it lay ready to hand.

The method of mining the iron ore in the Wye Valley was simply to follow a vein or "pipe" of ore so far as a man could get, or so far as it remained profitable. Sometimes the miners started from the face exposed in a cavern dug in the hillside, as shown in the illustration, and sometimes from the bottom of a large shallow pit. When the vein became thin and only one man could work in it, he squeezed along, using a short iron crowbar to pull down the ore, while another man raked it up into a box or basket and passed it out. Oak shovels as shown in the cut, formed of split laminæ, have been found and seem to have been held in the right hand and filled with the left. The hole in the center may have been intended to let the water run through when working in wet ground. Wedges, chisels, and hammers were used. By their aid galleries were cut in all directions in the two hills, called the Great Doward and the Little Doward, near the Wye between Ross and Monmouth.

Iron was mined by the Romans in many other parts of the island, but the Forest of Dean and thereabouts seems to have been the principal seat of the industry. The iron is thought to have been shipped chiefly from a place near Southampton, now called Bitterne, to which suitable roads were made for the purpose.

Lead, however, was what the Romans wanted most. They employed it lavishly, if clumsily, in thick sheets, and seem to have used it for almost everything. Down below the streets of York, Colchester, London, and many other towns lie the remains of the citizens of the days of the Cæsars, each in a massive leaden coffin elaborately decorated with patterns of scallop shells and other devices. At Bath the leaden water pipes in the public baths, where the veterans of the legions used to reinvigorate their war-worn limbs, are of absurd massiveness. Not only north Wales but central Wales has extensive lead deposits, which have been worked ever since Roman times and are not nearly exhausted yet.

The county of Montgomery, especially, contains numerous traces of Roman mines and must have been extremely rich in ore at one time. The ore contains a good deal of silver, which the Romans well knew how to extract. Many of the leaden pigs bear inscrip-

tions stating that the silver has been separated. Copper is also found in the same neighborhood, and in the form of bronze was much used by the Romans. Both the copper and the lead were practically on the surface when first worked. On Llanymynach Hill, in Montgomeryshire, are extensive remains of Roman copper mines, the mineral being a green carbonate. Near the pits are signs of vitrification, showing that the ore was smelted on open hearths. Copper was worked at least so far down the north Wales coast as the Great Orme's Head.

The mines of Wales and the English counties bordering upon it were certainly fully worked before the end

11 inches by 8½. 16 inches by 8½

OAK SPADES FOUND IN ROMAN MINES

of the first century of the present era, although the subjection of Britain was not taken seriously in hand till A.D. 43 by Aulus Plautius.

Of the people who actually worked in the mines little is really known, but probably they were the aboriginal inhabitants, treated as slaves and forced to work whether they would or no. Guarded by soldiers drawn from various conquered countries, they could expect little sympathy or kindness from them or from the Italian experts who directed the mining operations and who saw that the fixed amount of tribute in metal was duly sent to Rome. In fact, they were treated much in the same way as the Spaniards treated the Incas of Peru, for the Romans, with all their great qualities, were a cruel and brutal race at heart.

Lookout Towers Used in Surveying

An essential task preliminary to the mapping of any area is that of covering it with a connected system of triangles in which each angle is accurately measured. Ordinarily this task is slow and expensive, but recently topographic engineers of the U. S. Geological Survey, while working in the heavily timbered area of northern Maine, saved great expense by making observations from the numerous steel lookout towers erected by the Maine Forestry Commission to aid in protecting the timber from fire. These lookout towers range in height from about forty to seventy feet, and in each of them a watchman is stationed day and night during the summer and fall. The Government surveyors found that these towers make admirable observing stations and by using them they were able to do work in five weeks which would otherwise have consumed four or five months. In this way they saved several thousand dollars and were able to cover a larger area than they could otherwise have covered with the funds available. The State of Maine thus derives a double benefit from its wise provision for the protection of its forests.

The Position of the French Iron Industry

In a recent article in the *Echo des Mines* the writer combats the optimistic utterances of some of his countrymen on the subject of France's iron ore position. The statements which have been current to the effect that France holds Germany by means of her ore, and will henceforth dominate the metallurgical industries of Europe, are described by the writer as altogether illusory. In proof of this contention figures are adduced showing the pre-war distribution of ore produced in the three regions—French Lorraine, annexed Lorraine, and Luxembourg. These figures demonstrate that of the total national production of 40,000,000 metric tons, 27,000,000 tons were consumed in France, Lorraine, and the Sarre, leaving for export 13,000,000 tons, of which 5,000,000 tons went to Belgium, 4,700,000 tons to Luxembourg, and 3,900,000 tons to Germany. Where, then, the writer asks, is the alleged immense German outlet for French ore?

It must not be forgotten that Westphalia and the Ruhr, the only metallurgical regions in Germany capable of consuming Lorraine ore, have always been large importers of the rich Spanish and Swedish ores (in 1913 the importations were 3,632,000 tons and 4,558,000 tons respectively), and that of the 8,500,000 tons of Rhenish-Westphalian pig iron only 1,500,000 tons (about 18 per cent) have been produced from Briey, Luxembourg, and Thionville minette. Thus, Germany has been dependent on France to the extent of only 18 per cent of her pig-iron production in normal times, and as the German works are not producing more than 50 per cent of their capacity, owing to the restriction in the coal supplies resulting from the Spa Convention, Germany's dependence on Lorraine ore is now correspondingly less. "The solution of the problem of our ore exports would," the writer concludes, "be perfectly simple, if it were merely a matter of exporting 13,000,000 tons out of the 40,000,000 tons we produce. Its complicated nature arises from the difficulty we shall experience in treating, as before the war, 27,000,000 tons in Meuthe-et-Moselle, Lorraine, and the Sarre; and if the output of ore increases, as it probably will do, or even if it remains stationary, it will not be 13,000,000 tons we shall have to export, but 15,000,000 or 18,000,000 tons. Should we propose to get over the difficulty by exporting pig iron instead of ore, we shall want coke, more coke, still more coke!"

Australia's Copper Manufactures

An agreement is under discussion between the Queensland Minister for Mines and the Copper Works at Port Kembla, in that state, according to *The Ironmonger*, which provides for the purchase, for two years, by the company, of Chillagoe blister copper up to 300 tons a month, and of the gold and silver it contains, at the market price ruling over a mean of seven days at the time of arrival of the copper at Port Kembla. A large quantity of copper is awaiting treatment at Port Kembla, for, by commonwealth regulation, copper must be refined before it is exported from Australia. With the exception of one works in the United States, the Port Kembla Copper Co., of Queensland, is the only works in the world where copper ore is smelted, then electrolytically refined, and finally rolled into wire. The manufacture of sheet copper is under consideration.

An American Engineer in Japan

First Impressions of the Land Where Every One Seems Happy—Predominance of Manual Labor Surprising—Transportation Facilities in Need of Modernization—Engineering Knowledge in Demand, but Practical Application Left to Mechanics

By Charles F. Mason
Written for *Engineering and Mining Journal*

FIRST impressions are frequently misleading; and it is not without hesitation that I am putting down my first impressions of Japan, with the hope, in some cases, and fear in others, that they may prove to be erroneous. Certainly no impression could be more pleasant to the impressée than that created upon steaming into Tokyo Bay on a perfect June day, with Fujiyama occasionally visible through the haze to the west. Rounding Treaty Point we find ourselves suddenly in Yokohama harbor, where we anchor only long enough for a brisk examination of the ship by the health authorities.

Being met at the pier by Japanese friends, the customs examination is no ordeal at all, and in the twinkling of an eye I am bundled bag and baggage into a waiting *takushi* and am on the way to the train for Tokyo, about eighteen miles distant. My regret at not having more time in which to enjoy the new thrill of being for the first time in Japan is tempered by the assurance of my friends that other places are of far more interest than this; and by my own still, small voice telling me that, after all, I am on business and not on pleasure bent. Later experiences convince me that no line can be drawn between pleasure and business in this land of pleasure—the two are inseparably connected in a thousand ways.

Prodigal Expenditure of Human Energy

Aside from the thrill at being for the first time in a strange land, my primary astonishment is at the apparently enormous expenditure of human physical energy on all sides of me. Each day, at first, I think, surely this must be a special occasion—these men (and women and children, too) tugging heavily laden carts through the streets, or poling ponderous barges along the canals single-handed at a snail's pace, or handling back-breaking steel billets by main strength in a rolling-mill—surely they must be putting a shoulder to the wheel to tide over a temporary rush! But as each new day fails to show any slackening up, I am forced to the conclusion that this is the every-day state of affairs here. And, later on, I see the carter and his wife enjoying a few quiet puffs in the shade of a tree by the roadside; the boatman at his ease at his tiller while a favorable breeze carries his cargo (and probably his home and family as well) nearer to his destination; the rolling-mill crew squatting in the shade outside of the mill fortifying themselves for the next task with tobacco smoke and hot tea. Human energy has its limitations here as well as anywhere else!

A walk at night through one of the popular streets in any of the larger cities is a trip through fairyland, in which one loses all sense of time or distance. And here again comes the thought: What special holiday has brought all these merrymakers out to participate in the gayety? Night after night, however, one sees the same scenes and comes to the same conclusion: This is different—this is Japan!

A predominating characteristic of all these gatherings, which strikes the Occidental visitor most forcibly, is the courtesy which prevails at all times. A smile always brings a smile in return; a scowl is never seen. I have yet to see a quarrelsome person on a street in Japan. This despite the fact (or because of it, perhaps?) that alcoholic beverages of all degrees of intoxicating power are plentiful and inexpensive.

Sartorial Freelancing

The matter of clothing apparently concerns Mr. Average Japanese Citizen not at all. Whatever appeals to his fancy or imagination he puts on and wears without a trace of self-consciousness. Anything goes, and goes unnoticed. Of course the kimono is still the national dress, for both men and women, the latter generally wearing the gayer colors, but Occidental garments are widely worn; often in, to us, at least, ludicrous combination with the native dress. The wooden shoe, supporting the feet of the wearer two or three inches above the ground, is practically a necessity on account of the condition of the streets, which are generally either very muddy or very dusty, and frequently both, within a few hours' time.

Transportation facilities here are certainly in urgent need of modernization. The waterways are used to an extent never dreamed of in our own fair land, but the roads are usually very narrow and crooked, making motor traffic slow and difficult. Practically all of the steam railways are narrow gage, which fact does not become very noticeable, unless in the comparative slowness of the trains, which rarely travel faster than thirty or thirty-five miles per hour, until a night trip in a sleeping car is undertaken. I am a man of slightly less than average stature, at home, but here I fill a lower berth to overflowing both ways. The government is preparing to widen the gage of some of the main lines, but it will be several years before any great changes are made—this is Japan! The railways, in common with all enterprises here, employ several times the number of operatives that would be considered necessary on American lines, and they are invariably courteous and cheerful.

University of Hard Knocks Not Popular

In meeting and talking to Japanese engineers during these last few weeks, I have been impressed with their expressed desire for information on all engineering subjects. If I may be permitted a mild criticism of their quest for information along engineering lines, after such short acquaintance, it is this: In very many cases they want only knowledge that comes in tabloid form, so to speak. Books without number are devoured, and lectures without end are listened to with rapt atten-

tion (I am told that all Japanese are inveterate lecture-goers), but apparently the good old University of Hard Knocks has a very small attendance. Whether this is owing to the inherent cleanliness of the race, making the idea of greasy hands and dirty clothes abhorrent, or merely to the idea that practical experience is unnecessary in the profession of mechanical engineering, I am not prepared to state. This is one of the impressions that I sincerely hope will prove to be wrong, although it applies to many who have received part of their training in foreign countries as well as others who have been educated entirely in Japan.

The variety of occupations existing within a few square yards, or even under the same roof, is amazing to us. Here a jinrikisha stand shares the same shelter as a jewelry store; there a blacksmith shop nestles close by the side of a tiny restaurant; over yonder is a small building whose first floor is shared by a stone cutter and a tailor, while a tea house does a flourishing business upstairs.

Osaka, as this is written (early August), is a very unattractive place for the pleasure-seeking tourist. Being the principal industrial city (it is called the "Pittsburgh of Japan"), it has little to appeal to the seeker for the æsthetic, although it figures prominently in the history of Nippon. The population numbers about two million, I am told, and, all things considered, Osaka should be the best place in Japan in which to get in touch with the industrial, and particularly the engineering, progress being made in this country.

The Wonbah Molybdenite Mine and Mill, Queensland, Australia

Mineral Occurs in a Pipe of Quartz—Ore, After Being Crushed by Stamps, Is Treated in Mechanically Agitated Flotation Machines

By J. H. Reid
Written for *Engineering and Mining Journal*

THE Wonbah Molybdenite Mining Co., Ltd., is the premier producer of molybdenite in Queensland and apparently also in Australia. The mining lease is situated at Wonbah, a siding on the railway to Mount Perry from Bundaberg, the latter being one of the largest sugar-growing centers in Australia. It is about sixty miles inland from the Pacific coast in the heart of the Coastal Range.

Geologically, the occurrence is of extreme interest, for it consists of an almost pure white quartz pipe in granite, close to a dike of quartz-porphyry and near the periphery of the *massif* in its contact with Paleozoic slates. The pipe, which is almost cylindrical, varies from 42 ft. to 60 ft. in diameter between the surface and a depth of 200 ft. It is not tortuous and has a regular inclination or dip of about 15 deg. from the vertical. Calcite is rather abundant and in the lower levels small masses of chalcopyrite, pyrite, galena, and blende have appeared. The outer zone of the pipe is the working area, being richer in molybdenite. The working face is 16 ft. across, leaving a central core standing about 25 ft. in diameter, which is relatively poor.

The ore consists of white milky quartz with coarse and fine flakes, and also masses, of molybdenite. The base sulphides mentioned occur as small segregations, which are discarded in mining, leaving quartz and a little calcite as the only gangue to be eliminated in the flotation treatment. The ore going to the mill averages 0.8 per cent MoS_2.

The mill comprises a battery of ten head of heavy quartz stamps in conjunction with a 12-in. unit oil-flotation plant (Minerals Separation Co. and De Bavay's patent). The flotation machine is driven by a 33 hp. Crossley suction gas engine with openhearth generator. Recently thirty to forty tons of ore have been treated per day (three shifts). The crude ore is broken to 1½ in. and passes to a plant storage bin (capacity fifty tons) on a slow conveyor belt which permits boys to hand-pick the material, all solid ore being thrown on to a dump, from which it is bagged and shipped direct.

The 1,000-lb. stamps, with ninety-eight drops per minute, crush the ore to pass woven-wire screens with 625 holes per square inch. The pulp is elevated to a Callow settling spitz, which feeds the coarser particles to the stirrer boxes while the slime overflow is carried by launder to a Dorr thickener (capacity 100 tons). The thickened slimes are laundered to a 4-in. elevator having a speed of 200 ft. per min., and elevated to meet the feed from the Callow settler.

The flotation machine is a 12-in., six-stirrer unit, and consists of six stirrer boxes at the back of the machine and six flotation boxes at the front. The stirrers, or mixers, have a speed of 450 r.p.m. The pulp from the Callow settler and Dorr thickener is introduced into the first stirrer box with four parts of water to one part of pulp, and eucalyptus oil is automatically added, ¼ lb. of oil to one ton of crushed ore. Extremely small quantities of kerosene, of unfixed amount, are also added periodically to assist frothing.

The comminuted ore is forced into the flotation box, where the floated MoS_2 overflows and is carried by launder to two concentrate bins 10 ft. x 5 ft. x 4 ft. 6 in. each. The non-floating gangue, with up to 10 per cent of unrecovered molybdenite, is passed through the remaining five flotation units, and from the last box the residues go to the tailing dump. The initial treatment gives a concentrate of 70 per cent MoS_2, but at the end of the month the whole of the concentrates are retreated, bringing the grade up to 90 per cent.

The concentrates are dried on a small openhearth furnace and bagged. The output is purchased and exported by Messrs. Dalgety & Co. on behalf of the British government. The following figures give the output of the mine and the value of the concentrates for the last two years:

Year	Crude Ore, Long Tons	MoS_2 Concentrates, 90 per Cent, Long Tons	Value, £
1918	2,435	13 95	6,052
1919	6,026	41 75	18,100

It will be seen that the production last year was considerably greater than in 1918.

Rumanian Mineral Resources

Minerals in Rumania which have not yet been fully exploited, according to *Commerce Reports*, are asphalt (the Germans exported 3,000 tons), mica (the Germans exported 400 tons), and graphite. Throughout the mountainous areas there are quarries of granite, quartz, sand, limestone, gravel, china clay, gypsum, and some minor minerals, which could be worked with advantage. It is only recently that this wealth has been exploited.

An Old Game With a New Angle

SAN FRANCISCO CORRESPONDENCE

THERE is a nice kettle brewing away out in the Far West. The Broken Hills Silver Corporation, Governor Boyle of Nevada, the Fidelity Finance Funding Co., of Reno, Nev., G. E. Arrowsmith & Co., of San Francisco, E. C. Bellows, State Commissioner of Corporations of California, the San Francisco Stock Exchange, Jacob S. Herzog, better known as George Graham Rice, a few lawyers and mining engineers, as well as the Blue Sky Law of California, several newspapers of San Francisco and that part of the public eager to thrust its money into every widely advertised mining project are the chief ingredients in the kettle. Needless to say, it is not a savory mess. The pot is so actively boiling that it is difficult to disentangle the relation between the good and bad ingredients.

As near as ascertainable the facts are these: The Broken Hills Silver Corporation was incorporated under the laws of Nevada to acquire and operate a silver prospect southeast of Fallon, Nev. According to accounts, the property in question is considered to be a likely prospect. Shipments of high grade have been made, and attracted considerable attention. The company was capitalized at 3,000,000 shares, par value 10c. each, treasury stock 2,000,000 shares, the stock being fully paid and non-assessable. Ed Malley, of Carson City, treasurer of the State of Nevada, is named as the president of the company. The 2,000,000 shares of treasury stock have been underwritten by the Fidelity Finance & Funding Co., of Nevada, reputed to be under the control of George Graham Rice. This company is said to have imposing offices in Reno. C. H. McIntosh is president.

It should not be overlooked that George Graham Rice once made Reno and Nevada the center of his activities before he moved to the richer fields of the East. According to an advertisement that appears in the *San Francisco Chronicle*, on Oct. 8, 1920, the Fidelity Finance & Funding Co., of Nevada, will pay the Broken Hills Silver Corporation $380,000 for this 2,000,000 shares of treasury stock. After this whole transaction is over, it appears from the same advertisement that the Broken Hills Silver Corporation will possess the mine and have left available assets of $247,500, which is presumably to be spent for mine development, equipment, and operation.

Under date of Oct. 7 the stock was sold at approximately 19.5c. per share on the San Francisco Stock Exchange. At this price the whole 2,000,000 shares would have a sales value of $390,000. This would indicate a profit of $10,000 to the Fidelity Finance & Funding Co. It is obvious that the dear public is to be stampeded into actively bidding up the stock so that its sales price will be forced upward without regard to intrinsic values. All such activity will swell the profits of the Fidelity company, although the mine itself will get no additional capital. It, the mine, has farmed out its stock for $380,000. The Fidelity company gets all above this that it can. It's an old story with new words.

G. E. Arrowsmith is the San Francisco broker handling the stock sales in San Francisco. He has placed an extensive advertisement in the *San Francisco Chronicle* of Oct. 7. This advertisement is cunningly worded and undoubtedly designed for stampeding the unwary, the ignorant, and the "suckers" into parting with their money. It appears from published accounts emanating from E. C. Bellows, State Commissioner of Corporations of California, that the Broken Hills Silver Corporation began in June to arrange to sell its stock without first applying for permission from the Commissioner of Corporations, as required by the California laws. When this was called to George Graham Rice's attention he filed a "statement of fact" with the commissioner. This was not an application for a broker's license. Rice later asked the commissioner to investigate his holdings in Nevada. This was done and it is stated that the findings of the commissioner's engineer, Fred M. Miller, were unfavorable.

To the surprise of the commissioner the stock was offered for sale on the floor of the San Francisco Stock Exchange. W. G. Deal, attorney for the San Francisco Stock Exchange, according to published statements, said that the San Francisco Stock Exchange listed the stock of the Broken Hills Silver Corporation after a formal application accompanied by a letter from a reputable Reno lawyer as to title and after examination had disclosed that reputable persons of Nevada were officers in the company and that Arthur Perry Thompson had made a report that the property was one of merit. Upon that showing the property was listed. The discovery was then made that the Commissioner of Corporations had no jurisdiction over sales made on the floor of the exchange between brokers. Thus a hole is punctured in the California Blue Sky Law.

Apparently now the only restraint upon the sales of miscellaneous stock is the good faith of the Stock Exchange with the public. The significance of these happenings will be appreciated when it is said that in 1919 the total of transactions in Divide stocks reached $50,000,000. The San Francisco Stock Exchange is made a party, unwittingly or otherwise, to the evasion of the laws of the State of California because it affords a market for stock speculation.

Governor Emmet D. Boyle of Nevada was drawn into the limelight by reason of a letter which he sent to C. H. McIntosh and in which he made indiscreet statements about the merit of the property. This letter appears in the stock-selling advertisements in the *San Francisco Chronicle* of Oct. 8. In sharp contrast, there is the effort of Commissioner E. C. Bellows to protect the public and enforce the California laws against questionable practices, and two officials of the State of Nevada lending their names to a company of questionable repute.

The situation is worth the attention of the mining industry for the reason that it introduces a new angle of an old game. In this case the prospect has some intrinsic value, but it is probably considerably less than $380,000, the sum for which it was underwritten. By questionable publicity it is being forced upon the public at an inflated value, the inflated value going to enrich the pockets of certain people who have little interest in the property as a mining proposition. Something for nothing. The public, or at least that part of the public that is not astute enough to distinguish an even break for its money, pays.

Mine Operators of Note

Walter Fitch, Sr.

BY GEORGE J. YOUNG
Western Editor *Engineering and Mining Journal*

A KEEN logical mind, close observation, and a knowledge of men and affairs, if coupled with initiative, constitute another recipe for success. Walter Fitch did not have a college education. Nevertheless he has made a success in the things he has attempted. Unlike some self-made men he is eager to concede the value of college training and has put his sons through that excellent institution, the Michigan College of Mines. In educating young engineers he believes that contact with bright minds is essential. He says "a man not possessed of an engineering education is unable to overrate its value." Walter Finch was born in London and had the usual education in the English private schools. He first went to work in a lawyer's office and then gravitated into the printers' and stationers' business. At the age of twenty, he became dissatisfied with the outlook that presented itself to him and decided to go to America. He went to Michigan and grubbed around in mines to secure a start. He accepted any employment that offered. At the end of five years he was superintendent of two mines and subsequently went from position to position as opportunity for advancement offered itself. In all he spent thirty years in the Michigan mines and as a result reached a high place in a mining region where there were many good men. At about the time he was thinking of retiring, he went to Utah. He became interested in the Tintic district and made a general study of mining conditions there. Securing the services of James R. Finlay, who, as Mr. Fitch said, knew more about "limestone mines" than he did, he made good use of that engineer's knowledge. With Finlay's help he visualized the geological conditions and formed definite opinions as to the continuity of the prevailing lines and zones of mineralization. Noting that the trend of these crossed some ground upon which a mine known as the Little Chief was operating with poor success, he interested himself in this mine. At the time the shaft of the mine was 800 ft. in depth and a large amount of work had been done west of a north-south line through the shaft. Despite twelve years' work and forty-three assessments, the mine had failed to find profitable ore in quantity. East of the shaft no underground work had been done, and Mr. Fitch reasoned that here was an excellent gamble. Half of the work had been done without success. There was only one other place to go. In spite of Mr. Fitch pointing out to the owners of the mine the conclusions of his studies, they were not enthusiastic nor did they at the time make any effort to follow them up. They finally asked Mr. Fitch to go in with them and test out his conclusions. Moved by the dominating motive of securing an opportunity for his two sons, who were completing their mining education, Mr. Fitch decided to go into the project. The general plan so roughly sketched out in the beginning was followed. Anticipation became a fact. The shaft was sunk from 800 to 1,400 ft. While sinking a crosscut was driven at the 1,000-ft. level and penetrated the ore zone. At this point no ore was discovered but the mineralized zone was definite. The 12th level yielded nothing. On the 14th level drifting was started upon the ore zone, and day by day the samples gave no encouragement, when one day a return of 1,700 oz. of silver per ton was received. A rich orebody had been discovered. This was in 1908, and since then a number of orebodies have been found. Up to the end of 1919 the amount of development totaled 125,038 ft. In 1909 the production was 75,849 oz. of silver, 120 oz. of gold and 146,028 lb. of lead from a total of 1,325 tons. In 1919 the production was 2,757,533 oz. of silver, 3,753 oz. of gold, 5,979,588 lb. lead, and 15,574 lb. of copper from 63,726 tons of ore. Walter Fitch had faith in his deductions. The mine which he was so fortunate in discovering is now being operated by his sons. Mr. Fitch believes in concentration of effort. He and his sons have settled in Utah, and are devoting themselves to Chief Consolidated.

WALTER FITCH, SR.

By The Way

Currency Exchange and Gold

In his account of travels and discoveries in North and Central Africa, from the journal of an expedition undertaken under the auspices of the British government in the years 1849 to 1855, Dr. Henry Barth made several references to the kinds of money used by the inhabitants of the regions extending from Tripoli southward. In describing a market place, he stated that though the women were profusely ornamented with strings of glass beads, the men were generally wearing a short black shirt and a small straw hat, their neck adorned with several strings of *kúngona* or shells. Continuing, he said "There is not at present any standard money for buying and selling; for the ancient standard of the country, viz., the pound of copper, has long since fallen into disuse, though the name, *rotl*, still remains. The *gábagá*, or cotton strips which then became usual, have lately begun to be supplanted by the cowries or *kúngona*. . . Eight cowries or *kúngona* are reckoned equal to one *gábagá*, and four *gábagá*, or two-and-thirty *kúngona*, to one *rotl*. Then, for buying larger objects, there are shirts of all kinds and sizes; from the *dóra*, the coarsest and smallest one, quite unfit for use, and worth six *rotls*, up to the large ones, worth fifty or sixty *rotls*. But, though this is a standard value, the relation of the *rotl* and the Austrian dollar, which is pretty well current in Bórnu, is subject to extreme fluctuation." Further on he says that Dr. Overweg, the geologist of the party, succeeded in purchasing a goat with his servant's shirt. "This article, even if much worn, is always regarded as ready money in the whole of Negroland, and as long as a man has a shirt he is sure not to starve." But what we started to tell about is that while exploring the headwaters of the Bénuwé River, south of Lake Tsád, Dr. Barth learned that the river carries gold in its sands. He made the discovery while bathing in the river, where the shelving bank and a swift current caused him to submerge involuntarily several times. The natives, as often as he dipped under water, cried out that he was searching for gold, the presence of which was known to them. Observing the shirtless condition of the doctor, and his dredging motions at intervals, their conclusion was both logical and obvious.

A Divining Rod With a Whang

It has taken C. A. Japhet, of Seneca, Kan., thirteen years to devise a magnet that is an infallible guide to the discovery of oil and gas wells, according to the *Seneca Tribune*. Though we would not belittle another's achievement, it seems that Mr. Japhet could have done as much in thirteen months. However, the instrument is said to be exceptional in that it will meet all the critical tests to which it may be subjected. It is described as a cone with a 4½-in. base and 7 in. high. A copper-coated plate surrounds the apex, reaching half way down the side. The cone is filled with chemicals whose nature, of course, cannot be divulged. "At the apex is a staple set in a leather whang. To the whang is tied a linen cord 9 in. long. At the end of the cord and supporting the cone so that it may swing freely is an ordinary clothespin." The whole thing weighs about 3 lb. and is seen to be quite simple in construction. According to Mr. Japhet, an oil pool or a gas pocket far below the surface of the earth causes this cone to swing in varying circles, though he admits he cannot tell why. The chemical combination inside the cone does the trick. Only one who has the gift of water-witching can work this magnet, says Mr. Japhet.

The Jack Pot Kitty

An interesting method of placer mining was proposed some years ago by an enthusiastic West Coast tourist or tropical wanderer, in the course of his efforts to interest a little development capital. Writing from the Republic of Potoma (sometimes referred to as the lost province), he expatiated on the advantages of La Recompensa mine, located on the Sisic River. His tale was almost literally as follows: "The Sisic River has been washing down mountains full of gold ore ever since Potoma exists, and there has been nothing done to it. The gold occurs in the plyers of the river, with 2 to 5c. gold in every shovelful. The river also has pusses every now and then, and the gold is washed down to the pusses, where it stays. La Recompensa mine holds two pusses, one 30 ft. deep and one 18 ft. deep. The Sisic River is 30 ft. wide on this mine and the pusses are situated between two mounds. It would be easy and inexpensive to build wooden flueses to carry water over the pusses. With the same water power a pump could be used to pump the water out of the pusses up to the bedrock; then smooth out the pusses with cement and put quicksilver on the bottoms, so in the rainy season we can take up the flueses and let the water that carries the gold run in again. So, every year we can pump it out and have a good deal of profit without any expense of labor." If the combing of the beaches or *playas* is done with a steam shovel, the estimate of values seems conservative. The mysterious "pusses" are probably *pozos* or potholes, popularly conceived to be repositories of untold wealth. Happy the man who may seek his hammock at the end of the dry season and enjoy an uninterrupted series of rummy siestas; while his faithful pusses purr contentedly as they seize the scurrying golden mice.

Relief for Magnesite Producers

We have been asked for the address of the gentleman who "recently wrote an article on the subject of manufacturing egg shells from magnesite." Our correspondent doubtless is thinking of the news item that we published in all seriousness some time ago to the effect that an official of a Washington magnesite company was giving his hens ground magnesite instead of lime, thereby improving the quality of the resulting eggshells, or so it was alleged. This may or may not be considered manufacturing, according to one's point of view. Possibly the magnesite is converted from the crude into the finished product on the hen's premises. On the other hand, the magnesite, which when pure is $MgCO_3$, may act simply as a pre-natal determinant or something of that sort. At present the Bureau of Mines has a co-operative agreement with the Northwest Magnesite Co., and it will be well if this subject is given careful study. One has only to consult the statistical reports of the National City Bank to learn the huge number of eggs laid in one year in the United States, and throughout the world, in fact. He will then see what a chance awaits the producer of magnesite.

CONSULTATION

United States Mining Laws

"I am interested in procuring a set of the mining laws of the United States, and have been referred to you as being able to suggest a proper reference. My idea is to have a pamphlet or small book, not one of those voluminous works on the thousand and one legal decisions rendered in mining litigation, but something giving all the laws."

An excellent paper covering the mining laws of the United States is issued by the General Land Office, Department of the Interior, Washington, D. C., and is entitled "United States Mining Laws and Regulations Thereunder." It is a 104-page pamphlet giving the laws and regulations regarding the reservation, exploration, location, possession, purchase, and patenting of the mineral lands of the public domain. No one interested in mining matters should be without it.

Although the pamphlet does not touch upon the interpretation which the courts have placed upon the various sections, clauses, and words of the legislation, it gives the groundwork of the country's mining laws. For a discussion of the working of the mining laws reference of course should be made to some work upon the subject, such as "Lindley on Mines," which is a voluminous compilation covering the interpretation of mining legislation by the courts.

For the mining regulations of the several states recourse can be had to the respective secretaries of state for information, as there are certain regulations which are subject to state control, such as the maximum width of a mining claim.

Besides the Congressional legislation enacted to cover the exploration of the public domain's mineral wealth, there are also the regulations of the various states covering principally safety work, mine inspection, and other matters concerning the operation of a mining property.

American Mining Capital in South America

"I am greatly interested in the extent to which American capital is involved in the development of South America's mineral resources (metallic), and would request you kindly to give me an estimate as detailed as possible covering the larger operations, with such other supplementary data as may make the matter more informative."

A surprisingly large amount of American capital is being employed in the development of South America's great mineral resources, and although it is difficult to obtain exact figures of the amount, an estimate can be readily made. With that idea in view, the following list of the largest and more important American mining and smelting companies in South American countries has been prepared, giving the capital invested in the operations and various outstanding features of each enterprise.

A conservative estimate of the total capital invested in the development of South American mines, disregarding the many millions of invested capital omitted from the table through lack of accurate information, would be $163,206,790. It would be safe to say that about $240,000,000 of American capital has found its way to South America.

The capital distribution so far as it can be ascertained is approximately as here noted:

Bolivia	
Guggenheim Brothers, 120 Broadway, New York, engaged in the development of tin properties. Capital engaged	(a)
International Mining Co., 7 Hanover Square, New York, owned by W. R. Grace & Co. and engaged in mining of tin and tungsten ores. Capital engaged	(a)
Chile	
Andes Copper Co., 42 Broadway, New York. A subsidiary of the Anaconda Copper Mining Co., developing an immense copper property in Chile. Capital	$50,000,000
Bethlehem Chile Iron Mines Co., 111 Broadway, New York. A subsidiary of the Bethlehem Steel Corporation, developing Chilean iron mines. Capital	(a)
Braden Copper Mines Co., 120 Broadway, New York. A subsidiary of the Kennecott Copper Corporation, with large copper holdings. Capital, approximately	$28,000,000
Societe de Minas y Fundiciones de Carrizal, owned by the American Smelting and Refining Co., and operating two smelting plants in Chile. Capital	(a)
Chile Copper Co., 120 Broadway, New York. a Guggenheim property developing an immense copper deposit. Capital engaged	$53,800,000
Fundicion de Guayacan, 61 Broadway, New York. A subsidiary of the American Metal Co., employed in copper smelting. Capital engaged	729,000
Santiago Mining Co., 42 Broadway, New York. A subsidiary of the Anaconda Copper Mining Co., developing Chilean copper properties. Capital	10,000,000
South American Metal Co., 61 Broadway, New York. A general trading company supervising exploration work in South America of American Metal Co. Capital	250,000
Colombia	
Breitung Mines Corporation of Delaware, 11 Pine St., New York. A holding company to own or control promising mining properties. Capital	1,127,790
Mammoth Gold, Silver, and Platinum Mines, Los Angeles, Cal. Placer holdings in Colombia. Capital	(a)
South American Gold & Platinum Co., 61 Broadway, New York. A holding concern for various shares of gold and platinum mining companies operating in Colombia. Capital	$ 9,500,000
Peru	
Cerro de Pasco Copper Corporation, 15 Broad St., New York. A large copper property in Peru. Capital engaged	49,000,000
Peruvian Copper & Smelting Co., 115 Broadway, New York. Development of copper-silver and silver-lead mines in Peru. Capital	4,600,000
Vanadium Corporation of America, 120 Broadway, New York. Extensive vanadium deposits in Peru. Capital	10,000,000
Total	$217,006,790

(a)—Information not available.

HANDY KNOWLEDGE

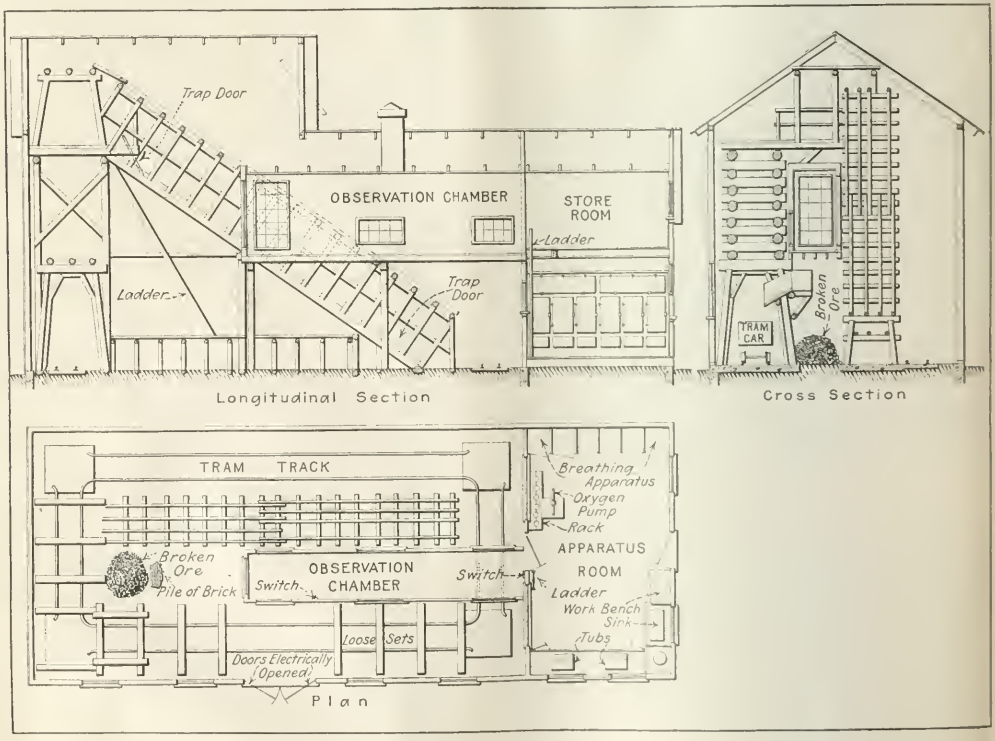
A Practical Mine Rescue Building*

By R. H. Seip

The first aid and mine rescue training quarters of the New Jersey Zinc Co. at Franklin, N. J., are shown in the accompanying sketch. This building was constructed for the purpose of securing for the men who are trained in mine rescue work, conditions similar to those met in the mine. The ground floor is divided into two rooms: an apparatus and instruction room 13 x 22 ft. and 8 ft. in height, from which a door gives access to the smoke room immediately adjacent to it, and the smoke room, 22 x 43 ft., varying in height from 20 to 28 ft., to permit the erection of the necessary timber. Double doors on one side open to the outside of the building. These doors are equipped with electric door openers, which may be operated from the apparatus room or the observation chamber. The doors are counterweighted, so that their operation in opening is entirely automatic. This feature, in addition to a window in the upper part of the building operated by a rope, provides for the rapid removal of fumes should an emergency make it desirable. The floor of the smoke room is cinder covered.

Above the apparatus room is a small storage room, from which an observation chamber projects into the smoke room for a distance of 24 ft. This is ventilated by a separate ventilator in the roof. Access to both the storage room and observation chamber is obtained by a vertical iron ladder from the apparatus room.

One end of the apparatus room is equipped with six vertical closets for the storage of the apparatus, each closet accommodating two sets of apparatus. Above these closets are two horizontal compartments for new first aid supplies, and below are six drawers for first aid practice materials and other useful paraphernalia. The opposite end of the room is equipped with two copper-lined wash tubs, an antiseptic solution container, and a white enameled sink. The drain boards of all of these receptacles are covered with sheet lead. Hot and cold water faucets are supplied for each tub and sink. A small work bench, with additional cupboards above and below the sinks, completes the equipment, with the



FIRST AID AND MINE RESCUE BUILDING OF THE NEW JERSEY ZINC CO., FRANKLIN, N. J.

*Abstracted from a paper, "Requirements of Rescue Training for Metal Miners," presented at the Ninth Annual Safety Congress of the National Safety Council, Milwaukee, Wis., Sept. 30, 1920.

exception of the charging pump and six oxygen tanks in a rack.

A standard mine car has been installed on standard mine tracks extending around the four sides of the room, with turnplates at each corner. On one side and end of the room are standard mine timber sets, four sets of which are loose for erection or removal in training. Over the rack a vertical cribbed raise has been constructed with a standard chute at the bottom for loading the car. At one side of the center of the room an inclined timbered raise or manway connects with a platform at the top of the vertical raise. Another means of access to this platform is by a ladder beneath the inclined raise to a trap door at the top. A low timbered passageway directly beneath the inclined raise is reached through a trap door at the bottom of this raise. The opposite end of the passageway is left open. Pipe lines have been installed for practice work, as well as the necessary tools, such as axes, hammers, bars, wrenches, and ropes. Smoke or fumes are generated by means of a smudge pot.

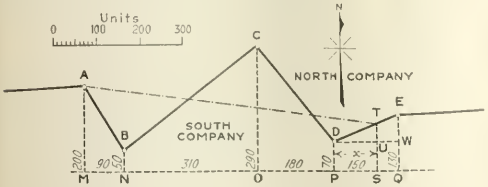
Straightening a Crooked Boundary

A Neat and Accurate Method of Solving a Troublesome Survey Problem—Mathematical Work Greatly Simplified

By Alex Richardson[1]

Written for *Engineering and Mining Journal*

It is sometimes desirable, to facilitate surface or underground work, to smooth the zigzag outline of a joint boundary by substituting an equivalent straight line which will preserve the respective total areas intact. The problem is commonly solved by tedious trigonometrical methods; and the following solution is accordingly offered, as being equally accurate and far more simple:



The method is applicable to boundaries that have been established by chain and offset surveying, but in the case now to be considered it is assumed that the best modern practice has been followed, and that the co-ordinates of all the monuments are available.

CO-ORDINATES OF MONUMENTS

(In feet, yards, meters, or similar unit)

Monument	Latitude (Northing)	Departure (Easting)
A	700	1000
B	550	1,090
C	790	1,400
D	570	1,580
E	630	1,730

Let AT be the desired line to straighten and equalize the irregular joint boundary $ABCDE$. It is required to determine the co-ordinates of the point T.

At any suitable distance from the boundary, here 200 units south of A, take an east-west datum line. The distance of this datum line from the east-west axis of co-ordinates is then $700 - 200 = 500$. The distance BN is therefore $550 - 500 = 50$; CO is $790 - 500 = 290$, and so on.

The distance MN is departure of B — departure of $A = 1{,}090 - 1{,}000 = 90$; NO is $1{,}400 - 1{,}090 = 310$, and so on.

Let x be the departure of T with respect to $D = DU$.

The latitude of T with respect to $D = TU$.

By similar triangles, $TU : DU :: EW : DW$.

$$\text{Therefore,} \quad TU = \frac{x\,(EQ - PD)}{\text{dep. of } E - \text{dep. of } D} = \frac{x\,(130 - 70)}{1{,}730 - 1{,}580} = \frac{2x}{5}$$

$$\text{And} \quad TS = PD + TU = 70 + \frac{2x}{5}$$

By the conditions of the problem, area of figure $MATS$ = area of figure $MABCDTS$. Area of $MATS$

$$= (90 + 310 + 180 + x)\left(200 + 70 + \frac{2x}{5}\right)\frac{1}{2}$$

$$= 78{,}300 + 251x + \frac{x^2}{5}$$

Area of $MABCDTS$ =

$$\left[(250 \times 90) + (340 \times 310) + (360 \times 180) + \left(70 + 70 + \frac{2x}{5}\right)x\right]\frac{1}{2}$$

$$= 96{,}350 + 70x + \frac{x^2}{5}$$

$$\text{Equating,} \quad 78{,}300 + 251x + \frac{x^2}{5} = 96{,}350 + 70x + \frac{x^2}{5}$$

$$181x = 18{,}050$$

$$x = 99.72$$

$$\text{Latitude of } T \text{ from } D = \frac{2x}{5} = 39.89.$$

Total latitude of $T = 570 + 39.89 = 609.89$.

Departure of T from $D = x = 99.72$.

Total departure of $T = 1{,}580 + 99.72 = 1{,}679.72$.

CO-ORDINATES OF NEW MONUMENT

Monument	Latitude	Departure
T	609 89	1, 79 72

The result can be checked by entering the value of x in the equation, and ascertaining if both sides agree. A more complete check is to calculate the areas of the two figures by means of the co-ordinates of their angular points; the results should balance. If the agreement is desired to extend to decimals, it may be necessary to carry out the value of x a little further. For ordinary tabulations of co-ordinates, however, two decimal places are usually sufficient.

DT, the distance to be measured along the line DE to fix the position of T on the ground, can be readily obtained from the right-angled triangle TUD, of which the sides TU and DU are known.

In the case of a boundary whose general trend is north-south, a north-south datum line would be taken. Whether to assume a north-south or east-west datum, what distance it shall be taken from and on which side of the boundary are matters of convenience for the surveyor to decide; the principle on which the solution is based is not affected thereby.

[1]The School of Metalliferous Mining, Camborne, Cornwall, England.

THE PETROLEUM INDUSTRY

Oil Shales of Indiana

Advantages of Location and Homogeneous Character of Raw Material Warrant Expectation of Commercial Possibilities When Experimental Data Determine Satisfactory Method of Recovery—Results of Dry and Steam Distillation Tests

BY JOHN R. REEVES
Indiana Geological Survey

Written for *Engineering and Mining Journal*

THERE is no doubt in the minds of those who have studied the status of the petroleum industry of the United States today that the increase in demand for gasoline, crude fuel oil, and lubricants cannot be met satisfactorily in the future unless recourse is had to other sources of supply than the present production from the oil fields. In the last few years attention has naturally been directed, as a means to relieve this situation, to the oil shales of this country. The success of this industry in Scotland has more than ever made this source of supply seem the logical successor to the waning oil fields. Much experimental work, both laboratory and commercial, has been done on oil shales of some of our Western States, and it seems eminently possible that they will soon be a reliable source of oil.

THE NEW ALBANY SHALE

In Indiana there is a large deposit of oil shale known as the New Albany shale. This body of shale is Mississippian and Devonian in age. The outcrop covers approximately five hundred square miles in Floyd, Clark, Scott, Jefferson, Jennings, and Jackson counties. The outcrop covers a strip of territory about fifty miles long and ten miles wide, from the Ohio River at New Albany north to North Vernon, in Jennings County. The shale lies practically horizontal, but actually dips to the west at the rate of thirty feet per mile. Near the western border of the outcrop the shale is thickest, in many places being more than one hundred feet thick. The total thickness of the shale is about one hundred and forty feet. From the western border of the outcrop the shale gradually becomes thinner toward the eastern border, where only the tops of the hills are capped with shale. The terrain of the area of the outcrop is rolling, but in places the shale stands in bluffs along the streams.

During the last year I have studied this formation and have collected a large number of samples, many of which have already been tested in the laboratory for their oil content as well as for the byproducts, ammonium sulphate and potash. In collecting the samples, a miner's pick was used to dig into the fresh shale, as the weathered shale on the face has lost much of its bituminous content. Each sample is a composite representative of the outcrop from which it was taken, as small parts of the sample were collected from each vertical six inches. Some samples were collected where the shale had been freshly blasted from a face and where wells were being dug, thus being representative of the shale that would be used in a plant operation.

The apparatus used in the determinations is the same as that designed by Woodruff and Day and used by the U. S. Geological Survey. (See Bulletin 641.) To compare the results obtained by dry distillation with those attained in using steam, this same retort was fitted so that steam could be used in the distillatory process. The results are given in gallons of oil, pounds of ammonium sulphate, and cubic feet of gas, per ton of shale. The table below shows the results obtained from samples taken at random. Results with and without the use of steam in distillation are shown.

INDIANA SHALE DISTILLATION WITH STEAM

Gallons of Oil	Cubic Feet of Gas	Pounds of Ammonium Sulphate	Per Cent Fixed Carbon	Per Cent Volatile Hydrocarbons	Per Cent Ash
10 00	997	28 5	6.25	12 84	80.91
12 75	912	22.2	8 50	13 14	78 36
18 00	1,836	20 4	6 90	22 81	70 29
9.50	570	38 4	8 00	10 90	81 10
9 50	886	35 5	4 00	9 50	86 50
16.50	1,350	22 4	7 90	18 00	76 40
12.09	980	24 0	8 30	10 40	81.30

DRY SHALE DISTILLATION

Gallons of Oil	Ammonia Liquor	Gallons of Oil	Ammonia Liquor
20	.	20	6
12		30	10
14	10	16	..
14	10		

From a commercial point of view there are several valuable features of these shales. In the first place, quarrying will be a comparatively simple matter and of the cheapest type. It may be done by blasting and steam shovel, the material being fed to the plant by gravity. The shale is so homogeneous in texture that the sorting out of foreign material will be practically unnecessary. It is much easier to crush than limestone, and as its hardness and other physical characteristics are the same throughout the formation, this will be an easy operation to handle. These shales do not coke in the retort, and the distillation may be carried on at a low temperature. Potash may be extracted by hot water and evaporation. A great and expensive acreage will not be necessary if the plant is built where the shale is thickest. There are several places close to railroads and water where there is ninety feet of shale above the level of a valley.

Although the Indiana shales are not as high in oil content as some others, the excellent yield of byproducts in the distillation, as gas, ammonium sulphate, and potash, as well as the valuable byproducts from the refining of the crude oil, the ease and low cost of mining, homogeneous character of the shale, good water supply, and very good railroad transportation will com-

pensate for this comparative deficiency. The retort that will be used will be probably one of a large capacity, simple but scientific in construction. This will have to be developed by experimental work on a commercial scale.

U. S. Oil Production for September Registers Decrease

Record Figures Shown in Monthly Consumption and Imports—California Takes First Place In Daily Production

THE following statistics of petroleum production in the United States east of California in September, 1920, and the two preceding months, based on reports filed with the U. S. Geological Survey, show the quantity of oil received from producers by pipe line and other marketing companies and by refineries that receive petroleum through private pipe lines or in tank cars directly from the wells. Data concerning oil consumed on the leases and producers' storage cannot be obtained in time for use in the monthly reports, but are used in compiling the annual figures showing production. The production reported for California is the average shown by figures collected by the Standard Oil Co. and by the Independent Producers' Agency and includes all petroleum brought to the surface.

PETROLEUM PRODUCED IN THE UNITED STATES IN JULY, AUGUST, AND SEPTEMBER, 1920.

(Barrels of 42 U. S. Gallons)

State	September, 1920 Total	September, 1920 Daily Average	August, 1920 (a) Total	August, 1920 (a) Daily Average	July, 1920 Total	July, 1920 Daily Average
California	9,128,000	304,267	8,997,000	290,226	8,583,000	276,871
Oklahoma	9,084,000	302,800	9,371,000	302,291	9,328,000	300,903
Central and Northern Texas	5,766,000	192,200	(b) 6,148,000	198,322	6,009,000	193,839
Coastal Texas	2,114,000	70,466	2,264,000	73,033	2,160,000	69,678
Kansas	3,629,000	120,967	3,721,000	120,032	3,621,000	116,806
Northern Louisiana	2,597,000	86,566	(b) 3,371,000	108,742	(b) 3,294,000	106,258
Coastal Louisiana	131,000	4,367	144,000	4,645	137,000	4,419
Wyoming	1,573,000	52,434	1,524,000	49,161	1,586,000	51,161
Illinois	903,000	30,100	924,000	29,806	925,000	29,839
Kentucky and Tennessee	772,000	25,733	775,000	25,000	749,000	24,161
West Virginia	672,000	22,400	688,000	22,194	673,000	21,710
Central and Eastern Ohio	453,000	15,100	469,000	15,129	461,000	14,871
Northwestern Ohio	187,000	6,233	189,000	6,097	196,000	6,323
Pennsylvania	626,000	20,867	640,000	20,645	650,000	20,968
Indiana	86,000	2,867	77,000	2,484	79,000	2,548
New York	78,000	2,600	76,000	2,451	80,000	2,580
Montana	37,000	1,233	(c) 9,000	290	8,000	258
Colorado	9,000	300	10,000	323	9,000	291
Total	37,845,000	1,261,500	39,397,000	1,270,871	38,548,000	1,243,484

(a) Revised. (b) Includes some petroleum drawn from producers' storage, which was produced in previous months but not heretofore credited to production. (c) Cat Creek field not included.

GAIN OF 353,000 BBL. IN AMERICAN STOCKS OF MEXICAN OIL

Production of petroleum during September, amounting to 37,845,000 bbl., decreased slightly, the daily average being 1,261,500 bbl., as compared with 1,270,871 bbl. in August. Consumption, however, increased to the record figure of 48,670,000 bbl. The deficiency in domestic production was offset by net imports of 10,914,000 bbl., the largest ever recorded in a single month, so that, although there was a decrease of stocks of domestic petroleum of 264,000 bbl., there was a gain in stocks of Mexican petroleum held by importers of 353,000 bbl. Therefore, estimated consumption during September was slightly less than the domestic production plus imports, a condition which has existed since June.

The slight decrease in production recorded for September is due to decreased returns from central and north Texas and north Louisiana. The decrease in both states, however, was more apparent than real, because production for August was credited with some petroleum drawn from producers' storage but produced in previous months and not heretofore credited to production. Increased production is reported for the other states, excepting Colorado. California attained the record daily production of 304,267 bbl., supplanting Oklahoma as first in rank. The report of production from the Cat Creek field, in Montana, places that state ahead of Colorado.

DOMESTIC PRODUCTION SHOWS INCREASE

The net decrease of domestic stocks was contributed to by withdrawals from stocks of California, north Louisiana, and Appalachian grades. The continued increase in stocks of Mexican petroleum held by importers reflects the increased imports.

During the first nine months of 1920 domestic production increased in round numbers fifty million barrels compared with the first nine months of 1919, and imports increased thirty million barrels. This record indicates that production plus imports in 1920 will exceed five hundred and twenty-five million barrels. In view of the greatly increased consumption, however, it is not yet evident whether the increased supply will make possible a net addition to the stocks on hand by the end of the year.

Petroleum Refining in Dutch West Indies Exhibits Important Development

The most important industry of the Dutch West Indies, according to Consul William Bardell, is the refining of petroleum at Willemstadt, where the plant of the Curacao Petroleum Co. keeps more than 1,000 hands employed. The establishment up to this time has cost nearly $2,000,000. This company for a while was greatly handicapped in obtaining crude oil from its wells in Venezuela, because of the lack of appropriate vessels. This difficulty, however, has now been practically overcome, and the refinery receives large quantities of crude oil, not only from its own wells in Venezuela, but also from Mexico.

The plant is at present working day and night. Machinery for the manufacturing of tin cans to hold the gasoline has recently arrived from the United States, and the company hopes, within a short time, to be capable of turning out about 5,000 cans of gasoline daily, which it expects to sell to all of the West Indies and the northern part of South America. Many oil-burning vessels now stop at this port for fuel oil furnished by this company.

NEWS FROM THE OIL FIELDS

Cat Creek Field Output Estimated at 10,000 Bbl. Daily

From Our Special Correspondent

The Frantz Corporation, operating in Cat Creek field, Montana, recently brought in a third well, an offset to its No. 2, showing a flush output of 2,000 bbl. The Frantz, Mid-Northern and Forbes interests also brought in a well with a flush output of 1,500 bbl. Output of the Cat Creek field now is approximately 4,600 bbl. daily, not including the production of the last two named wells, and the field now is estimated to have a capacity for an output of 10,000 bbl. daily, which is larger than that of the Salt Creek field, in Wyoming. The well being drilled by the Anaconda Copper interests has a production of 150 bbl. and the deeper sands have not yet been reached. The Carter Oil Co., a Standard Oil subsidiary, has started drilling in the Duck Creek section, near Billings, Mont., and has reached a depth of several hundred feet with a 22-in. hole. It is proposed to go at least 4,000 ft. here in exploratory work, and about 3,000 ft. of casing is already on the ground. The size of the well is larger than the general run of wells being drilled. The Dutch Shell interests also have representatives in the Cat Creek field.

Oil Prospectors Seeking Claims in Arctic Country

From Our Special Correspondent

As a result of the oil strike at Norman, at the confluence of Great Bear River and Mackenzie River, N. W. T., by the Imperial Oil Co., several parties are leaving Edmonton by dog team for the new field, to stake claims in advance of the other prospectors who will go north by the river route in the spring. Owing to the prospective rush of next season, all available berths on steamers plying to the north have already been reserved. The prospectors now starting out with a view of reaching Norman this winter are likely to be turned back by the Mounted Police at Fort Smith, on the Slave River, unless they can show that they have sufficient food supplies and are otherwise equipped to encounter the severity of the Arctic winter.

Shortage of Oil-Well Equipment Hampers Production

With the advent of the recent land-leasing bill additional petroleum production may be looked for provided the operators can secure the necessary equipment to drill, according to the Independent Oil Producers' Agency. Owing to the enormous demand for drill pipe and casing in Texas, Wyoming, and other fields, California has experienced difficulty in getting needed supplies. The American Petroleum Institute has secured through the Interstate Commerce Commission the allotment of sixty cars per day for the shipment of oil-well material from the mills to the fields. This co-operation should ameliorate local conditions to some extent, but California is in dire straits, due to an insufficient supply of material at a time when it is needed most. If this allotment is maintained there remains but one other factor: Can the mills supply the needed equipment? If they cannot, conditions must be remedied immediately by expansion and the output increased.

So acute has this shortage of oil-well equipment become that casing and material of wells which do not net a fair return because of the present insufficient price of oil are being used in further development work.

Completion of Bowling Green Refinery Expected Jan. 15

From Our Special Correspondent

Shipment of material for the new 1,500,000 bbl. refinery at Bowling Green, Ky., is rapidly progressing. Completion is expected by Jan. 15. This refinery has contracted for 2,000 bbl. of crude daily, with options on 2,000 bbl. more, as it is expected that the refinery will have to be enlarged.

Well No. 6 on the John Covington lease, estimated at 100 bbl., between the Three Springs and Nashville pikes, Warren County, has been completed. The five other wells on this lease are producing. Well No. 2 on the Brownfield lease, west of Bowling Green, flowed twice last week. It is estimated that this well will produce between 50 and 60 bbl.

The White Plains Oil Co. has a well on the John Strait lease in the Halifax pool of Allen County, pumping 100 bbl. The well on the Bailey lease, shot last week, is reported by Joe Hicatt good for 250 bbl.

September reports show Lee County still head of the production column with 443,157 bbl.; Estill, 97,667; Allen, 74,009, and Warren County, 44,454 bbl.

Blue Ridge Tracts Bring High Figures for Texas Leases

From Our Special Correspondent

Blue Ridge, Fort Bend County, Tex., is now attracting more attention than any other Gulf Coast oil field. First, the Gulf Production Co. brought in two wells on the northeast side of the dome, and these were followed by the Texas Co.'s No. 1 Robinson on the west side, flowing several thousand barrels a day initial production. This well, following the completion of the Gulf Co.'s producing wells, indicates the possibility of a large acreage of oil-bearing territory; at least, the oil scouts believe so, and leases on tracts of any acreage are in demand.

One of the largest deals reported so far was on a seventeen-acre tract divided into one-acre lots adjacent to the Texas Co's No. 1 Robinson. Prices for the leases, it is stated, ranged from $10,000 to $17,000 per acre bonus plus one-sixth royalty.

Successful Cementation Completed in Wyoming

From Our Special Correspondent

Well No. 30 of the Buck Creek Oil Co. in the Lance Creek oil field, Wyoming, which was cemented a short time ago by Government cement experts in an effort to cut off the water, is now flowing about 300 bbl. of oil per day, with no water. No. 38 well, an offset to No. 30, has since been cemented and is ready to be drilled in.

The company will conduct other drilling operations in the Lance Creek field. Its total production from this field is now 460 bbl. daily. Since the discovery of oil in the southeast anticline of the Mule Creek oil field, it is believed that deeper drilling in the western and more prominent anticline will show oil to exist there in the Dakota sandstone. The wells of the Mule Creek field are small producers, 150 bbl. a day being about a maximum, but the oil is of high grade.

Salt Water Intrusions on Lot 114

From Our Special Correspondent

The week ended Oct. 23 has proved to be one of the most important in the history of the Mexican oil fields. In the last seven days no less than five gushers have been reported to be showing signs of the intrusion of salt water. The center of action is the lower Chinampa field, in the vicinity of the famous Lot 114. (This lot contains more huge gushers than any other piece of land of its size in the known oil world.)

Thompson's No. 1 has been entirely closed in, due to the high percentage of water. The well was brought in about the first of the year, and has been flowing between 30,000 and 40,000 bbl. every day since that time. The Union Oil Co.'s well, also on Lot 114, has been showing salt, and will soon be shut down. This well was completed on July 17 and was rated at 85,000 bbl. daily production.

Other wells reported to have gone to salt are owned by the International Petroleum Co., the Texas Co., and the Freeport Mexican Petroleum Co., with an aggregate production of 200,000 bbl. per day. The salt-water intrusion on Lot 114 is not dampening the efforts of the drillers on that lot, as no fewer than ten wells are being rushed to completion.

Book Reviews

The Manufacture of Sulphuric Acid in the United States. By A. E. Wells and D. E. Fogg. Paper, 6 x 9; pp. 216. Published as Bulletin 184, Bureau of Mines, and obtainable from the Superintendent of Documents, Washington, D. C., for 40c.

This is a more pretentious book than many of the Bureau publications. Although not to be compared, of course, to the classic work of Lunge on this subject, it is an excellent review of recent developments in the industry and of the equipment and methods used in sulphuric-acid manufacture. A discussion of the supplies of sulphur-bearing raw materials and mention of the uses of the acid are included. The information given is generally known among acid manufacturers, for it was obtained from them, and confidential matter of course has not been published, but others will find much that is new and of interest. It should make an excellent college textbook.

Sulphuric acid is being made from roaster gases at the following copper smelters: Garfield Smelting Co., Garfield, Utah; Anaconda Copper Mining Co., Anaconda, Mont.; American Smelting & Refining Co., Perth Amboy, N. J.; Mountain Copper Co., Martinez, Cal.; and Calumet & Arizona Mining Co., Douglas, Ariz. Waste gases from copper blast furnaces are used at the Tennessee smelters of the Tennessee Copper Co., and the Ducktown Sulphur, Copper & Iron Co. At all of these plants the chamber process is used; in fact throughout the country, except in the South, chamber plants outnumber those using the contact process two to one. In the South, every plant—and there are nearly a hundred, with the exception of a government powder plant at Nashville, Tenn.—uses the chamber process. Most of the patents for the contact process will expire in 1923, and after that time that process may increase in popularity, as it produces acid more economically, although requiring highly trained operators and pure ores.

We understand that no free copies of this book are available. E. H. R.

"The Limestone and Phosphate Resources of New Zealand." Part I, Limestone, by P. G. Morgan, New Zealand Department of Mines, Geological Survey Branch. Bulletin No. 22 (new series). Wellington. 1919, 11 x 8½ in., 316 pp. 14 plates, 6 text figures, 2 maps.

The chief purpose of the report is to describe limestone deposits that may be used for agricultural purposes. The application of lime and limestone to the soil, and problems relating thereto, are given in detail. The remainder of the introductory part is devoted to a discussion of the constituents of limestone, chemical composition, geology, origin, and sampling. On pages 35 to 289 detailed description is given of the limestone deposits by counties. The descriptions are comprehensive and include numerous chemical analyses, but many of the limestones described are very impure. The author emphasizes the broad field to be covered in a bulletin of this character, and, assuredly, the task is so tremendous that one is led to question the wisdom of including with it, as the author does, an elementary treatise on chemistry and geology. O. B.

Graphite. By Hugh S. Spence, M.E. Paper, 202 pp., 56 plates, 43 figures, 6 maps. Mines Branch, Department of Mines, Ottawa, Ont.

During the war attention was directed to graphite to a greater extent than in former years, and the belligerents sought information in regard to their available resources of this mineral. In Canada this led to the restudy of the graphite deposits and the preparation of a new report to replace that of F. Cirkel, published in 1907, and now out of print. The work has been well done by Mr. Spence, and the comprehensive report on the various phases of the graphite industry will be much appreciated.

The introductory chapters consist of discussions on the history, properties, geologic occurrence and origin of graphite. Other general chapters describe the uses of graphite, the manufacture of the artificial variety, the occurrence of graphite in foreign countries, and methods of analysis of graphite and its ore. The more specific portions of the report are concerned with its various occurrences in Canada and of the processes employed in concentrating and refining the graphite flake.

The principal deposits of Canada lie within the provinces of Ontario and Quebec, although some graphite, mainly of the amorphous variety, occurs in British Columbia, New Brunswick and Nova Scotia. Graphite mining was first carried on in Quebec, where a deposit was worked about 1846; not until 1870 was any mining done in Ontario. Since then numerous deposits in these two provinces have been worked intermittently, but the industry has never attained much prominence and most of the projects have been unsuccessful. The most common modes of occurrence are in the form of disseminated flakes in the sillimanite gneiss or in the crystalline limestone. The ore which has been worked is said to contain from 10 to 20 per cent graphite, and there are undeveloped deposits of lower grade but as rich as many of the deposits that have been worked in other countries.

The numerous methods and machines employed in the concentration of the flake graphite are clearly described. Many typical flow sheets are given. The author concludes that "frothing oil flotation would appear to offer the cheapest and most efficient means of concentrating graphite that has yet been devised," a conclusion that seems to be in agreement with the opinions of the majority of the graphite producers at the present time. B. L. M.

Technical Papers

Requests for papers herein mentioned should be addressed to the publisher, whose address, together with the postpaid price, is given when it is known.

British Statistics—Production and accident statistics for the mineral industry of Great Britain and Ireland for 1919 have been published (twenty-five pages), and can be obtained from H. M. Stationery Office, 28 Abingdon St., London, S. W. 1, for 3s.

Oil Shale — *The South African Journal of Industries* (Pretoria, price 6d.) in its August issue, contains an article entitled "An Oil-Shale Industry for South Africa," by T. G. Trevor, Inspector of Mines, at Pretoria. This paper outlines the occurrences of oil shales in the Wakaerstroom and Ermelo districts and gives some economic facts concerning the activities of the African Oil Corporation in the former district.

A. A. E.—The *Arizona Mining Journal* (Phoenix, Ariz., price 25c.) devotes the greater part of its October issue to the activities and purposes of the American Association of Engineers. The growth of this organization among mining men, particularly in the Southwest, is notable. Articles prepared by C. E. Drayer, Secretary of the A. A. E.; Bradley Stoughton, of the A. I. M. E.; G. M. Butler, E. B. Miller, and Leroy K. Sherman are included.

Power Plants—The new 7,000-hp. steam power plant of the Associated Smelters, at Port Pirie, South Australia, is described in a six-page article in *Chemical Engineering and Mining Review* for September (Melbourne; price 11d., post free). The description will be of interest to American smelter power-plant designers in the opportunity which it gives to compare ours with the latest Australian practice. Two Fraser and Chalmers Rateau blowers, each having a capacity of 32,000 cu.ft. of free air per minute at 5 lb. pressure, and one Parsons turbo blower, with a capacity of 36,000 cu.ft. at 4 lb. pressure, furnish air for the furnaces.

Flotation at Anyox P. E. Peterson, superintendent of concentration at the Granby mill, at Anyox, B. C., has a four-page paper in the *Bulletin of the Canadian Institute of Mining and Metallurgy for October* (Drummond Building, Montreal), on flotation practice at that mill. An unusual feature is that 19 per cent of the flotation feed is coarser than 40 mesh. To handle this coarse feed the Peterson flotation machine has been devised and is illustrated. Air is admitted through a porous hose instead of a flat canvas mat.

Oklahoma Oil—Bulletin 686-X of the U. S. Geological Survey, Washington, D. C., is an eight-page pamphlet describing the structure and oil and gas resources of the Osage Reservation.

ECHOES FROM THE FRATERNITY

Hydro-Electric Power to Play Large Part in Future of South America's Mining Industry

The great potential water power of South America and the projects to develop it by hydro-electric power plants which will supply energy to furnaces, railways, and metallurgical works is discussed in a recent bulletin by the Guaranty Trust Co.

In Argentina the Iguazu of the northeastern corner of the country and the great group of water-power resources in northwestern Patagonia, Neuquen, Rio Negro and Chubut, are capable of producing enormous quantities of hydro-electric power. The falls of the Iguazu afford the best single resource in Argentina and one of the best in the world. Accordingly, the Argentine government is making a preliminary survey for a power plant there. An international power plant, with a capacity of 150,000 hp., will be erected jointly by the governments of Argentina, Uruguay and Brazil. At present La Compañia Hidro-electrica de Tucuman (English) is the only power plant actually established.

Brazil has extensive plans for the development of interior transportation, including the construction of power plants for industries and the electrification of railways. A power plant of 30,000 hp. is to be built on the river Jacuhy, under a thirty-year concession, at the expiration of which the state will take over the installations. Rio de Janeiro is to have a 270,000-hp. plant in the near future by an international company with American interests.

The Itabira Iron Ore Co., Ltd., recently secured a concession from the Brazilian government to construct and exploit high-temperature furnaces, a steel factory, reducing and like apparatus, and plans to electrify the Victoria-Minas railway. An electric smelting plant, the first of its kind in South America, will be built in Ribeiro Preto, Province of São Paulo, by the Companhia Electrica Metallurgica Brazileira. The construction of the mill, seventy-five miles from the iron mines of Minas Geraes, will be started as soon as the American contractors can get their engineers on the ground.

Bolivia is a country of mines, though other resources exist, and the present field for street railroad and power transmission material is restricted. The greatest hydro-electric resources are those in the vicinity of La Paz, Tres Cruces, and Colquechaca, and plans for their exploitation have been made. The three initial power plants will entail an expenditure of $10,000,000 and will require large quantities of other machinery and electrical accessories in addition.

The La Paz-Yungas government electric railroad now being constructed, the Corocoro copper mines and the city of La Paz will use power from the Yungas River near La Paz. The progressive mining section of Tres Cruces requires power and tramways; the wealthy mining district of Colquechaca lacks electric power and needs to extend the railway to Uncia, another mining center.

Hydro-electric power is beginning to be utilized by the tin and copper mines of Bolivia. The Guggenheims of New York have acquired rights to three tin mines, comprising more than 4,000 h., in the Department of La Paz. Water and power rights to some six streams in the vicinity of the mines have been secured, and a hydro-electric power plant is to be built, and an electric smelting plant is under consideration.

The Bolivian Government has been for some time contemplating the electrification of all railways and has declared as public domain the waters of rivers with power possibilities.

In Peru most of the important cities and towns have electric light and power systems. Various sections of the Peruvian railways also are being electrified, especially the interurban lines near Lima. The mines of Peru are beginning to appropriate the hydro-electric resources of the Peruvian Andes. The Cerro de Pasco Copper Corporation of Cerro de Pasco is now installing a large up-to-date smelter at Oroya and providing modern facilities for its workmen. A vanadium ore-reducing plant for the mines of Minasgra is to be built at Jumasha, Peru, by the Vanadium Corporation of America, of Pittsburgh, Pa. A 20,000-kw. hydro-electric plant for treating the ore is to be constructed about twenty-five miles from Jumasha.

In Ecuador public utility development has been very slow. Chile has vast hydro-electric resources, which have been only slightly developed, chiefly by German and British capital. The Chilean Government will electrify all the state railways. An international company (Anglo-Chileno-Americano) in Valparaiso plans a 100,000-hp. power plant for that region, and the British-owned Antofagasta-La Paz Railway in the nitrate region of northern Chile is to electrify its lines at a cost of $7,500,000, which will call for a power plant.

Colombian cities are becoming modernized with the development of Colombia's industries, and her mineral resources are being exploited actively.

A number of the larger Venezuelan cities and towns have electric lighting and tram service, and the Caroni Falls will be harnessed to provide power for the new electric railway from San Felix, on the Orinoco River, to the Guasipati goldfields.

Gold and Silver Questions Discussed by Butters, Lawrie and Other A. I. M. E. Members

The regular monthly meeting of the New York Section of the A. I. M. E., held at the Machinery Club on Nov. 4, heard addresses by Charles Butters on "How Can We Stimulate the Demand for Silver?" and by H. N. Lawrie, of the American Mining Congress, on "The McFadden Bill."

Mr. Butters called attention to this innovation in Institute discussions, urging a wider interest among mining men in matters affecting markets. Drawing on his own extended experiences in silver mining in Mexico, he recalled the difficulty Mexican mine managers had in obtaining silver to pay their labor and the advisability of increasing the supply of Mexican silver pesos. He advocated a silver producers' association and made an estimate that the world's silver consumption in 1920 would greatly exceed the production.

Mr. Lawrie outlined the purposes and proposed working of the McFadden Bill and was kept busy replying to many interrogations regarding its operation. W. C. Ralston, A. J. Clark, Kirby Thomas and J. E. Spurr were all called on for a discussion. Mr. Spurr pointed out the difficult position of gold and silver producers—they had to study a combination of marketing and monetary problems which led them into all sorts of difficulties. He emphasized the wide divergence of opinion in banking and economic circles regarding the status of the precious metals and the McFadden Bill and the tremendous importance of the gold reserves in the world. D. M. Liddell deplored the lack of general propaganda behind the McFadden Bill as compared with strength of the propaganda opposing it.

Whence France Draws Her Fuel

The French Minister of Public Works has published the following figures, according to *L'Echo des Mines et de la Metallurgie*.

The total coal production by France between Jan. 1 and July 31, 1920, amounted to 13,246,339 tons (of 1,000 kg.) including 12,695,193 tons of soft coal and 551,146 tons of lignite. During the same period her fuel importations amounted to 13,700.079 tons coal, 2,317,412 tons of coke and 1,005,775 tons as follows:

	Coal	Coke	Agglomerate
Saare	2,581,819	.	.
United Kingdom	7,771,338	550,183	541,257
Belgium	686,554	.	.
U. S. A.	612,919	..	
Germany	1,990,255	1,690,409	332,870
Other countries	57,194	.	.

MEN YOU SHOULD KNOW ABOUT

Arthur E. Kitts is leaving the Isle of Man as conductor of a mining expedition to the southern Sudan.

John H. White, of Denver, Col., has been making examinations in the old Steeple Rock district in western New Mexico.

R. L. Chase, mining engineer of Denver, Col., is spending November in oil-shale work at Grand Valley and De Beque, Col.

Donald M. Liddell, metallurgical engineer, has moved his offices to Room 330, No. 2 Rector St., New York City.

Stewart Campbell, mining engineer and United States mineral surveyor, of Hailey, Idaho, was elected Idaho State Mine Inspector on Nov. 2.

Dr. Henry Mace Payne, formerly assistant to the president of Bertha Coal Co., is now associated with Andrade-Eyre, Inc., 80 Broadway, New York City.

Spencer C. Browne and **Karl F. Hoffmann**, consulting mining engineers, have both opened offices at 2 Rector St., New York City.

F. H. Moffit has returned to Washington after five months' geological field work on the western shore of Cook Inlet and in the Copper River region of Alaska.

H. Foster Bain, formerly of U. S. Bureau of Mines, who has been doing consulting work in China, is returning to the United States. He is expected early in December.

Frank L. Hess, geologist of the U. S. Geological Survey, who went to South America last December on a special mission, has returned to Washington.

Fred B. Ely, of Fort Worth, Tex., is leaving for a stay of several months in northeastern Mexico. Mr. Ely will examine a considerable area in that section for its possibilities in oil and natural gas.

Andrew M. Fairlee, chemical engineer, of Atlanta, Ga., and specialist in sulphuric acid, has been retained by the Baugh Chemical Co., as consultant in connection with the operation of its acid plants at Baltimore, Md.

Walter E. Clark, president of the University of Nevada, was in Washington recently in connection with the cooperative work which the University of Nevada is carrying on in connection with several of the Federal bureaus.

Louis D. Huntoon, mining engineer, of 115 Broadway, New York City, and **G. D. Van Arsdale**, now of Los Angeles, Cal., have formed the partnership Huntoon & Van Arsdale, consultants in mining, geology and hydro-metallurgy.

V. Dolmage, of the Geological Survey of Canada, recently completed geological field work from Barclay Sound north to Quatsino that makes possible a geologic map of the whole of the west coast of the island of Vancouver, B. C.

R. C. Emmons, a graduate in geology of the University of British Columbia and assistant geologist with Dr. V. Dolmage on the west coast of Vancouver Island, is taking a post-graduate course in geology at the University of Wisconsin.

Walter Harvey Weed, geologist and mining engineer, announces that he has severed all connection with Harris & Co., stockbrokers, 25 Broad St., New York City. Mr. Weed's addresses are Tuckahoe, N. Y., and 29 Broadway, New York City.

M. W. Potterfield, who has charge of the Boston Hill manganese properties at Silver City, N. M., is making an exhaustive study of the manganese situation in the East, as it applies to the grade of ferromanganese ores mined on his properties.

A. T. Thompson, assistant to the president in the east; **P. G. Beckett**, general manager, and **Gerald Sherman**, consulting engineer, of the mines department of the Phelps Dodge Corporation, are inspecting company properties in the Southwest.

O. B. Perry, general manager of the Yukon Gold Mining Co., a subsidiary organization of the Guggenheim interests, returned recently from a visit to the company's mining properties in the Mayo district and near Dawson, both in the Canadian Yukon.

H. E. Bierce, formerly managing director of Gibson Consolidated Copper Co., Bellevue, Ariz., announces that he has resigned to assume charge of the mining department of Wellman-Lewis Co., engineers, of Los Angeles, Cal. His address is 900 Hibernian Building, that city.

L. E. Ives, formerly business manager of *Engineering and Mining Journal*, and more recently assistant advertising manager for the Penton Publishing Co., is now manager of sales for Clement K. Quinn & Co., miners and shippers of iron ores, Kirby Building, Cleveland, Ohio.

Frank M. Sylvester, of Vancouver, B. C., formerly general manager for the Granby Con. M. S. & P. Co., has been appointed president of the Moose Group Mining Co., owning mining property situated in Alice Arm district, British Columbia. P. W. Racey is in charge of mining operations.

John Borg, of New York, president of the Consolidated Interstate-Callahan Mining Co., recently spent two weeks at Wallace, Idaho, familiarizing himself with the company's operations. This is his first visit since his election to the presidency of the company, succeeding the late John A. Percival.

C. W. Purington, consulting mining geologist, wrote under date of Oct. 3, at Hakodate, that during the summer he had examined a quartz gold mine in Japan, visited the goldfields of the Kuktui near Okhotsk, and had been wrecked off Sakhalin. His address is now 5 Sodomsky Pereulok, Vladivostok, Russia.

Prof. R. W. Brock, of the University of British Columbia, formerly director of the Geological Survey of Canada, has returned to Vancouver, B. C., after having made a geological and topographical survey of country west of Burns Lake, near the Grand Trunk Pacific Railway, in the interior of British Columbia.

Kirby Thomas, consulting mining engineer, has returned to New York City after several weeks spent in Colorado, examining mining properties in San Juan district and in Gilpin County, and in investigating the uranium and vanadium deposits of Utah and Colorado and the oil-shale deposits and processes in western Colorado.

Gilbert H. Cady, geologist with the Geological Survey of Illinois for some years, and recently returned from a year spent in professional business in the Far East, has been appointed professor and head of the department of geology of the University of Arkansas, at Fayetteville, Ark. He also becomes State Geologist of Arkansas, succeeding N. F. Drake.

J. D. MacKenzie, who succeeds the Deputy Minister of Mines, Charles Camsell, as head of the British Columbia branch of the Geological Survey of Canada, was graduated in mining engineering from the Massachusetts Institute of Technology in 1911, and five years later received the degree of doctor of science from the same institution. He recently returned to Vancouver, B. C., after having spent three months investigating iron-ore deposits in the Taseko Valley and Bridge River regions of the province.

OBITUARY

Thomas W. Clarke, mining engineer, who went to Tampico, Mexico, last spring in the interest of the Standard Oil Co., died there on Oct. 27 from malaria, according to word received Nov. 2 from the Mexican government. Mr. Clarke, who was only forty-seven years old, had resigned from U. S. Shipping Board to accept this mission to Mexico.

Alexander J. McCone, of Los Angeles, Cal., founder and president of the Fulton Engine Works there, died in San Francisco on Oct. 26, at the age of sixty-one. Mr. McCone was also one of the founders of Harron, Rickard & McCone, of San Francisco. He and his father were pioneers of the Comstock district, Nevada, where the father built the first foundry, afterward merged with Nevada Engineering Works of Reno, Nev. About ten years ago Alexander was Speaker of the House of the Nevada Legislature, and five years ago he moved to Los Angeles, Cal.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Many Speakers Scheduled for Mining Congress Convention

Representative L. T. McFadden To Talk on Gold Question—Taxation, Flotation and Standardization To Be Discussed

At the convention of the American Mining Congress to be held at the Albany Hotel, Denver, Col., Nov. 15 to 20, the industrial situation will be discussed by speakers of national prominence, among whom are Governor Henry J. Allen, of Kansas, whose subject will be "The Right of Labor to Strike"; and Dr. Charles A. Eaton, editor of *Leslie's Magazine*, who will have as his topic the "Present and Future Relations Between Labor and Capital." James Lord, president of the mining department of the American Federation of Labor, will speak on "Organized Labor and Its Attitude in the Present Industrial Crisis"; Charles A. Chase, on "The Colorado Open Shop Declaration"; and Senator Charles S. Thomas, on "Industrial Honesty." Carl Scholz, at one time president of the American Mining Congress and now manager of the Raleigh-Wyoming Coal Co. of West Virginia, will discuss the recent decision of the Appellate Court of West Virginia through which the historic permanent injunction was issued restraining the United Mine Workers of America from pernicious activity within the jurisdiction of that court.

The Gold Conference will have an equally interesting list of speakers, including Congressman Louis T. McFadden, whose subject will be "The Financial Reconstruction of the Nation." Among the other speakers are Governor Emmet D. Boyle, of Nevada; Hon. Fletcher N. Hamilton, State Mineralogist of California; Dr. Milnor Roberts, dean of the College of Mines, University of Washington; Dr. Henry M. Fox, director of the Oregon Bureau of Mines and Geology; George E. Collins, of Denver, governor of the Colorado chapter of the American Mining Congress; B. C. Yates, superintendent of the Homestate Mining Co. at Deadwood, S. D., and Dr. Harold N. Lawrie, chief of the division of rare and precious metals of the American Mining Congress.

The Tax Conference will be in charge of Robert G. Wilson, director of the tax division of the American Mining Congress, and a committee, composed of Paul Armitage, of New York, chairman of the tax committee of the Mining Congress; Dr. R. C. Allen, vice-president of the Lake Superior Iron Ore Association, Cleveland, and Dr. George E. Holmes, author of "Holmes on Taxation." It will take the form of a "round table" discussion.

On the general program of the convention, H. J. Pierce, of Seattle, will speak on "The Utilization of Western Water Power," and Edwin Terrell, executive director of the Water Power League of America, will discuss "The Reduction of Mine Operating Cost Through Use of Mountain Streams." General L. C. Boyle, former attorney general of Kansas, will speak on "The Effect on the Western Industry of the New Freight Schedules Recently Adopted."

There is also an interesting list of speakers on the subject of oil flotation, including Gilbert H. Montague, of New York, and George L. Nye, attorneys for the American Mining Congress, and Alfred D. Cook, director of Minerals Separation North American Corporation.

War minerals will be discussed and it is expected that the three-day Standardization Conference will be productive of good results. In all about sixty speakers are scheduled for the various meetings of the convention.

WEEKLY RÉSUMÉ

Five smelters in northern Mexico have suspended operations, and railroads and various mining companies have been crippled by the act of coal operators of Coahuila in shutting down their mines as a result of the deadlock in the labor situation. It is reported that officials of the de la Huerta government have taken over some of the coal properties in consequence. At Pachuca 3,000 men were laid off the last week in October. In this country the financing of the zinc ore storage warehouse project in the Joplin-Miami district is reported to have been arranged. In Arizona, Iron Cap has brought suit against the Arizona Commercial at Globe, in an effort to have the pending litigation between the two companies heard in the district where the properties are located. At Jerome the United Verde has cut its force owing to the condition of the copper market. The Penn-Arizona, at Bisbee, has shut down. In Colorado the Gem Mining Co. has acquired the holdings of the Argo Reduction & Ore Purchasing Co., including the Newhouse tunnel. In Canada the case of Stewart vs. Molybdenum Mining & Reduction Co. has been decided in favor of the defendant, whose property is in the Alice Arm district of British Columbia. The suit over the ownership of the Engineer Group at Atlin, B. C., is now being heard; the claims are alleged to have been fraudulently jumped by the late Captain Alexander. In Ontario the power situation is easier.

The scope of the work of the new Mississippi Valley experiment station of the U. S. Bureau of Mines has been decided upon and a program for the future drawn up.

Five Mexican Smelters Closed Owing to Coal Strike in Coahuila

Coal Operators Shut Down—Mines Flooded—Many Miners Leaving for U. S.—Railroads Crippled

The most discouraging condition in the mining situation throughout Mexico at the beginning of November is the collapse of all efforts of the government to harmonize the differences between the mine owners and strikers of the coal fields in Coahuila. After the appointment of various special representatives by the President, whose efforts have all failed, the companies decided to close, some of them announcing a suspension of six months. All the mines are now flooded and even if an agreement were reached it would require several weeks at best to reopen effectively. In the meantime the mine workers are emigrating in large numbers, many hundreds having crossed into the United States in search of work.

The first result of the closing was the shutting down of the smelters at Aguascalientes, Torreon, San Luis Potosí, Saltillo and Monterrey, throwing over 30,000 men out of employment, in addition to the 8,000 mine workers. The closing of the smelters will naturally be followed by the closing of a number of mining properties in the north. Another feature is the crippling of the railways, as all the lines in the north use coal from these mines. The first step by the government to secure relief was an order removing, temporarily, the duty on coal and coke, but even with this exemption it is impossible to secure equipment for bringing these commodities into the country in sufficient quantities to better the situation.

The mine operators blame minor government officials for the situation. It is claimed that even agents of the government sent to arbitrate the strike incited the men to hold out and by their attitude made it impossible for the contending parties to get together.

Tax Delinquent Mexican Mines Listed for Re-denouncement

The mining department of the Ministry of Commerce and Industry of Mexico is preparing a formidable list of mining properties which the government has declared forfeited because of the failure of owners to avail them-

selves of the special exemption decree which ended Oct. 31. The list is being sent to the various mining agents throughout the country advising them that the properties in question are open to re-denouncement.

Suit Over Engineer Group at Atlin, B. C., Before Court

The suits predicted with reference to the Engineer mine, at Atlin, B. C., are before the courts. W. L. Goodwin and eleven other prospectors have taken out a *lis pendens* to prevent the sale of the property until their claims can be brought before a grand jury, it being suggested that a sale for $3,000,000 to Cobalt interests is in negotiation.

Mr. Goodwin and his associates assert in effect that they and not the estate of the late Captain Alexander are the lawful owners of the mine. Twenty years ago, it is declared, they staked the claims now known as the Engineer Group and Captain Alexander, it is alleged, staked over them, altering the lines and making the eleven claims which afterward were known as the Engineer claims. It is, therefore, set up that their property was fraudulently jumped and recorded and that Crown grants were wrongfully issued to the Alexander party.

The second action against the estate of Captain Alexander is brought by W. Pollard Grant, of Vancouver, who claims a one-fifth interest in the mine and affirms that documents in his possession will prove that Captain Alexander was his trustee for the one-fifth interest in the mine referred to. Mr. Grant states that one of the business matters bringing Captain Alexander south when he met death through the foundering of the "S. S. Princess Sophia" was to arrange for the transfer to him of this interest.

Iron Cap Brings Suit in Globe Court Against Arizona Commercial

The Iron Cap Copper Co. has instituted action in the Superior Court at Globe, Ariz., against the Arizona Commercial Mining Co., seeking to quiet title to the property in the Globe district claimed by the complainant. This suit counters against apex claims made by the Commercial to the effect that substantially all the ores mined by the Iron Cap came from veins that have surface showings on Commercial ground. The litigation started in an equity suit brought by the Arizona Commercial in a Massachusetts court in February, 1919. This was followed in September of the same year by an ordinary suit in the Massachusetts courts, alleging substantially the same causes of action. Both suits were dismissed for lack of Massachusetts jurisdiction. Thereafter the Commercial filed its suit in Maine. The Iron Cap suit seeks to bring the trial of the dispute to Arizona in the same district in which the mines are located.

Oklahoma Ore Storage Project Financed

Warehouse at Tar River Ready To Open, Others To Follow—Producers Said To Be Well Disposed

There is a revival of interest in the Joplin district in the proposal to store zinc ore as a result of the formal announcement of officials of the Oklahoma Ore Storage Association that a well-known Pennsylvania and New York warehouse company, after sending two representatives to this field and making a careful study of the situation, has agreed to advance money on warehouse certificates to the extent of $9,000,000 in cash at present and with an ultimate limit of $30,000,000.

Several ore bin warehouses were erected in this district in the last year but no attempt has been made to use any of them. When one of them was partially wrecked by a cyclone last spring it was immediately rebuilt. One of the warehouses, that located at Tar River, Okla., will open at once and the other four at intervals of a week or two weeks until all are in operation, provided the ore producers are willing to try out the plan.

The larger operators of the field are said to be quite ready to have the plan given a thorough trial. Some of them express the opinion, however, that the proposed scheme is quite likely to be tried by the smaller companies only and so result in keeping some of them producing ore when they ought to be closed down.

Utah Con. Turns Disputed Ground Over to Utah Apex

The Utah Consolidated Mining Co., of Bingham Canyon, Utah, which recently lost the decision in its celebrated apex suit against the Utah Apex Mining Co., has stopped mining ore in the Highland Boy limestone under Utah Apex territory since Oct. 20, when the court's decision was handed down. The workings in question were immediately turned over to Utah Apex without the necessity of a court injunction. Within thirty days of the entry of the decree the Utah Consolidated must file a statement of the ores extracted from below the surface of the Utah Apex giving the tonnages and value.

Mineral Resources of Ungava, Quebec

The return to civilization of H. L. F. Blake, civil engineer, and his party, which had spent the summer in exploration work in the Ungava region of Quebec, has caused it to be known that a British syndicate will spend a large sum in developing that region. Mr. Blake left last March, and on arrival at St. Felicien, Quebec, collected supplies and a party of Montagnais Indians, with dogs, sleds and canoes. They proceeded north to Chibougamou, en route to Lake Misstassini, thence north to Lake Nichinsen, and then into the unknown. Ungava has been found rich in minerals.

Some Austrian Iron-Working Industries Stagnant

Former Customers in Newly Created States Can in Some Cases No Longer Import

From Our Vienna Correspondent

Vienna, Oct. 12 Many branches of the iron working industries show no signs, as yet, of interrupted productivity, but complete stagnation has prevailed in some groups for some time past. There are various reasons for this. Thus the armature industry is very dull, because many of the newly erected states are beginning to supply themselves in part, while no deals can be concluded with some other foreign districts, such as Poland. In most of the cases where the machine y trade complains of stagnant conditions, the trouble lies in the high price, which hinders domestic sales and makes foreign traffic quite impossible. This is the trouble with certain types of machine tools.

Some branches of the Austrian iron-working industry, whose products have a world-wide reputation, can no longer deliver their goods abroad because the new national states are already prepared to manufacture the same things. This is the case with railway axles among other things. The Austrian heavy-duty-axle business, which is almost wholly within the confines of Austria, until recently delivered its products to Silesia and Moravia, Hungary, the Balkan countries and to the South. Today some enterprises in Czecho-Slovakia are prepared to manufacture car axles, and the government at Prague now draws from them and refuses import permits for this line. Also in Jugoslavia a firm has taken up the manufacture of freight axles. In Hungary the demand for these articles is now chiefly supplied by the Rima Muranyer Ironworks Co. The prospect is also poor for exports to the Balkans.

The danger to Austrian industries arising from possible development of special industries in the new national states to compete with hitherto Austrian specialties is felt in other lines of the German-Austrian iron and metal wares. Just at present it is specially acute, since the slugishness in the usual domestic products of the new states is diverting energy to the manufacture of articles not previously produced there.

In yet other branches of the iron industry it is lack of material that is interfering with industry. This is particularly true of the wire-working industries. Because of wire shortage in Austria it is necessary to bring in German material at high prices Therefore some forms of wire, for example, wire nails, continue very scarce.

Burma Corporation produced 2,790,000 lb. refined lead and approximately 251,550 oz. refined silver in September, compared with 4,424,000 lb. refined lead and 243,340 oz. refined silver in August.

Tonopah Section of A. I. M. E. Holds Third Annual Meeting

John G. Kirchen Elected Chairman—Reno Selected for Next Year's Session—Tonopah Divide Mine Visited

BY E. R. BENNETT

The third annual meeting of the Nevada Section of the American Institute of Mining and Metallurgical Engineers was held at Tonopah, Nev., on Oct. 26-27, 1920. Owing to war conditions in 1918 and labor troubles in 1919 no meeting has been held since the session at Ely, Nev., in June, 1917.

Thirty-four members registered at the opening meeting at the Elks' hall at 9:30 a.m. on Oct. 26. The meeting was called to order by Prof. J. C. Jones, vice chairman of the Nevada Section. In his opening remarks Professor Jones spoke of the advisability of holding meetings at least once a year in order to facilitate an exchange of ideas on practice and methods. After reading the minutes of all previous meetings Henry M. Rives, secretary of the local section, stated that President Herbert Hoover and Secretary Bradley Stoughton had wired their regrets.

The selection of officers made by the nominating committee was unanimously approved and the following were elected: John G. Kirchen, Tonopah, chairman; Prof. J. C. Jones, Reno, vice chairman; Henry M. Rives, Reno, secretary-treasurer. Executive committee: John G. Kirchen, Tonopah; Prof. J. C. Jones, Reno; Governor Emmet D. Boyle, Carson City; R. A. Hardy, Virginia City; W. S. Larsh, Ruth; F. D. Bradley, Goldfield; J. L. Dynan, Tonopah; W. H. Blackburn, Tonopah, and Alexander Wise, Virginia City.

It was the sense of the meeting that the next annual session be held at Reno, Nev., from which place side trips will be taken to Virginia City and Dayton.

At the conclusion of the business session the following papers were presented: "Operating Conditions at Tonopah Extension Mine," by John L. Dynan; "Surface Plant at Victor Shaft, Tonopah Extension Mine," by J. P. Hart; "Mine Pumping in Tonopah District," by Homer L. Williams; "Crushing and Agitating Practice at Tonopah Extension Mill," by H. A. Burk; "Precipitation and Refining Gold-Silver Precipitates at West End Mill," by Fred Ninnis and Walter Anderson; "Tonopah Extension Assay Office," by George L. Christian, and "Mine Accounting," by F. D. Bradley.

An interesting statement in connection with Mr. Dynan's paper was to the effect that the Tonopah Extension Mining Co. during its operating period had marketed 15,267,216 oz. of silver, which returned $10,057,426.50, for an average value of 65.87c. per oz.

The new surface plant at the Victor shaft was described in detail by Mr. Hart, who in his paper explained the difficulties encountered in constructing the plant during war times. In his paper Mr. Williams drew a comparison between pumping practice with turbine and plunger pumps.

After a discussion of the different agitators in use in the several Tonopah mills, Mr. Burk stated that in his opinion the ideal agitator should be of a mechanical type wherein atmospheric air, rather than compressed air, could be introduced by a blowing device. In his opinion impurities, such as engine-oil and CO, in the compressed air, have a deleterious effect that could be eliminated by the use of atmospheric air.

Mr. Anderson, in presenting his paper written jointly with Fred Ninnis, described the general practice of precipitation and refining in the Tonopah district. Some very interesting comparisons have been made in this paper.

Mr. Christian's paper described a well-designed assay office. Numerous labor-saving devices were described in detail. Several different systems of mine accounting were discussed by F. D. Bradley, whose paper proved him to be a close student of the subject.

After the presentation of the papers a recess was taken and the members and guests adjourned to the Mizpah Hotel for lunch. At 2 p.m. the members were taken to the Belmont mill in automobiles, where the party was taken on a tour of inspection by Albert Silver, superintendent of mills for the Tonopah Belmont Development Co.

On the morning of Oct. 27 the members were taken through the Victor mine of the Tonopah Extension Mining Co. The new surface plant at this property also proved of great interest.

Following a luncheon at the Mizpah Hotel an automobile trip was taken to the Tonopah Divide mine at Divide, where an inspection of the underground workings was made. The type of ore deposit at this property was of particular interest to the visiting members. Specimens of the mineral powellite found in the mine were eagerly searched for. The meeting concluded with a dinner at the Mizpah Hotel followed by an informal dance.

Photo by Brissell, Tonopah, Nev.

MEMBERS OF THE NEVADA SECTION, A. I. M. E., AT VICTOR SHAFT OF TONOPAH EXTENSION MINING CO., TONOPAH, NEV.

Canadian Engineers Meet at Winnipeg

Mineral Resources of Manitoba and Alberta Described in Numerous Papers—Possible Government Royalty on Copper Discussed— Dominion's Attitude as to Provincial Natural Resources Denounced

SPECIAL CORRESPONDENCE

THE growing importance of the mining industries of Manitoba and Alberta was reflected in the highly interesting and successful gathering held at the Fort Garry Hotel, Winnipeg, on Oct. 25-27, on the occasion of the second annual western convention of the Canadian Institute of Mining and Metallurgy. There was a large attendance, including a number of members from eastern Canada. Thomas H. Johnson, attorney general of Manitoba, extended a cordial welcome to the delegates on behalf of the province. President O. E. S. Whiteside in the course of his address said that it was only within the last few years that Manitoba had been regarded as anything but a wheat-growing area. But it had been proved to contain mineral deposits of great value and had the beginnings of what it was hoped would become a flourishing mining industry. He enlarged upon the function of the Institute in educating the public in respect to mining in order that the industry should as far as possible be retained in the hands of Canadians.

The principal feature of the opening session was an address by F. W. Gray, of Toronto, on the coal fields of the West. The gap of 2,000 miles between the eastern coal fields and those of the western provinces could be bridged by an extension of the Great Lakes Waterways to enable Nova Scotia coal to enter Lake Ontario by water carriage, and by the railways adopting a comprehensive program for the transport of coal from the western coal fields. The objective of the Canadian coal mines was to limit the importation of American coal to the smallest area possible. The coal resources of Nova Scotia were not large, while those of the western coal fields were as large as it was desired to make them. The world need for coal was so pressing that it might be that an export trade in coal would precede the development of the western coal field to provide fuel for local industries. He considered that the position of the Alberta collieries with reference to Vancouver, and those of British Columbia with reference to Prince Rupert, were not dissimilar to the relation of West Virginia collieries to the Atlantic ports. The opportunity to enter British markets was open to any coal field in North America that could get its coal to tidewater within commercial limits of cost of rail haul. The real role of the western field, however, would be filled when it had become the site of industries based upon bituminous coal.

Duncan McDonald, inspector of mines of Calgary, Alta., read a paper on mine rescue and first aid work. He stated that voluntary mine rescue training in Alberta had met with very satisfactory results, and was of opinion that this system was much preferable to compulsory training. He pointed out the importance of a knowledge of first aid, lives having been frequently lost where injured persons had been discovered by those ignorant of it.

H. A. Mackay, chief engineer of the Manitoba Bridge and Iron Works, gave an address on the use of powdered coal in the company's rolling mills at Selkirk. Pulverized coal was used in the furnaces for heating billets and scrap for rolling, and also for operating open-hearth furnaces for making standard grades of mild steel from scrap. With the installation of powdered coal a Canadian coal was substituted for the American coal previously used.

A smoker was held in the evening at which moving pictures were shown illustrating the development of water power and other natural resources.

MINERAL RESOURCES OF MANITOBA AND ALBERTA DISCUSSED

On the second day Dr. J. A. Allan, of Alberta University, spoke on the mineral resources of Alberta, emphasizing the need of more accurate information with regard to them, especially now that the province seemed to be on the verge of a great oil boom. In several cases mineral development had been retarded by overestimated reports of the value of deposits. He described the grades of coal in the different basins and pointed out that there was no anthracite in Alberta with the exception of occasional irregular pockets. Among other mineral resources dealt with was the sodium sulphate which occurred as a remarkable deposit on the western margin of Saskatchewan, which was greatly in demand in the pulp industry. In the absence of N. C. Pitcher, professor of mining engineering in Alberta University, a paper prepared by him on the more efficient utilization of Alberta coal was read by Dr. Allan.

J. A. Richard, acting chief inspector of mines of Alberta, briefly outlined the methods of collecting coal samples for analysis and the endeavors made to standardize the analysis.

D. King, of Winnipeg, dealt with the problems in connection with the marketing of western coal, stating that the main difficulty was the prejudice against it. He contended that there were steam coals in the west equal to any coming from the Eastern states and that with different methods of firing some of the western coals would give equal satisfaction.

In the afternoon Prof. F. J. Alcock, of Ottawa, described the various properties in the Herb Lake gold district of Manitoba, stating that a number of them offered good possibilities of being worked at a profit. The present high cost of labor and transportation had been a drawback to development. The amalgamation of several of the more important properties lying close to each other on the east shore of Herb Lake was suggested as a means of reducing the cost of separate management and operation.

J. F. Gordon, the discoverer of high-grade gold deposits in the Copper Lake district of Manitoba, described the geological formation of the area and the development work done on his properties.

ENGINEERS SEE NEED OF RAILWAY FOR FLIN FLON

Dr. R. C. Wallace, commissioner for Northern Manitoba, dealt with the Flin Flon ore deposit and stated that the recent visit of a number of members of the Manitoba Legislature had made them acquainted with the situation and caused them to realize that the property could not be properly developed without a railway. If the deal for the property was completed before the opening of the Legislature the question of a railway would be considered, with a view of leasing it, when built, to the Canadian National Railway Board.

Prof. J. S. De Lury, of Manitoba University, contributed a paper on the Rice Lake district, stating that wonderfully rich pockets of free gold had been discovered. While rich samples were encouraging they must be supplemented by careful sampling of the whole mineral deposit before mining operations were warranted. Such sampling was the most pressing need of the district.

In the evening Dr. R. C. Wallace gave an illustrated lecture on northern Manitoba, laying much stress on the importance of completing the Hudson Bay Ry. as soon as possible to hasten the development of the territory. He regarded the mining industry as the main factor in the opening up of the country. A railway to the Flin Flon property would develop a copper industry and with this would be created a gold mining industry throughout The Pas mineral belt.

POSSIBLE GOVERNMENT ROYALTY ON COPPER DISCUSSED

The following session was largely devoted to a discussion regarding the royalty on copper which the Canadian government may see fit to impose after Jan. 1, 1921. Several speakers expressed strong opposition to the imposition of any royalty on copper for some time to come. A resolution was

adopted which, after reciting that the matter of royalties is left to the discretion of the minister; that valuable orebodies have been discovered which can only be developed by the expenditure of large sums of capital, and that it is important that investors should know with reasonable certainty the government's attitude with respect to royalties, concludes as follows:

"That this convention strongly urge the government of Canada to so amend the said regulations as to set out specifically what are to be the royalties charged on the different minerals produced, and particularly that the time for which copper shall be exempt from such royalty shall be extended for a period of ten years."

Dr. Fahrenwald Talks on Non-Corrosive Steels

Dr. E. A. Fahrenwald, of Cleveland, Ohio, the inventor of non-corrosive steel and rhotarium, gave an instructive address on "Non-Corrosive Steels." The day of the old-time pioneers, he said, had passed and new pioneers of a different type were required—men equipped with modern scientific tools and training. Dealing with industrial and scientific research in relation to future development he stated that knowledge regarding chemical combinations was limited. As soon as a new element is discovered some new industrial application will be found for it. Scientists, by taking advantage of newly discovered relationships of elements, can provide alloys meeting special requirements. Explaining the advantages of non-corrosive steel he cited the non-corrosive gun barrels which would before long come into general use.

H. E. Knobel outlined the possibilities of creating a western iron and steel industry based on purely domestic sources of iron and coal. He claimed that Ontario iron ores and Alberta coal could be utilized for steel to supply western Ontario and the prairie provinces.

Data Presented on Operation of Mandy Mine

G. R. Bancroft, superintendent of the Mandy mine of northern Manitoba, presented some interesting details in regard to the discovery and operation of that deposit. The gross value of the production from the Mandy up to the present was $2,000,000, and a large tonnage of ore remained untouched which was of too low a grade to stand the transportation charges, but could be handled to good advantage by a smelter at Flin Flon.

D. C. McArthur, of Winnipeg, gave an address on the non-metallic deposits of Manitoba.

In the afternoon a visit was paid to the rolling mills of the Manitoba Bridge & Iron Works and the plant of the Manitoba Steel Foundries at Selkirk.

The convention was brought to a close by a banquet in the evening, the principal speaker at which was Hon. E. Brown, provincial treasurer of Manitoba, who said that the position taken by the Dominion government with regard to provincial ownership of the natural resources was an outrage and an injustice and in every way indefensible. The Dominion government had expressed a willingness to turn over the natural resources to the province, subject to the approval of the other provinces. They had met in conference with the other provinces but without result, and it was unfair that the provinces which controlled their own resources should have anything to say against the western provinces getting control. They had hopes, however, that a settlement would be reached and some redress obtained but until that time came it would be folly for him to seek to outline a mining policy. Speaking of the Flin Flon property, Mr. Brown said that the construction of a railway was properly a matter for the Canadian National Ry., but it had turned it down. The province would probably build the road, but officials were waiting for a guarantee from the holders of the options that the products of the mine would be sufficient to justify the outlay of $8,000,000 which would be required to build the railway.

More British Capital Needed, Says Winnipeg Mayor

Mayor C. E. Gray, of Winnipeg, said that while he was glad to see American capital come in, he would like to see the introduction of more British capital. He advocated the appointment of a commission of industry to give correct information concerning the natural resources of the province to the British public. The opening up of the north country was largely in the hands of the mining engineers, who could do much to give capital faith in its development.

J. A. Campbell, M. P., thought that the transfer of the natural resources from the Dominion to the control of the provinces was the most important question at the present time. The western provinces should get together and demand a settlement, he said.

T. R. Deacon spoke of the need of developing natural resources to their fullest extent as a means of rectifying the adverse balance of trade which resulted in the depreciation of Canadian currency.

Blast Furnaces in Switzerland To Smelt Swiss Iron Ore

Special Berlin Correspondence

After systematic prospecting iron ore deposits of importance have been discovered in Switzerland which promise to be an important factor in the economical development of the country. They are located near Herznach in the valley of the River Frick and estimated to contain at least 15,000,000 tons of phosphorus iron ore averaging approximately 31 per cent iron. The mining conditions are favorable. Preparations are being made for the erection of blast furnaces. The Federal government of the republic has submitted to the legislature a bill for financial support by the state of the new enterprise.

Molybdenum Mining & Reduction Wins Against Stewart

Supreme Court of British Columbia Decides in Favor of Alice Arm Company

The question of ownership of the Molybdenum Mining & Reduction Co.'s property in the Alice Arm district of British Columbia has been closed as far as the Supreme Court of the province is concerned. The action is known as Stewart vs. the Molybdenum Mining & Reduction Co., Ltd. Chief Justice Hunter, who finds for the company, says in his judgment:

"I think that the plaintiff Hayes had no right of action against the company. As to the other plaintiff, I am of the opinion that the Conundrum claim (one of the claims of the group) lapsed on June 13, 1915, and was not revived by the Exemption Act, 1915. The Conundrum ground was relocated and recorded by Riel and his associates, who conveyed it to the company, but the plaintiff rests his action mainly on the agreement of Aug. 19, 1915, by which the co-owners of the Conundrum and Hayes, the owner of the Blackwell, agreed to sell those claims for $35,000 to Riel.

"Moreover it appears to me that the action of Riel in locating and dealing with the new claims was acquiesced in by the plaintiff and this view is strongly corroborated by the giving of the subsequent agreement to Riel pending the litigation.

"At any rate the plaintiff stood by while large sums of money were expended on the ground without notifying either the Stilwells or the company that he had any claim against them or it and the principle applies that if a man is silent when in fairness he ought to speak he must remain silent when in fairness he ought not to speak."

Recent Production Reports

Old Dominion produced 2,912,000 lb. copper in October compared with 1,957,000 in September.

Inspiration produced 7,000,000 lb. copper in October compared with 6,506,000 in September.

Anaconda produced 11,000,000 lb. copper in October compared with 11,100,000 in September.

Greene Cananea produced 3,500,000 lb. copper in October, the same as in September. The October production of silver was 156,200 oz. and of gold 895 oz.

Kennecott produced 8,878,000 lb. copper in September (including Braden's output) against 11,268,000 in August.

Interstate-Callahan's shipments in October increased about 20 per cent over those in September. Comparative figures are: Zinc concentrates, 5,000,000 lb., as against 4,230,000 in September; lead concentrates, 2,600,000 lb., compared with 2,180,000 lb. in September; and silver, 26,000 oz., which compares with 21,800 oz. in September.

U. V. Extension produced 3,864,756 lb. copper in October, compared with 3,327,644 in September.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Scope of Mississippi Valley Station's Work Agreed Upon

Improvement in Zinc Smelting One Important Objective—To Maintain Office in St. Louis

As a result of the conference last month in St. Louis with the zinc and lead operators, the following program has been agreed upon for the Mississippi Valley experiment station of the U. S. Bureau of Mines:

Mining problems: (1) Underground handling and haulage of dirt, (2) drill steel problem in co-operation with the North Central Station of the Bureau at Minneapolis, Minn.

Ore-dressing problems: (1) Careful study of the milling problems met with in each of certain districts; namely, Wisconsin, Illinois, southeast Missouri, and Joplin.

Metallurgy: That an intensive study be made as far as the funds of the station will permit of processes other than retort processes applicable to the treatment of zinc ores found in the Mississippi Valley and which will enable the metal to be obtained from the ore at a lower cost than do present-day processes.

In addition to the personnel already announced, Prof. C. R. Forbes, professor of mining in the Missouri School of Mines and Metallurgy, has been appointed consulting mining engineer, and has been asked to direct that part of the drill steel investigation which has to do with the actual use of drill bits, their proper sizes, shape, etc.; this work to be carried on in co-operation with the North Central Station of the bureau at Minneapolis, Minn.

Through the courtesy of the Chamber of Commerce of St. Louis, the bureau has been given office quarters in room 713, Chamber of Commerce Building, corner of Broadway and Locust Street. This office will not only serve as headquarters for the Mississippi Valley Station, but for the bureau's activities in that part of the country as well, and will also serve as the St. Louis office for the Missouri School of Mines and Metallurgy, and for the Missouri State Geological Survey.

In this connection, Dorsey A. Lyon, supervisor of stations, said: "The object of establishing this office in St. Louis is to permit the bureau to maintain more readily a contact with the industry. It is hoped that the industry will feel free to visit this office and become acquainted with F. F. Rutledge, the superintendent, and his assistants. The Mississippi Valley mining experiment station has been established for the benefit of the lead-zinc industry of that region. However, it will fail utterly in its purpose unless it has the hearty support and co-operation of those interested in the lead-zinc industry. It is, therefore, earnestly hoped that the industry will take an active interest in the work of the station and will not hesitate to offer any suggestions in regard to the work of the station that will enable it to best serve the industry."

It is regarded as probable that the state of Missouri will follow the example of Alabama and add to the appropriation of the station an amount equal to that appropriated by the Federal Government. If, in addition to that, co-operative agreements may be effected with some of the operators some very comprehensive work on zinc and lead can be undertaken.

It has already become evident that there is an unusually favorable opportunity existing for technical study of the mechanical means for handling dirt in the mines of the Mississippi Valley. Another important phase of the station's work is a study of the metallurgical problems. This is pointed out by Prof. Charles H. Fulton, the director of the Missouri School of Mines and Metallurgy. He says:

"Looking on the metallurgy of zinc from a broad viewpoint, the fact stands out that present practices and principles are ancient. Present-day practice is essentially what it was 150 years ago. In modern times this ancient practice is met with certain great disadvantages. It requires a large amount of hand labor and consumes an enormous amount of fuel for the results obtained. It differs in principle from the metallurgy of other metals, in which labor-saving devices have been long employed and in which large units are used in the production of metal. Even the largest zinc furnace is small because it is within the retort. Since fire clay is the refractory material used increase in the size of the retort is limited. I am a firm believer that the electric furnace is the solution of the problem."

New Import Classification Needed

It is very generally recognized that there is the greatest need for a revised classification covering imports and exports of commodities. The Bureau of Foreign and Domestic Commerce, which compiles import and export statistics, is being relied upon more and more by the industries for this information which is so necessary to the intelligent conduct of nearly every enterprise. There also is the greatest need, in the opinion of students of the question, for placing under a single management the Bureau of Customs Statistics in New York and the Bureau of Foreign and Domestic Commerce in Washington. Whether this reform can be put into effect January 1 depends entirely upon securing the necessary appropriation before that date. Otherwise it must go over for a full year.

War Mineral Awards

A total of $75,039.06 was recommended for award by the War Minerals Relief Commission for the week ended Oct. 30. The recommendations, showing the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed, are as follows: Liberty Manganese Co., manganese, $4,851.75, 30 per cent; Baker Hot Springs Manganese Co., manganese, $789.26, 30 per cent; J. J. Appel, manganese, $2,375.41, 36 per cent; Georgia Iron & Coal Co., manganese, $55,404.01, 32 per cent; Layton and McCormick, manganese, $1,459, 58 per cent; Needles Mining Co., manganese, $4,561.66, 25 per cent; P. S. Dean, chrome, $1,856.50, 33 per cent; J. K. McCloy, chrome, $300, 75 per cent. Further awards have been recommended in the following claims which had been acted upon previously by the committee: Charles L. Cole, $1,669.49; J. E. Higgins, $814.40; Adama & Woodward, $957.50.

Survey and Bureau of Mines Men on Standards Committee

Responding to an invitation of the American Engineering Standards Committee, the Department of the Interior has appointed three members to serve with that committee. They are P. S. Smith, of the U. S. Geological Survey; E. A. Holbrook, of the U. S. Bureau of Mines, and O. P. Hood, of the Bureau of Mines. Messrs. Holbrook and Hood also become members of the subcommittee on mining equipment.

Mine Experiment Station Heads To Meet in San Francisco

Dorsey A. Lyon, supervisor of experiment stations for the U. S. Bureau of Mines, has called a meeting of all superintendents of stations west of the Mississippi River to be held in San Francisco January 17, 1921. The principal object of the meeting is to coordinate plans for future investigations.

A total of 148,338 tons of nitrate of soda moved through the Panama Canal during August. All but 46,569 tons, which went to European ports, was destined to American Atlantic and Gulf ports. Two cargoes of chrome ore destined to New York also passed through in August.

NEWS BY MINING DISTRICTS

Special London Letter

Recent Developments on the Rand—West African Diamonds Reported in Blue Ground at 12 Ft.—Dolcoath Tin Mine To Shut Down

BY W. A. DOMAN

London, Oct. 26—Internationally, the gold supply is of so important a character that the latest developments reported from Johannesburg are creating a very considerable degree of interest. It is generally believed that as a whole, and certainly where the central part of the field is concerned, the Witwatersrand has seen its best days. So far as regards production of the metal the mines of the Far Eastern section are affording, and seem likely to afford still further, ample compensation for the shortcomings of the older areas. What were originally the finest properties have become virtually exhausted, so that now eyes are turned to the great Modder trio, namely, New Modderfontein, Modderfontein B, and Modderfontein Deep, and to Geduld, Springs, Van Ryn Deep, Brakpan, and others. There is considerable activity all over this district, and the finance houses are using their utmost endeavors to maintain the supply of gold. Several new shafts are being sunk, and development is being pushed forward as rapidly as the supply of native labor will permit. There are two outstanding events of the current week. The New State Areas, a mine under the management of the house of Barnato, has encountered the reef in the south shaft at a depth of 3,676 ft., and the Geduld Proprietary has announced some capital values disclosed in development work during the September quarter. The significance of these two items of news lies in the fact that the properties are contiguous, the southern boundary of Geduld forming the northern boundary of the New State Areas. In the shaft of the latter mine twelve sections taken over the whole bottom give an average assay value of 89.8 dwt. over 18.9 in., the dip of the reef being 8 deg. This is almost flat, and consequently does not make for a great tonnage per claim, through the reef in this part of the Rand is very undulating, so that no real conclusions can be drawn. The result is nevertheless highly encouraging. It is not often that a shaft sunk, so to say, in the veldt, strikes a rich patch as in the case of New State Areas, though it has happened previously on the Rand. The orebodies in the Far Eastern section run in shoots, and the Geduld Proprietary in its east drive at No. 7 level of No. 3 inclined shaft has driven 3,219 ft., of which 2,820 ft. have been sampled. Of this 64 per cent is payable, and assays 17.6 dwt. over a stoping width of 66 in. It must be admitted that such a length and value are good, and create hopeful views as to the gold content of the reef in the ground as yet unproved between the workings of the two companies. Another interesting point is the cutting of the reef in the Daggafontein ground, in the same vicinity, at a depth of 3,951 ft., assaying 26.1 dwt. over 14.5 in.

An interesting rumor is current that a private undertaking called the West African Diamonds has struck blue ground at a depth of 12 ft. Usually yellow ground is first encountered in a diamond pipe, but possibly there may be no yellow at all. The work on the property is in charge of a diamond prospector from the neighborhood of Kimberley, a fact which makes people place more reliance in the report than they would otherwise do. Alluvial diamonds, up to ½ carat per load, are said to have been found in the vicinity. This, if true, is distinctly high, for De Beers and even the prolific Premier yield nothing approaching this figure.

The Nundydroog, a leading Indian mine on the Kolar field, finds itself in want of funds. It has reached a depth of 4,000 ft., and the management, John Taylor & Sons, wish to sink 2,000 ft. lower, because at that depth the Ooregum mine to the south is meeting with high-grade ore. A reconstruction is proposed, one new 10s. share carrying the heavy liability of 6s. per share being exchanged for each existing 10s. share.

The directors of the famous old Dolcoath tin mine in Cornwall have given notice to the employees to stop work, owing, it is believed, to the financial uncertainty caused by the coal strike. The china clay industry is also seriously affected on account of the shortage of bunker coal affecting shipping.

CANADA

British Columbia

Diamond Drilling Discontinued on Gloucester Group at Franklin

Grand Forks—Diamond drilling on the Gloucester Group and the G. H. claim of Franklin camp, near Grand Forks, which has been in progress for some months under the supervision of the provincial department of mines, has ceased on account of winter weather. A total of 2,888 ft. of drilling has been done in the camp, most of it on the two properties named.

Trout Lake—The Mansfield Mining Co. has uncovered a large vein of $12 silver-lead ore at a depth of 350 ft., according to M. R. Leahy, manager.

Ontario

Few Tax Delinquent Claims Restaked—Power Conditions Improved

Cobalt—In the Cobalt and Lorraine sections twenty-five claims that were thrown open last week because of the defaulting on taxes have been restaked. In the Larder Lake district less than fifteen claims have been restaked. As far as can be learned about 14,000 acres have been thrown open, but apparently, with the exception of a few of the more promising properties, no great activity was shown in restaking which is not considered surprising.

Power conditions in Cobalt and Porcupine have decidedly improved during the last week, owing to the open weather and the considerable amount of rain and snow which has fallen. In Porcupine conditions, although bad, are better than in Cobalt. The power company has only started to draw on its storage within the last two weeks, and without any additional precipitation has sufficient water to carry the mines through at full capacity for about sixty days. The officials of the company endeavored to have the Porcupine operators co-operate and cut the amount of power consumed. It was difficult, however, to get the operators together, so the power company has decided to keep running at full capacity and take a chance on the rainfall later.

In Cobalt also rain has fallen, and in addition to this the mines have been co-operating and have decreased their power consumption about 20 per cent. The same conditions apply in Kirkland Lake.

There is still little evidence of the freeze-up, and operators are hoping that they will get enough water to carry them through the winter. Practically none of the Cobalt mines have had air compressors in operation for several years and have depended entirely on the air supplied through the power companies. Although some of these compressors could be put in commission at short notice, it is probable that the coal supply is not sufficient to enable them to operate for more than two months.

The Crown Reserve is dewatering the North Cobalt mine in Bucke Township, and also has claims under option in Gillies Limit, South Lorraine, Larder Lake and Northwestern Quebec, which properties the company intends to prospect.

Kerr Lake has installed a crusher and is ready to start shipping its 75,000-ton dump to the Dominion Reduction Co. The three veins discovered on the surface while installing the crusher will be developed from the 90 and 150-ft. levels.

H. H. Sutherland, of Toronto, has left for England to conclude the deal for the disposal of Davidson stock to English interests. About $1,000,000 is involved.

It is understood that the Murray-Mogridge gold mine will endeavor to arrange in England the financing of further operations.

MEXICO

Claimed Taxes Must Be Reduced If Silver Output Is To Be Maintained

City of Mexico—The mining department of the Ministry of Commerce and Industry of Mexico has issued a statement to the effect that the decline in the price of silver has not, as yet, affected the production of that metal in Mexico. During the first six months of 1919 the output for the entire republic was 30,538,000 oz., compared with which the production for the first six months of 1920 was 32,958,000, an increase of 2,420,000. The statement adds that thus far the production for the last six months of the year is considerably in excess of the output for a similar period last year.

The president of the Industrial Chambers of Industry takes issue with the statement of the Minister, although no attempt is made to refute the actual figures given. The former points out, however, that by far the larger portion of the silver producing properties of Mexico carry low-grade ore which was worked extensively during the first part of the year but cannot continue to be worked profitably under present prices unless the government comes to the relief of the silver miners by a reduction in general taxes and also a considerable reduction in the export tax. The facts are that up to this date none of the silver camps have actually suspended work. The larger concerns are holding their bullion confident of a reaction.

It is reported from Mexico City that coal mines in the northern states were taken over by officials of the de la Huerta government on Nov. 5. Government ownership is not intended.

State of Mexico

San Miguel Tlaxpampa Puts Mill in Operation

Zacualpam—The San Miguel Tlaxpama, district of Zacualpam, started milling late in October on good grade ore and the management is pushing the output despite the unpromising price of silver. The San Miguel is an old property, recently reopened and reorganized with strong backing. S. J. Lewis is in charge.

A number of small properties in the same district are preparing to open up. The principal drawback to the development of the district is the lack of railway transportation.

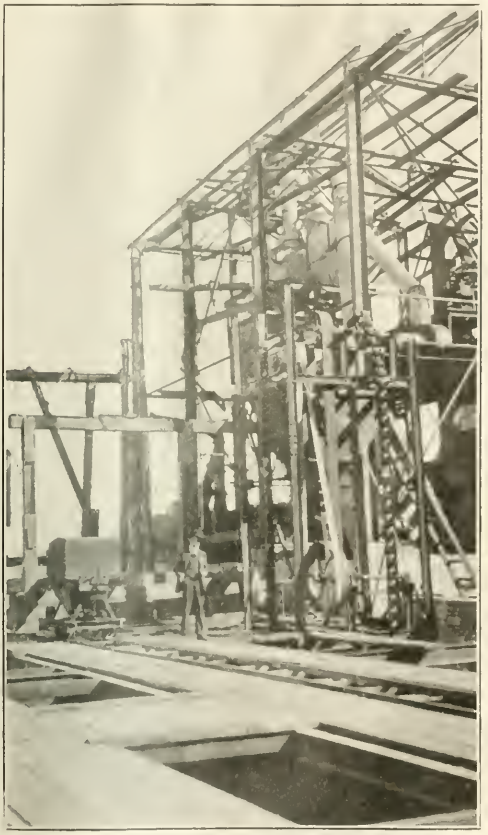
Guanajuato

Guanajuato — J. Walker, formerly manager of the Bank of London and Mexico, now heavily interested in mining here, held a very satisfactory conference with the President of the Republic relative to the removal of the heavy export taxes on the output of low-grade properties. A very large portion of the mines in this state come under this head. Mr. Walker reports that assistance was promised along the line outlined and that an effort will be made to secure rolling stock to remove the congestion here.

Hidalgo

3,000 Workers Laid Off at Pachuca

Pachuca—Three thousand men were laid off the last week in October, ostensibly because of the low price of silver. All the large properties here are working on low-grade ores. Probably the real reason for letting the men out was to forestall a strike which had been threatened on a large scale that would have resulted in a complete paralysis of the entire camp.



EQUIPMENT FOR DRYING AND PULVERIZING CHARCOAL USED FOR FIRING REVERBERATORY FURNACE OF FAMATINA MINING CO., SANTA FLORENTINA, ARGENTINA

ARGENTINE REPUBLIC

Operations of Famatina Mining Co. in Chilecito Region

Santa Florentina — The Famatina Mining Co. in the Argentine Republic, is operating at Santa Florentina in La Rioja province, Department of Chilecito. Santa Florentina owes its existence to the mining activity of this region. The town is situated at the foot of Famatina Mountain, at the top of which, about 15,000 ft. above the sea, are located the rich copper deposits which have been known for years.

The mines can be worked only during the summer months. For transporting the ore the national government has built an aerial tramway, 21 miles long, with eight stations from the mines to the smelter, which may be used by private individuals on payment of a very small freight charge per ton.

For many years the ore was treated in small smelters equipped with water jacketed furnaces which used almost all the available wood of the near-by forests. These although not very large, gave life at least to those regions that today are completely arid and desolate.

Owing to the high-grade ore, the Famatina company was formed and installed a smelter with reverberatory furnaces having a capacity of 200 tons per day. The smelter has been working since Aug. 18 of this year. There are also two converters each with a daily capacity of 10 tons of blister copper carrying a little gold and silver, also equipment for drying and pulverizing charcoal which was bought in Detroit, Mich., and all the accessories required in a plant of this kind. A low-grade gold quartz will be used for lining the converters.

In addition to what has been mentioned the equipment includes two turbines, boilers and two water jacketed furnaces with a capacity of 100 tons.

In spite of the fact that charcoal does not give a high efficiency in the reverberatory furnaces owing to the fact that it has a low percentage of volatile matter, nevertheless the company hopes to get good results and has undertaken to build a similar smelter. The heat of combustion passes under a series of waste heat boilers which generate steam for operating air compressors that supply air to drills in the mine.

The ore averages 5.5 to 6 per cent copper, 28 to 30 grams of gold per ton and from 300 grams to 1 kilogram of silver per ton. The mineral is found in the form of oxide, sulphide and carbonate.

The Chilecito region has an abundance of minerals and there are silver mines which yield 70 kg. per ton. There are also gold and lead mines. Leo W. Michel, an engineer, is trying to organize a company with Chilean capital to exploit a wolfram mine which according to all reports can supply a fair tonnage of wolfram ore.

Mendoza—The owner of the mines of Paramillo de Uspallata, Benito Villanueva, who is vice president of Argentina, has recently sent Zako S. Béyl, Lester W. Strauss and Dr. E. H. Bergeat into this field for the purpose of making reconnaissance and laying out a working plan. It seems that these engineers are going to re-establish a company with Dutch capital to exploit silver properties of this region where ores are found that contain 1 to 2 per cent silver. This is without doubt one of the most important mines of the Argentine Republic, and is situated close to the city of Mendoza. The orebody is about 4 kilometers in dimensions north and south and 4½ kilometers east and west. Galena is the commonest mineral and is found in all of the veins, at times mixed with considerable blende. Chalcopyrite is found in all of the veins and is generally mixed with iron pyrites, which causes considerable variation in the silver and copper content. Tetrahedrite and antimony and arsenic minerals also usually occur. The Paramillo ore is very complex and refractory to smelting, which is the method commonly used for reduction, and to date has not given very good results.

It is proposed to install a concentrator. There is over $400,000 (U. S.) worth of machinery, tools and buildings at the mine. All the veins have been sufficiently worked to make it possible to estimate the available ore approximately. There is also about 30,000 tons of ore in stock.

In the region south of Mendoza exploration permits have been solicited for 1,000,000 hectares (2½ million acres) with the idea of locating rafaelite, vanadium ore and petroleum. The people making the investigations are Argentinians, Chilians and North Americans.

Sandstones have been found which contain 1 to 2 per cent of molybdenum according to analysis by the Division of Mines of Mendoza Province, and this has no doubt created some excitement.

CALIFORNIA

Control of Plumas-Eureka Said To Have Changed Hands

Quincy—W. J. Gruss, president and operating manager of the Gruss Mining Co., reports that he has struck the east and west vein at the point where it crosses the Gruss vein, about 350 ft. north of the shaft on the 200-ft. level. The vein was entered on the footwall and though it has been crosscut for a distance of 30 ft., the hanging wall has not been reached. Mr. Gruss plans to install a 200-ton mill and to buy power from the Great Western Power Co. whose line passes within 1,600 ft. of the property on its way to the Walker mine. Regular shipments of concentrates to the smelter are planned.

Colfax—Activity at the Rising Sun mine near Colfax is increasing. The mill is running twenty-four hours. The ore coming from the mine is of excellent grade and it is thought that the company will soon enter the ranks of dividend payers. The ore recently cut on the 6th, 7th, 8th, and 9th levels is being developed, and enough ore to keep the mill in operation for some time to come is said to have been blocked out.

Sutter Creek—Operations at the Central Eureka mine are progressing steadily. The ore coming from the newly opened level is improving as the crosscut advances. Most of the new machinery is in place, adding to the efficiency of the plant.

Yreka—The Roxbury Mining Co. has completed preparations for extensive hydraulic operations and will place three giants in commission as soon as water is available. Much profitable gold-bearing gravel is in sight.

It is rumored in mining circles that the Plumas-Eureka gold mine, near Johnsville, has passed into the control of the Guggenheim interests. The property is near the Plumas copper belt, and has been a great gold producer for many years.

NEVADA

Ely District Shipping Manganese Ore

Ely—The Jennie A mine at Hamilton, near Ely, will continue development work during the winter, though the trucks will stop hauling ore to Kimberley. Five cars of silver-lead ore have recently been sent to the Utah smelters. John W. Nice is in charge.

Shipments of manganese ore are being made from the Ely district at present. Increased demand and better prices are reported, but increased freight charges menace the activity.

Pioche—Ore shipments from the Pioche district for the week ended Oct. 28 totaled 2,955 tons. Shippers were: Prince Con., 1,750 tons; Virginia Louise, 650; Con. Nevada Utah, 200; Bristol Silver Mines, 160; Black Metals, Inc., 105; Bristol Battles Lease, 45, and Bristol Campbell Lease, 45.

COLORADO

Gem Mining Co. Acquires Argo's Holdings, Including Newhouse Tunnel

Idaho Springs—The tunnel, mill and mining properties of the Argo Reduction & Ore Purchasing Co. have been acquired by the Gem Mining Co. By this transaction the Gem Mining Co. secures control of the Newhouse tunnel with its numerous tributary properties in Clear Creek and Gilpin counties, including the Gunnell mine, which is tapped by the tunnel at a point over 4½ miles from the portal. Recently the Gem Co. secured the properties of the Idaho Mining, Tunnel & Transportation Co., which, together with the original Gem holdings, will materially increase the company's field of operations. The Gem and Silver Age mines are working a crew of about forty men, and as soon as the results of development warrant the working forces will be increased. The production from these properties is now being treated at the Newton mills, but it is probable that the Argo mill will be placed in operation as the tonnage from the newly acquired properties is increased. The Gem Mining Co. is engaged in custom milling, in addition to treating ores from its own properties.

Telluride—Shipments for September were as follows: Tomboy, 31 cars; Smuggler, 33; Liberty Bell, 4; total, 68, all concentrates. Shipments were curtailed by reduction in output of the Smuggler as a result of fire destroying important milling equipment, and on account of a rock slide which temporarily stopped operation of the Tomboy tramway.

Durango—The Esmeralda property is being developed under the direction of W. B. Cauble. Several pockets of rich silver ore have been opened recently. A small trial shipment to the smelter returned over 300 oz. silver per ton.

Leadville—Development is under way in the Fanny Rawlins property, and the first level is being advanced into oxidized ground. On the 4th level some high-grade ore has been developed and is being shipped to the local smelter. About fifteen men are employed.

Alma—Rich ore has been opened recently in the old Dolly Varden property. Assays as high as 400 oz. per ton are reported. A. E. Moynahan is manager.

Gladstone—The Bandora mine has been reopened, and is being developed and operated under the management of E. D. Lycoff. Shoots of silver-lead ore have been opened. The boarding house is being remodeled and two new bunkhouses built, so that work can continue throughout the winter.

Gilpin County—The Topeka and Frontenac mines, formerly operated by the late Henry P. Lowe, have recently been examined in the interests of a New York syndicate, which is supposed to represent British capital.

Ouray—Lessees and small operators have nearly all suspended, owing to high freight and treatment costs. A few have survived and are putting in supplies for the winter. A storm bringing one to two feet of snow has temporarily stopped hauling to and from the mines, but though this is somewhat unusual, all mines will yet have time to make their usual preparations before winter sets in.

The Paymaster Mines Co. has completed the cleaning out and repairing of the Virginia tunnel and is laying track therein preparatory to continuing the drive to cut the ore body recently encountered on Paymaster ground. This will probably be done by contract.

The Mountain Top, Atlas, and Camp Bird remain the only larger mines in operation, the Red Mountain Mines Co. having suspended operations for an indefinite time, chiefly on account of adverse external conditions. The Moun-

tain Top is connecting an air lift and will shortly begin unwatering the shaft to reach the main high-grade body. Plans for a drainage and haulage adit lower down are being perfected.

Among the smaller operators, the Eurades Mining Co. has completed buildings, coal bins and the like and is beginning to haul supplies for a vigorous development campaign during the winter. James A. Lannon, in charge of the Guadaloupe, is installing machinery and supplies for development through a new and lower adit level. Lessees at the Barstow have opened a large body of good milling ore and are putting in supplies for the winter; the winter's accumulation of ore will be milled next summer, as usual. The Paymaster Mines Co. has begun work in the lower crosscut on the Silver Bell and will soon reach the Silver Bell "break," which will be followed to the Paymaster shaft. The Ouray Consolidated M. & R. Co. has been reorganized under K. MacDermid and is taking options on good property near its mill in Ironton, expecting to begin exploration and development on this property this fall.

The test runs at the Gold Crown mill in Ouray by the Pony Express company are about completed and have demonstrated several things of interest locally. About 100 tons of Beaver Belfast ore, carrying considerable lead and much zinc, was successfully treated; high-grade lead concentrates and zinc concentrate were produced in a small mill using only a ball mill, one flotation machine and a few tables. Pony Express ore is now being treated with good results; this is a semi-oxidized siliceous silver ore, regarded as impossible of treatment by flotation. This is the first attempt in years to do any experimental work on such a scale and demonstrate the possibilities of these ores, which have been untreated for years. The success of these tests is inducing serious consideration of other tests on various ores, likely to result in some of these mines being reopened.

Mayday — The Ten Broeck, seven miles above Mayday, on Lewis Mountain, has opened a new vein in the 3,000-ft. tunnel. It is 4 to 5 ft. wide and assays from $12 to $25 per ton in gold and silver.

Another lime orebody has been opened at the Esmeralda. This is the sixth stratum of lime opened here and makes a total of 9 ft. of ore assaying 22 oz. per ton in silver. A shipment made to the Durango smelter brought returns of 320 oz. per ton in silver. A 25 ton mill is to be erected.

Lessees have taken over the Mayday, one of the largest producers of high-grade ore in the district, and will begin work at once.

The Bessie G. shipped 32 sacks of high-grade gold-silver ore, which was packed by burro from the mine to Mayday, then hauled by truck to the Durango smelter. Paul Dalpra and associates have secured a lease on the Idaho and have a carload of ore which is expected to bring $50 per ton.

UTAH

Daly Mine Taken Over by Interests Close to Judge M. & S.—To Open Naildriver From Ontario

Eureka—Ore shipments from the Tintic district for the week ended Oct. 30 amounted to 129 cars, as compared with 174 cars (an unusually heavy tonnage) the week preceding.

The Iron King is doing considerable development on its lower levels and shipping about a car of fluxing iron ore daily from its tunnel level.

At the South Standard, southeast of the Tintic Standard, power connections have been completed to the site of the new shaft and machinery moved over. Buildings are to be erected, after which active development of the property is expected. The shaft of the Central Tintic Standard is down 600 ft. and drifting is expected to start soon on this level. The Copper Leaf has been working for some time to reach the northern extension of the Tintic Standard oil zone. This property is closing down for the present, but is expected to resume work about the first of the new year. The Pinion Queen, also in "east" Tintic, has its shaft down 800 ft., where some mineralization, mainly in silver, has been encountered. Drifting for a cross fissure will be started from the bottom of the shaft in the hope of opening a paying body.

Alta—The Emma Silver at its annual stockholders' meeting elected the following directors: A. L. Hoppaugh, J. E. Galligher, C. S. Burton, J. Herlihy and F. B. Cooke. George H. Dern resigned as manager. A report on the property by M. M. Johnson submitted to the stockholders advised the cessation for the present of work below the Bay City tunnel, owing to heavy expense due to water, and the undertaking of work on levels higher up to locate the faulted segments of orebodies to the north of the Emma body. Work in this section successfully prosecuted would give data for operation later on below the Bay City tunnel.

Park City—Shipments for the week ended Oct. 29 amounted to 1 634 tons of ore and concentrates, as compared with 1,718 tons the week before.

The Daly mine has been taken over by men closely allied with the interests in control of the Judge Mining & Smelting Co. G. W. Lambourne is president and Oscar Friendly mine superintendent. The Judge company is giving employment in its mine and mill to old employees released by the closing down of its electrolytic zinc plant, owing to the increased power costs allowed by the State Public Utilities Commission. Experimental work is being continued until more normal conditions return and the plant can be reopened.

Arrangements have been completed whereby lower levels in the Naildriver can be opened from the Ontario. A drift started in the Ontario and passing through unprospected ground here also will cut the Naildriver at about 1,300 ft., giving an additional depth of 450 ft. below the present workings.

The New Quincy has purchased a compressor and hoist, the latter electrically driven. A lease on the shaft and workings of the Little Bell will permit of work being done on a larger scale than heretofore. At present five or six men are being worked, and as soon as the new equipment is installed the number can be added to.

ARIZONA

United Verde Cuts Force—Denn-Arizona Shuts Down—Arizona Copper Curtails

Jerome—United Verde, now that it has its development work well advanced, has made a cut of 75 per cent in employment of unmarried men, curtailing its force by 30 per cent, which became effective Nov. 1. Arizona-Binghampton, east of Mayer, has also cut its force.

Bisbee — Denn-Arizona has shut down, laying off about 100 men, on account of the copper market. Shattuck-Arizona will continue to operate mine and mill.

Clifton—The Arizona Copper Co. has laid off a large number of men, mainly Mexicans.

Winslow—Heavy drilling equipment is being installed by the Crater Mining Co. on the lip of the meteoric crater New housing has been provided and a water line has been brought in from Canyon Diablo. The first hole is to be in the upraised limestone crater lip on the south side, it being believed that the meteor sought came on a decided angle from the north. A number of years ago a company headed by D. M. Barringer, of Philadelphia, spent a large sum in trying to reach the nickel-iron mass assumed to be buried deeply in the bottom of the crater, which is about 3,800 ft. in diameter, with shattered walls uplifted 600 ft. above the floor. The lip is 130 ft. above the level of the surrounding plain. Below the earth of the crater floor is found what is locally termed "rock flour," so fine that it will sift through a 200-mesh screen. Shaft sinking proved impracticable and was abandoned at 200 ft. Drilling was prosecuted within the depression, but was hindered by the character of the material penetrated. Several of the twenty-five drill holes were bottomed on iron and others went through to the unaltered red sandstone. Chippings brought up had the same constitution as tons of fragments found on the plain, 92 per cent iron, with the balance mainly nickel, with platinum and iridium present to the extent of three-fourths of an ounce to the ton of metal. Estimates of the probable size of the meteor vary greatly. Fragments have been picked up more than five miles away. One of the largest pieces, weighing about half a ton, is in the Field Columbian Museum in Chicago.

Parker—A 125-ton leaching plant is being installed by T. J. Carrigan at

the Arizona Standard Copper's property to work a copper deposit said by Carrigan to have a large tonnage of carbonate and oxide ores that sample from 3 to 7 per cent.

Globe — Diamond drilling on the Castle Dome property is reported to have outlined an extensive sulphide deposit sampling 1.4 per cent copper, with a 20-ft. carbonate capping carrying 2½ per cent. Work has been suspended.

The Mine Operators Co. is installing an experimental leaching plant in the Mineral Creek section, where there are bodies of carbonate ores, capping the deeper sulphides.

Ajo—A cyanide plant is to be installed by A. W. Bramwell at the New Gunsight property.

A new hoist has been installed at the Copper Ridge property, formerly known as the Ajo-Cornelia.

NEW MEXICO

Snake & Opportunity Mines Stop Prospecting at Hillsboro

Silver City—The Maggie claim, located in Shingle Canyon, three and one-half miles from Fierro, is under option to Colorado zinc interests, represented by J. D. Harlan. The property will be drilled under contract by R. H. Hodge.

Hillsboro—The Snake & Opportunity Mines Co. have stopped prospecting and will ship all machinery to Helena, Mont. It is understood that the results of diamond drilling have not proven satisfactory. Nick C. Wallace, who has been in charge, will leave soon for Wallace, Idaho, to take charge of the Midnight property.

Rincon—The Ore Production Co. will start work on a tunnel to cut the vein on their fluorspar property at a depth of 300 ft. A. S. Sears, of San Francisco, who is interested, arranged for the financing of the work with Eastern parties.

MICHIGAN

The Copper District

Flotation To Be Tried on Amygdaloid Slimes—Geological Survey of Franklin Under Way

Houghton—For some years the shortage of trammers has been a serious condition in the copper district. Much thought and attention has been spent in developing mechanical devices which would decrease the manual labor involved. This has resulted in the use of mechanical haulage and mechanical shovels for some purposes. One of the largest operators in the district has developed a "stope scraper" which gives such promise that they are now building them on quite an extensive scale. This machine is built of a size to be operated by two men and will do the work of about eight trammers.

Some of the amygdaloid mines are planning to test the flotation process on their slimes soon. The flotation of the copper in the conglomerate slimes of the Calumet & Hecla and the shale formation of the White Pine Copper Co. has been a success. At the Calumet & Hecla the Minerals Separation process is used.

The Seneca Mining Co. has cut the lode with its 5th level crosscut.

The Franklin Mining Co. is having a geological survey made of its property. It has been shut down for considerable time except for the operation of the pumps. The result of this examination will determine the company's future policy, which will probably be announced soon.

MINNESOTA

Pickands-Mather May Deepen Rowe Shaft

Crosby—At the Portsmouth mine of the Gordon Mining Co. a drainage shaft has been sunk from the bottom of the present ore pit a depth of 75 ft. and a contract has been let for driving 200 ft. of drift from the bottom of shaft to drain the ore pit.

The Rogers-Brown Ore Co. has completed the loading of No. 1 and No. 2 grade stockpiles at its Meacham mine and has transferred its shovel to Cuyuna for loading the balance of Kennedy Mine stock.

Riverton — Pickands-Mather & Co. are considering deepening the Rowe mine shaft to the 375-ft. level and developing the orebody on this level. The shaft was completed to within 40 ft. of the proposed new level last spring, but since that time all work has been confined to active mining of the 220-ft. level.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Commonwealth Concentrator Ready—Federal S. & R. Closes Farmington Mine

Baxter, Kan.—The Commonwealth Mining Co. has completed the erection of its new concentrator just south of the Oklahoma-Kansas state line, south of Baxter Springs, and plans to start it at once. Only one shaft will be used for the present and the mill shaft, which is down only 40 ft., will probably not be completed before spring. The company has a 40-acre lease running for twenty years and is in no hurry to extract ore. Operations will be started at a depth of 150 ft.

Just north of this property a company, in which Charles M. Schwab is said to be interested, is drilling and good strikes have been unofficially reported.

Hockerville — The Federal Smelting & Refining Co. has temporarily closed its Farmington mine at Hockerville to curtail production. It is continuing to prospect by drilling on the Lucky Jenny and Choctaw Chief leases, which it recently took under option.

Miami, Okla.—Brick work has been started on the main building of the $100,000 School of Mines for Oklahoma located at Miami.

ILLINOIS

Strike Called Off at Hillside Fluorspar Mines

Elizabethtown—The strike has been called off at the Hillside Mines near Elizabethtown, Ill. The men wished to return to work and were told they could provided they would turn in their cards to the manager. The mines refused to recognize the union.

Chronology of Mining

October, 1920

Oct. 1. National Safety Congress closed 9th annual session at Milwaukee. —Independent Oil Men's Association meeting at Denver, Col., adjourned.

Oct. 4. New Mexico chapter of American Mining Congress organized at Silver City, N. M.

Oct. 9. Zinc and lead interests of the Mississippi Valley confer with Bureau of Mines officials at St. Louis concerning objectives of experiment station at Rolla, Mo.

Oct. 11. Lowell, suburb of Bisbee, Ariz., partly destroyed by fire.—Miners of Asbestos Corporation in Quebec strike.

Oct. 12. Colorado Metal Mining Association asked Western Trunk Line Committee to restore old freight rates within state.

Oct. 14. Oil producers and refiners meet big gas companies at American Petroleum Institute headquarters, New York City, to discuss oil supply.

Oct. 15. Joplin, Mo., zinc ore producers voted shut-down for two weeks. —St. Louis Section of A. I. M. E. held Fall meeting in the southeastern Missouri "Lead Belt"—General coal strike began in Great Britain.

Oct. 16. Copper Queen branch of Phelps Dodge Corporation announced layoff, effective Nov. 1, of part of steam-shovel force working on Sacramento Hill, Bisbee, Ariz.—Colorado Metal Miners Association filed application with Western Trunk Line Committee for hearing on re-adjustment of bullion rates between Colorado smelters and seaboard refineries.

Oct. 18. Canada Copper Corporation's new 2,000-ton concentrator at Allenby, B. C., began operation.—Canadian iron ore producers ask bounties of the Canadian Tariff Commission.—Subcommittee on standardization of petroleum specifications held open session at Washington, D. C., adjourning on Oct. 20.

Oct. 20. Utah Apex-Utah Consolidated suit decided in favor of former by Judge T. H. Johnson at Salt Lake City, Utah.—Ownership of Engineer group of claims in Atlin district, B. C., brought before courts.

Oct. 23. Judge Mining & Smelting Co., Salt Lake City, Utah, closed electrolytic zinc plant because of low prices and increasing costs.—Increased rates for power in Utah went into effect by order of Utah Public Utilities Commission.

Oct. 27. Two hundred jurymen drawn in the Bisbee, Ariz., deportation case.

THE MARKET REPORT

Daily Prices of Metals

Nov.	Copper, N. Y. net refinery* Electrolytic	Tin		Lead		Zinc
		99 Per Cent	Straits	N. Y.	St. L.	St. L.
4	14.60@14.75	38.00	38.75@39.00	6.75	6.50@6.75	6.80
5	14.60	37.75	38.50@38.75	6.75	6.50@6.75	6.75
6	14.60	37.50	38.25@38.50	6.75	6.50@6.75	6.75
8	14.60	36.00	37.00@37.50	6.50@6.75	6.50@6.75	6.70
9	14.60	36.00	37.00@37.50	6.50@6.75	6.50@6.75	6.65
10	14.60	36.25	37.25@37.75	6.50@6.75	6.50@6.75	6.50@6.60

*These prices correspond to the following quotations for copper, "delivered": 14.75 @14.90, 14.75, 14.75, 14.75, 14.75 and 14.75c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
4	92½	91⅝	100	259¼	263½	35¼	35⅛	38	39⅜
5	90¼	89½	100	259	262¾	35⅜	35	37⅜	39¼
6	...	...	...	...	...	...	...	...	...
8	90¼	89	100	251⅜	256½	35¾	34¼	37½	38⅞
9	90½	89½	100	245⅜	251¾	35⅝	34⅝	36⅞	38¼
10	90	88¾	100	242½	247	35⅛	34½	36¾	38

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Nov.	Sterling Exchange	Silver			Nov	Sterling Exchange	Silver		
		New York, Domestic Origin	New York, Foreign Origin	London			New York, Domestic Origin	New York, Foreign Origin	London
4	342	99½	82⅜	54⅛	8	334	99½	80¼	53⅝
5	341	99½	82	53⅞	9	336	99½	80¾	53¼
6	338	99½	82	54⅜	10	338½	99½	82¼	54⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Nov. 10, 1920

Reports of further price cutting in various industries and a decided slump in the stock market have made the metal market weaker during the last week, and it is difficult to find a note of optimism. Costs now have absolutely no bearing on prices, and the fact that zinc and copper are selling below the present cost of production does not make them a bargain in the eyes of possible buyers. The better feeling which we roported last week seems to have been largely a sentimental one following the election. It is now the general opinion that better prices can hardly be expected before next spring.

Copper

The rather general buying of the last two or three weeks is subsiding, and the present sales are mostly of small volume to customers who were slow in getting into the market. Copper can be bought freely now, even from the large producers, at 14.75c. delivered. Speculators are showing a tendency to come into the market at present levels, and it is likely that if the price were further reduced a large speculative demand would develop. Producers consider that the recent reduction from 18½ to 15c. was a good move, inasmuch as it not only resulted in selling considerable copper but also proved that the sellers were willing to do their share in the general price reduction movement.

Metal for forward delivery is nominally held at ¼c. advance over the prices which we quote, but it is likely that, on orders of any size, sellers would not insist on this premium.

Export demand has been a little better, but the reports of large tonnages sold in Europe are said to be exaggerated, and circulated purely for stock-market purposes.

Lead

On Monday, Nov. 8, the A. S. & R. official price was reduced from 7¼c. to 7c. New York. The St. Louis price remains at 7c., the smelting company feeling that under present conditions, with imported lead arriving here, the St. Louis price is on a parity with that in New York. St. Louis is not a large market for desilverized lead, dealing there being more in chemical lead, which is now commanding a premium of about ¼c., as we mentioned last week.

Less lead has been sold during the last few days than for some time.

Zinc

Demand has been even weaker than usual, and daily concessions in price had to be made to attract purchasers. Many producers continue unwilling to sell at current levels.

Correction: The average price of zinc, St. Louis, for October was incorrectly given as 7.650c. last week. The correct figure is 7.150c.

An Appreciation

THE United States Geological Survey would like to express its appreciation of the improvement in the section "The Market Report," under which is given most helpful information on an increasing number of mineral products. Another section of particular interest to the Survey is "Current Prices of Materials and Supplies." Your publication has long been of great assistance to this bureau, but is found to be of greater use than ever before.

Yours very truly,

GEORGE OTIS SMITH,

Director

Tin

On a declining market, business has been fairly active, with some consumer demand. Futures continue to be preferred to near-by delivery. Banca tin is now very scarce, and is reported commanding a slight premium in London, whereas a few months ago the market was flooded with this variety. Demand for 99 per cent grades has been fairly good, and some electrolytic has been sold at approximately the same prices as for Straits.

Straits tin for future delivery: Nov. 4th, 40.75@41c.; 5th, 40.25@40.50c.; 6th, 39.75@40c.; 8th, 38.75@39.25c.; 9th, 38.50@39c.; 10th, 38.50@38.75c.

Arrivals of tin in long tons: Nov. 1st, Straits, 230; China, 15; 8th, Straits, 1,900; China, 5.

Silver

For the last week the London quotation has remained fairly steady at about 54d., until Nov. 10, when it advanced to 54⅝d. on account of China buying, according to reports. Sterling exchange has played an important part in the New York price. China banks have continued to buy at a premium over the London parity, but the inquiry from this quarter narrowed considerably at the higher level. Up to the close of business Nov. 6, purchases by the U. S. Government under the Pittman Act amounted to 22,527,231 oz.

Mexican Dollars Nov. 4th, 62⅞; 5th, 67½; 6th, 62½; 8th, 61½; 9th, 61½; 10th, 62¾.

Gold

Gold in London: Nov. 4th, 119s. 6d.; 5th, 120s.; 8th, 122s. 4d.; 9th, 122s. 4d.; 10th, 121s. A considerable quantity of gold is now arriving here from Europe. Bankers are buying South African gold in the open London market.

Foreign Exchange

Almost all foreign money declined materially during the last week, in several instances touching new lows. The declining tendency is, in general, the result of a continued preponderance of American exports to Europe over imports. On Tuesday, francs were 5.86c.; lire, 3.42c.; and marks, 1.15c. New York funds in Montreal, 11⅛ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33.1c.; 98@99 per cent, 32.90c. Outside sales reported at 31c. for both grades.

Antimony — Chinese and Japanese brands, 6½@6¾c.; W. C. C. brand, 8c. per lb. Cookson's "C" grade, 12½@13c. Chinese needle antimony, lump, nominal at 6@6¼c. per lb. Standard powdered needle antimony[1] (200 mesh), 9c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 9½@10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum** Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $50@$75 per troy oz.

Palladium—$80@$85 per oz. Dull.

Platinum—Firm at $85@$90 per oz.

Quicksilver—Market quiet; $58@$60 per 75-lb. flask. San Francisco wires $55@$63. Market quiet.

Ruthenium—$200@$220 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb. Demand strong.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 65@75c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

Manganese Ore[1]—60@70c. per unit, seaport; chemical ore (MnO_2) $70@$80 per gross ton, lump; $80@$90 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 65@70c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.50@$5.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$2 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 6—Zinc blende, per ton, high, $47.90; basis 60 per cent zinc, premium, $41; Prime Western, settling, $47.50@$40; buying, $40; fines and slimes, $37.50@$35; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $45.21; calamine, $38.96; all zinc ores, $45.02.

Lead, high, $104.25; basis 80 per cent lead, settling, $100@$65; buying, $65, average settling price, $94.25 per ton.

Shipments for the week: Blende, 10,025; calamine, 173; lead, 926 tons. Value, all ores the week, $546,600.

With the mines closed down and the bulk of the lead loaded from advance purchases, the average settling price was advanced in the face of a weak buying market. Zinc buying aggregated 6,700 tons, practically the same as last week. Producers claim the output is being kept under 8,000 tons per week, but that exceeds sales, and is not reducing the stock.

Platteville, Wis., Nov. 6—Blende, basis 60 per cent zinc, $45 base for high grade. Lead ore, no sales reported. Shipments for the week: Blende, 854 tons. Shipments for the year: Blende, 57,925; calamine, 2,504; lead, 4,428; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 2,080 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$400; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$60, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content.

Gravel—No analysis guarantee, f.o.b. Roseview, Ill., $25 per ton; gravel suitable for acid, chemical or enameling purposes, $60.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $32.50 per net ton, Chewelah, Wash.; $52@$58, Chester, Pa. Austrian grade, $52@$55 per ton, t.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30. The foregoing domestic prices obtain also in the Chicago district.

Monazite[1] — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c. Market improving.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 14@14½c. per lb.; sulphide, powdered, 18@19c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225@$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15. Foreign conditions as affecting the price of American goods remain unchanged.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $175, freight allowed; $170, f.o.b. seaboard bases; English, $165@$170, c.i.f. Atlantic seaports. Spiegeleisen, 18@22 per cent, $75@$80, f.o.b. furnace.

Ferromolybdenum[1]—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $160.

Ferrotungsten[1]—Domestic, 70 to 80 per cent W, 75@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium[1]—Basis 30 to 40 per cent, $6.50@$8 per lb. of V contained, f.o.b. works.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Metal Products

Copper Sheets — Current New York price, 25½c. per lb.; wire, 19c.

Lead Sheets—Full lead sheets, 10½c.; cut lead sheets, 10¾c. in quantity, mill lots.

Nickel Silver—Unchanged at 36½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 23¼c.; sheathing, 23¼c.; rods, ¾ to 3 in., 20¼c.

Zinc Sheets—$12.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 12c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@$50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $121; soaps and splits, $134.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55@$60.

Iron Trade Review

Pittsburgh, Nov. 9, 1920

The decreased demand for steel which has been the feature of the market for some time is reflected more in decreasing mill operations than in declines in prices of the independent manufacturers. Prices for sheets are constantly falling, 6c. being now possible on black sheets for prompt shipment by some independent mills, galvanized being about 1.50c. higher, and heavy gages of blue annealed sometimes sell down to 4c.

Prices of independent steel producers will hardly be down to the Steel Corporation level, in all cases, before March or April.

Pig Iron—Bessemer has been offered at $42 Valley, or $3 further decline. Basic sold in a 2,000-ton lot at $38.50, or $1.50 decline. On an inquiry for 1,000 tons November and December foundry, as low as $41 was quoted by producers. We quote: Bessemer, $42; basic, $38.50; foundry, $41, f.o.b. Valley furnaces, with $1.96 freight to Pittsburgh. A common expectation is that pig iron will find a stable level at within $1 or $2 either way of $30 Valley, though the process may possibly require several months.

Semi-finished Steel—The market is altogether stagnant, with prices practically nominal at $55 for billets, $65 for sheet bars, and $70 for rods.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $16.50@$17; foundry, $18

Market for Feldspar

Kinds and Grades—Where Produced—Heavy Demand and High Quotations—Prices Now Ruling

FELDSPAR, used principally in the manufacture of pottery, chinaware, porcelain, enamel ware, and enamel brick and tile, is of three varieties: potash feldspar, containing potash as well as aluminum; albite, containing soda and aluminum; and soda lime feldspar, containing a mixture of soda and lime, as well as aluminum. In the trade, feldspar is divided into two classes, potash and soda. A typical potash feldspar contains eight to eleven parts K_2O, and two to three parts soda; whereas soda spar has three or four parts less of potash and more of soda. Each kind of feldspar is subdivided into two grades. The first grade is hand picked, and the impurities are removed; the second grade, sometimes called "regular," is run-of-mine. Occasionally, there is a medium grade. North Carolina is the largest producing state, with Maine, New York, Maryland, Connecticut, Pennsylvania, and California about in the order named. The United States is the largest producer, with the United Kingdom, Scandinavia, and Canada following.

World production in 1913 amounted to 210,870 long tons, of which the United States is credited with 108,000. In 1918 this country produced 88,498 in a world total of 161,075 long tons. The decrease was caused by scarce labor, curtailment of fuel supply to the pottery industry, and shortage of railway cars.

Heaviest Demand Ever Known

The demand for feldspar was never before so strong as now, and producers are ever on the lookout for new deposits. There are numerous discoveries of small quantities of spar, but, except where transport facilities are exceptional, the dimensions of a deposit should be such as to make possible the simplest quarrying methods. In fact, the deposit should be at least 25 ft. thick and free from such deleterious minerals as mica, garnet, pyrites and other minor substances. Anyone discovering a deposit of feldspar should ascertain its dimensions before trying to find a market.

Crude feldspar is sold by the long ton; ground feldspar by the short ton. At present, North Carolina crude is quoted at $7 to $8 per ton, f.o.b. mines; Canadian crude sells for the same price at mines, Canada. In the Ohio district ground feldspar sells for $24 to $26 per ton f.o.b. cars at mill. Ground feldspar sells for $25 per ton in Maine, and $21@$23 per ton in New York. Contracts used to be entered into between producers and purchasers for a year's supply; then the period was reduced to six months, and at present the general practice seems to be to charge the price effective at the time of shipment. This is indicative of the present heavy demand for feldspar and of an insufficient supply.

Mines of Huanchaca-Pulacayo, Bolivia

The mining district of Huanchaca-Pulacayo lies in the Province of Porco, Bolivia, and consists of some of the oldest and most famous mines of that country. The deposits according to Commerce Reports, were worked by the natives before the coming of the Spaniards, and were later exploited on a large scale by the Spaniards themselves. After a period of suspension, work was resumed in the 80's of the last century by a French company, which eventually disposed of the properties to the present Chilean owners. The production of ores, which run from 5 per cent and upward of silver, is between 1,500 and 2,000 metric tons per month. Most of the ore is sold to American interests. Enormous dumps below the mouth of the mine at Pulacayo contain about 22 oz. of silver to the ton, and several companies, including British and American interests, are understood to have made proposals recently for working them by modern methods of recovery.

Movements of Ores and Metals In September

Imports and exports of the more important metals and ores, to and from the United States, as reported by the Department of Commerce for September, 1920, and the figures for September, 1919, as finally revised, are as follows:

IMPORTS, SEPTEMBER, 1919 AND 1920

(In Pounds Unless Stated Otherwise)

	Sept., 1919	Sept., 1920
Antimony ore, contents	28	685,581
Antimony matte, regulus or metal	393,070	1,020,012
Copper:		
Ore, contents	3,712,966	5,368,657
Concentrates, contents	2,789,346	3,151,503
Matte, regulus, etc., contents	6,445,780	1,612,617
Imported from (in part):		
Canada	2,194,122	2,374,342
Mexico	9,396,950	4,032,912
Cuba	87,392	127,680
Chile	891,200	2,619,099
Peru	55,868	30,165
Unrefined, black, blister, etc	22,686,470	16,059,779
Refined, in bars, plates, etc	869,157	2,786,177
Old, etc., for remanufacture	199,324	1,509,444
Composition metal, copper chief value	1,896	73,466
Lead:		
Ore, contents	1,414,137	6,396,981
Bullion, contents	21,476,853	14,998,560
Imported from (in part):		
Canada	1,531,828	576,427
Mexico	21,359,162	15,595,599
Chile		1,057,048
Pigs, bars and old	2,622,636	17,125,245
Manganese ore, long tons	19,601	88,422
Imported from (in part):		
Brazil, long tons	16,786	61,800
British India, long tons	500	7,100
Cuba, long tons	275	75
Tungsten ore, long tons	818	360
Pyrites, long tons	28,658	14,433
Imported from (in part):		
Spain, long tons	20,583	883
Canada, long tons	8,061	10,700
Tin ore, long tons	4,036	2,292
Tin bars, blocks, pigs, etc	11,244,146	9,596,819
Imported from (in part):		
United Kingdom	5,568,911	952,504
Straits Settlements	4,730,489	6,034,850
Dutch East Indies	743,524	218,800
Hongkong	10,822	1,432,739
Australia	190,400	190,400
Zinc:		
Ore, contents	1,910,486	3,753,221
Imported from		
Canada	424,258	283,886
Mexico	1,486,228	3,469,335
Blocks or pigs, and old	34,477	500

EXPORTS OF COPPER, LEAD, AND ZINC

(In Pounds)

	Sept., 1919	Sept., 1920
Copper:		
Ore, contents	3,000	36,000
Concentrates, contents	52,460	166,381
Unrefined, black, blister, etc		2,700
Refined, in ingots, bars, etc	62,341,191	19,128,143
Exported to (in part):		
Italy	13,051,699	
France	8,317,911	4,659,360
Sweden	9,369,602	2,964,343
United Kingdom	2,814,973	3,326,631
Japan	25,028,735	
Composition metal, copper chief value	10,928	6,269
Old and scrap	201	2,463
Pipes and tubes	641,448	360,729
Plates and sheets	307,742	2,812,249
Wire, except insulated	2,522,305	2,142,898
Lead:		
Pigs, bars, etc.:		
Produced from domestic ore	744,815	773,879
Produced from foreign ore	8,648,828	1,493,600
Exported to (in part):		
France	448,000	
United Kingdom	224,000	672,000
Argentina	1,008,000	336,000
Brazil	112,000	380,800
Japan	7,375,295	672,000
Canada	149,701	37,683
Zinc:		
Dross	110,613	1,513,279
Spelter:		
Produced from domestic ore	19,034,689	2,240,800
Produced from foreign ore	1,486,337	955,055
Exported to (in part):		
France	160,137	1,008,000
United Kingdom	5,320,504	786,929
Mexico	400	58,300
Japan	14,794,410	
In sheets, strips, etc	3,392,428	1,104,515

COMPANY REPORTS

Kerr Lake Mines, Ltd., Ore Reserves Decreasing

Silver: Canada

The report of Kerr Lake Mines, Ltd., for the fiscal year ending Aug. 31, 1920, states that because of the gradual exhaustion of the reserves of both high- and low-grade ore at the Cobalt property, the amount of silver produced during the past year has been considerably less than during the previous year, and the cost of production higher.

Gross production for the year amounted to 956,049.92 oz. of silver, 42,654 lb. of cobalt, and 34 lb. of mercury. There was 23,151 tons of ore hoisted, at a mining cost of $10.52 per ton. Costs of production per ounce on the basis of entire production amounted to

Mining and development	25.48c.
Shipment and treatment	26.69c.
Administration and general expense	3.87c.
Total	56.04c.

A subsidiary company, the Kerr Lake Mining Co., reports:

KERR LAKE OPERATING AND PROFIT AND LOSS ACCOUNT

Cost of production and development		$243,627.23
Shipment, treatment and other charges		115,654.38
Administration and general expense		36,981.80
Expenses in lake drainage		5,580.79
Exchange		21,386.20
Estimated for taxes		50,000.00
Balance being profit transferred to balance sheet		618,052.08
Total		$1,091,282.54
Proceeds of ore sales		$1,236,859.84
Less: Ore on hand Aug. 31, 1919	$320,285.47	
Plus: Ore on hand Aug. 31, 1920	82,174.65	
Interest		92,533.52
		$1,091,282.54

Dividends paid by Kerr Lake Mining Co. amounted to $1,000,000, all of which was paid to Kerr Lake Mines, Ltd., which transferred $916,089.23 to profit and loss account in the following manner:

Dividends received from Kerr Lake Mining Co	$1,000,000.00
Interest	11,743.12
Total	1,011,743.12
Less:	
Administration and general expense	39,606.17
Sundry mine examinations	56,047.72
Balance	$916,089.23

Kerr Lake Mines, Ltd., now has $432,000 invested in the Tahoe Mine, Utah, and has advanced $278,986.15 to the Rimu Gold Dredging Co., New Zealand.

New Jersey Zinc Co. Shows Surplus of $31,873.68 for Third Quarter

Zinc; New Jersey

A report of the New Jersey Zinc Co. for the quarter ending Sept. 30, 1920, shows a surplus after payment of dividends amounting to $31,873.69. The statement follows:

Income (including dividends from subsidiary companies) after deductions for expenses, taxes, maintenance, repairs and renewals, betterments, depreciation and contingencies		$1,826,873.69
Deduct:		
Interest on first mortgage bonds	$40,000.00	
Reserve for retirement of bonds	75,000.00	115,000.00
Balance		$1,711,873.69
Dividends:		
Quarterly 4 per cent, payable Nov. 10, 1920		1,680,000.00
Surplus for the quarter		$31,873.69

NOTE: Reserve for Federal taxes has been sufficiently covered by the sums reserved in the first and second quarters of this calendar year.

Wallaroo & Moonta Records Deficit

Copper: Australia

The thirty-first annual report of the Wallaroo & Moonta Mining & Smelting Co., a British corporation, shows a deficit for the fiscal year ending June 30, 1920, of £38,914 2s. 8d. The Wallaroo Smelting Works produced 2,302 tons of refined copper, 301 oz. of gold, and 2,430 tons of sulphuric acid, from a total of 23,731 tons of ore mined or purchased. The output of copper was sold to the Copper Producers' Association.

Two dividends totaling 3s. per share were declared during the year on the 160,000 shares of £2 par value each outstanding. The surplus of £150,661 7s. on June 30, 1919, was reduced to £87,747 4s. 4d. on June 30, 1920.

The profit and loss account for the fiscal year follows:

DEBIT

	£	s.	d.
Working expenses	311,563	0	0
Adelaide office expenses, including directors' and auditors' fees, salaries, rent, and general business charges	4,979	15	2
Special charges	2,030	14	3
Royalty on mineral leases for 1919-20	200	0	0
State income tax, 1918-19	508	13	11
Interest and discount	3,773	4	8
Total	£323,055	17	0

	£	s.	d.
Balance of trade accounts	266,060	14	2
Federal income tax (refund account, 1917)	5,130	13	11
War-time profits tax (refund account, 1915-16)	12,950	6	3
Balance-reserve of accumulated profits	38,914	2	8
Total	£323,055	17	0

International Nickel Co. Shows Profit

Nickel; Canada, United States

A report of the International Nickel Co. for the six months ending Sept. 30, 1920, shows a profit of $2,262,017.89 on $8,912,600 of preferred and $41,834,600 common stock outstanding. Profit and loss statement follows:

Earnings		$3,729,675.00
Other income		464,300.06
Total income		$4,193,975.06
Administration and general expenses	$316,952.73	
Reserved for U. S. and foreign taxes (estimated)	460,665.84	777,618.57
Net income		$3,416,356.49
Depreciation and mineral exhaustion		1,154,338.60
Profits		$2,262,017.89

DIVIDENDS

Preferred No. 59—		
Paid Aug. 2, 1920	$133,689.00	
Preferred No. 60—		
Payable Nov. 1, 1920	133,689.00	267,378.00
Balance		$1,994,639.89

A consolidated general balance sheet of Sept. 30, 1920, follows:

ASSETS

Property	$48,364,300.31
Investments	1,603,705.06
Inventories	9,738,204.74
Accounts receivable	1,982,328.50
Loans on call	3,015,000.00
Cash	2,182,376.41
Total	$66,900,915.08

LIABILITIES

Preferred stock	$8,912,600.00
Common stock	41,834,600.00
Accounts payable and tax reserves	3,006,349.79
Preferred dividend No. 60, payable Nov. 1, 1920	133,689.00
Accident and insurance funds	377,803.02
Exchange reserve	250,000.00
Surplus April 1, 1920	10,391,233.38
Profit and loss (balance as per statement)	1,994,639.89
Total	$66,900,915.08

MINING STOCKS

Week Ended November 6, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston			*60	
Ahmeek	Boston	58½	56	57½	Sept. '20, Q .50
Alaska-B.C.	N. Y. Curb	⅞	⅞		
Allouez	Boston	23½	23½	23½	Mar. '19, 1.00
Anaconda	N. Y.	51½	50	51½	Aug. '20, Q 1.00
Ariz. Com'l	Boston	9½	9	9½	Oct. '18, .50
Big Ledge	N. Y. Curb	3/16	3/16	3/16	
Bingham Mines	Boston	9½	9¼	9½	Sept. '19, Q .25
Calumet & Ariz.	Boston	55	4	54	Sept '20, Q 1.00
Calumet & Hecla	Boston	260	250	251	June '20, Q 5.00
Canada Copper	N. Y. Curb			⅛	
Centennial	Boston	9½	9½	9½	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	39¼	38	38	Sept '20, Q 1.00
Chief Consol.	Boston Curb	3	3	3	Nov. '20, Q .10
Chile Copper	N. Y.	14⅛	13⅞	14	
Chino	N. Y.	26⅛	24	25⅛	Sept '20, Q 37½
Columbus Rexall	Salt Lake	*35	*34	*34	
Con. Ariz.	N. Y. Curb	1/16	1/32	1/32	Dec. '18, Q .05
Con. Copper M.	N. Y. Curb			*6⅛	
Copper Range	Boston	34½	33¾	34	Sept. '20, Q .50
Crystal Copper	Boston Curb	*65	*42	*61	
Davis-Daly	Boston	7¾	7	7¾	Mar. '20, Q .25
East Butte	Boston	10¼	9	9	Dec. '19, A .50
First Nat'l	Boston Curb	*85	*80	*80	Feb. '19, SA .15
Frankl'n	Boston	3	2¼	2¼	
Gadsden Copper	N. Y. Curb			*70	
Granby Consol.	N. Y.			28	May '19, Q 1.25
Greene Cananea	N. Y.	28⅛	25⅞	25⅞	Aug. '20, Q .50
Hancock	Boston	4	4	4	
Houghton	Boston Curb			*45	
Howe Sound	N. Y. Curb	3½	3¼	3¼	Oct. '20, Q .05
Inspiration Con.	N. Y.	43¼	42⅜	42⅜	Oct. 20, Q 1.00
Iron Cap	Boston Curb			8	Sept. 20, K .25
Isle Royale	Boston	24⅛	23½	24	Sept. '19 SA .50
Kennecott	N. Y.	23¾	22⅞	22⅞	Sept '20 Q .50
Keweenaw	Boston			1½	
Lake Copper	Boston			2½	
La Salle	Boston	2¼	2	2¼	
Magma Chief	N. Y. Curb			*21	
Magma Copper	N. Y. Curb			17	Jan. '19, Q .50
Majestic	Boston Curb	*15	*13	*13	
Mason Valley	Boston	1⅞	1⅞	1⅞	
Mass Consol	Boston	3⅛	3¼	3⅛	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	5	4½	4½	
Miami	N. Y.	19⅛	19	19⅛	Aug '20, Q .50
Michigan	Boston	3⅛	3⅛	3⅛	
Mohawk	Boston	58	56	57½	Nov. '20, Q 1.00
Mother Lode (new)	N. Y. Curb	6	5⅜	5⅜	
Nevada Con.	N. Y.	11⅞	11	11⅞	Sept '20, Q .25
New Arcadian	Boston			2½	
New Baltic	Boston Curb			3	
New Cornelia	Boston	18	17⅛	17⅛	Aug. '20, .25
Nixon Nev.	N. Y. Curb			*9	
North Butte	Boston	15⅛	14⅛	15	Oct. '18, Q .25
North Lake	Boston			*25	
Ohio Copper	N. Y. Curb			2/16	
Old Colony	Boston	2⅜	2	2⅜	
Old Dominion	Boston	23⅛	22⅛	22⅞	Dec. '18 Q 1.00
Osceola	Boston	31⅜	31	31	June '20, Q .50
Phelps Dodge	Open Mar.	†175	†150		Oct '20, Q 2.50
Quincy	Boston	43⅛	41⅞	43⅛	Sept '20, Q 1.00
Ray Con.	N. Y.	14⅛	13⅛	13⅛	June '20, Q .25
Ray Hercules	Boston Curb	*60	*58	*40	
St. Mary's M. L.	Boston	37	35	37	June '20, K 2.00
Seneca Copper	Boston	22	19½	22	
Shannon	Boston	1⅜	1⅛	1⅛	Nov. '17, Q .25
Shattuck Ariz.	N. Y.	8	7⅛	7⅛	Jan. '20 Q .25
South Lake	Boston			2	
South Utah	Boston	*10	*6	*6	
Superior Copper	Boston	4⅛	4⅛	4⅛	Apr. '17, 1.00
Superior & Boston	Boston	3	2⅛	2⅛	
Tenn. C. & C.	N. Y.	9⅜	9⅛	9¼	May '18, I 1.00
Tuolumne	Boston	*55	*50	*50	May '13, .10
United Verde Ex.	Boston Curb	*29⅜	*29	*29	Nov '20, Q .50
Utah Consol.	Boston	5	4⅛	4⅛	Sept '18, .25
Utah Copper	N. Y.	61⅜	58⅛	59	Sept '20, Q 1.50
Utah M. & T.	Boston	1⅜	1⅛	1⅛	Dec. '17, .30
Victoria	Boston	1⅞	1⅞	1⅞	
Winona	Boston	*50	*40	*40	
Wolverine	Boston	11⅛	11	11	Jan. '20, Q .50
LEAD					
Hecla Mining	N. Y. Curb	4⅛	4⅛	4⅛	Sept '20, QX .15
St. Joseph Lead	N. Y.	14⅞	14⅛	14⅛	Sept '20, QX .50
Stewart	Boston Curb			*13	Dec. '15, .05
Utah Apex	Boston	3⅜	3	3⅛	Nov. '20, Q .25
ZINC					
Am. Z. L. & S.	N. Y.	10⅛	9⅞	9⅞	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	40	40	40	Nov. '20, Q 1.50
Butte C. & Z.	N. Y.	7	6⅞	6⅞	June '18, I .50
Butte & Superior	N. Y.	16⅛	15⅜	16⅛	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	8⅛	7⅜	7⅜	June '20, Q .50
New Jersey Z.	N. Y. Curb			169	Aug '20, Q 4.00
Success	N. Y. Curb	3⅛	3	3	July '16, .03
Yellow Pine	Los Angeles			*90	June '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1	1⅛	1⅛	
Alaska Juneau	N. Y.	1	1⅛	1⅛	
Carson Hill	N. Y. Curb			22⅛	
Cresson Consol. G.	N. Y. Curb	1⅛	1	1⅛	June '20, Q .10
Dome Ex.	Toronto	*50	*42	*45	
Dome Mines	N. Y.	13	11½	12⅞	Oct. '20, Q .25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept '20, Q .02
Goldfield Con.	N. Y. Curb	*9	*8	*9	Dec. '19, .05
Hedley	Boston			4½	June '19, .10
Hollinger Con.	Toronto	5 65	5.25	5.55	Nov. '20, X .05
Homestake	N. Y.			45	Sept. '19, .50
Kirkland Lake	Toronto	*44	*39½	*43½	
Lake Shore	Toronto	1 08	1 05	1 08	Oct. '20, K .02
McIntyre-Porcupine	Toronto	1.95	1.92	1.94	Sept '20, K .05
Porcupine Crown	Toronto	*23	*23	*23	July '17, .03
Portland	Colo. Sprgs.	‡		*60	Oct. '20, Q .01½
Reorgan. Booth	N. Y. Curb	*5⅛	*4	*4	May '19, .05
Silver Pick	N. Y. Curb	*6	*5	*5	
Teck Hughes	Toronto			*8½	
Tom Reed	Los Angeles	1.47½	1.43	1.43	Dec. '19, .02
United Eastern	N. Y. Curb	3¼	2⅛	2⅛	Oct. '20, Q .15
Vindicator Consol.	Colo. Sprgs.	‡		18	Jan. '20, Q .01
West Dome Consol	Toronto	*5⅛	*5⅛	*5⅛	
White Caps Mining	N. Y. Curb	*9	*7	*8	
Yukon Gold	Bostoo Curb			1⅛	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*21	*18	*20	Apr. '20, M .03
Beaver Con.	Toronto	*39½	*37½	*39½	May '20, K .03
Cosmos	Toronto			2.37	Nov. '20, Q .12½
Crown Reserve	Toronto	*22	*22	*22	Jan. '20, Q .05
Kerr Lake	Boston	3¼	3⅛	3⅛	Oct. '20, K 12½
La Rose	Toronto			*30	Apr. '18, .02
McKinley-Dar.	Toronto	*49⅛	*47	*48	Oct. '20, Q .03
Mining Corp.	Toronto	1.69	1 65	1 65	Sept '20, Q 12½
Nipissing	N. Y. Curb	8⅛	8⅛	8⅛	Oct. '20, QX .50
Ontario Silver	N. Y.	5⅜	5⅛	5⅛	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12, .10
Peterson Lake	Toronto	*12	*11½	*11½	Jan. '17, 01½
Temiskaming	Toronto	*32½	*32	*32½	Jan. '20, K .04
Trethewey	Toronto	*26⅛	*24⅛	*26⅛	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*2	*1	*1⅛	
Barnes-King	Butte	‡		1.11	Aug. '20, Q .05
Best & Mont.	Boston			*63	
Canbboy	N. Y. Curb	*6	*5	*6	
El Salvador	N. Y. Curb	⅜	⅜	⅜	
Jim Butler	N. Y. Curb	*19	*16	*17	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*7	*5	*6	June '16, .05
Louisiana Con.	N. Y. Curb			1/32	
MacNamara M.	N. Y. Curb	1/16	1/16	1/16	May '10, .02½
N.Y. Honduras Rosar	Open Mar.	†11⅛	†10		Oct. '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1⅛	1⅛	Oct '20, Q .05
Tonopah-Divide	N. Y. Curb	1⅛	⅝	1⅛	
Tonopah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	Oct '20, Q .05
Tonopah Mining	N. Y. Curb	1⅜	1⅛	1⅛	Oct. '20, SA .05
West End Con.	N. Y. Curb	1⅛	1⅛	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb.	*19	*17	*17	July. '20, M .01
Consol. M. & S.	Montreal	22½	22	22	Oct. '20, Q .62½
Daly Mining	Salt Lake			2.40	July '20, Q .10
Daly-West	Boston			4½	Oct '20, Q .25
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q .10
Electric Point	Spokane	*14⅛	*14	*14½	May '20, SA .03
Fed M. & S.	N. Y.	10	9⅞	10	Jan. '09, 1.50
Fed. M. & S. pf.	N. Y.			31½	Sept. '20, Q 1.75
Florence Silver	Spokane	*25	*25	*25	Apr. '19, 01½
Grand Central	Salt Lake			*37½	June '20, K .03
Iron Blossom	N. Y. Curb	1/16	1/16	1/16	Apr. '20, Q .02½
Judge M. & S.	Salt Lake			3.82½	Sept. '20, Q .12½
Marsh Mines	N. Y. Curb	*11	*10	*10	
Prince Consol	N. Y. Curb	1/16	1/16	1/16	Nov. '17, .02½
Rambler-Cariboo	Spokane	*8	*6	*8	Feb. '19, .01
Rex Con.	N. Y. Curb	*6	*6	*6	
South Heola	Salt Lake			*85	Sept '19, K 15
Stand. S. L.	N. Y. Curb	1/16	1/16	1/16	Oct '17, .05
Tamarack-Custer	Spokane	2.10	2.10	2.10	Dec. '19, K .03
Tintic Standard	Salt Lake	3.40	3.05	3.40	June '20, Q .10
Wilbert Mining	N. Y. Curb	*4⅛	*3	*3	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	17⅛	16⅛	17	Mar. '19, .50
Internat'l Nick.pf.	N. Y.	83⅛	83½	83½	Nov. '20, Q 1.50
QUICKSILVER					
New Idria	Boston	2⅛	2⅛	2⅛	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb			*5	
VANADIUM					
Vanadium Corp.	N. Y.	64⅛	49⅛	52	Oct. '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	94	89	89½	Oct. '20, Q 1.50
Asbestos Corp. pf.	Montreal	99	96½	98	Oct. '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	61	57⅛	57⅛	Sept. '20, Q 1.00
Am. S. & R. pf.	N. Y.	91⅛	91	91	Sept. '20, Q 1.75
Am. Sm. pf. A.	N. Y.	81	78⅛	80	Oct '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	55⅛	52⅛	52⅛	Oct '20, Q 1.50
U.S.S.R.& M pf.	Boston	45	44	45	Oct. '20, Q .87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly. SA, Semi-annually. BM, bimontbly. K, Irregular. I, Initial X, includes extra

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York — Current	New York — One Yr. Ago
No. 10	$3 55 7 50	7 09	7 13	8 65	$7 00– 8 00	4 82
No. 12	3 60 7 55	7 09	7 18	8 70	7 05– 8 05	4 87
No. 14	3 65 7 60	7 09	7 23	8 75	7 10– 8 10	4 92
No. 16	3 75 6 70	7 09	7 28	8 85	7 20– 8 20	5 02
Black:						
*Nos. 18 and 20	4 15 8 30	8 10	7 90	10 60	8 41 9 80	5 80
*Nos. 22 and 24	4 20 8 35	8 10	7 95	10 65	8 46 9 85	5 85
*No 26	4 25 8 40	8 10	8 00	10 70	8 51 9 90	5 90
*No. 28	4 35–8 50	8 10	8 10	10 80	8 61 10 00	6 00
Galvanized:						
No. 10	4 70–8 50	9 60	8 60		8 91–11 50	6 25
No. 12	4 80 8 60	9 60	8 70	11 35	9 01 11 50	6 30
No. 14	4 80 8 60	9 60	8 70	11 35	9 01 11 60	6 35
Nos. 18 and 20	5 10 8 90	9 60	9 00	11 65	9 26 11 90	6 65
Nos. 22 and 24	5 25 9 05	9 60	9 15	11 80	9 41 12 05	6 80
*No. 26	5 40 9 20	9 60	9 30	11 95	9 56–12 20	6 95
*No. 28	5 70 9 50	9 60	9 60	12 25	9 86–12 50	7 25

* For painted corrugated sheets, add 30c. per 1000 lb. for 5 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets, add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh — Current	Pittsburgh — One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅜ in. and larger	$4 00–4 25	$3 35	$3 40@$4 00	$5 47½	$7 75
Track bolts	6 00–6 50	4 35	4 60@5 00		8 75
Standard section angle bars	3 00 4 00	3 00	2 75@3 40		5 45

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the $2.55 places named:

	Mill Pittsburgh	New York — Current	New York — 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in.	$2 45@$3 10	$4 30	$3 47	$4 04	$3 97
Channels, 3 to 15 in.	2 45@ 3 10	4 30	3 47	4 04	3 97
Angles, 3 to 6 in., ¼ in. thick	2 45@ 3 10	4 30	3 47	4 04	3 97
Tees, 3 in. and larger	2 45@ 3 75	4 35	3 52	4 09	4 02
Plates	2 65@ 4 00	4 50	3 67	4 24	4 17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4.00@ $4 50	$4 00@$5 00	$2 55

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Warehouse — Mill Pittsburgh	New York — Current	New York — One Yr. Ago	Chicago	St. Louis	San Francisco
½ in. and larger	$4 50	$6.11	$4.72	$5.00	$5.69	$7 05

CONE HEAD BOILER

½ in. and larger	4 60	7 10	4 82	5.10	5.79	7 15
⅝ and ¾	4 75	7 25	4 97	5.25	5 94	7 40
⅞ and 1	5.00	7 00	5.32	5 60	6.19	7.60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

Chicago, +10% on galvanized, 22½–21½% off on bright.
Western and California Territory:
20%, plow steel; 22½%, galv. iron rigging and guy rope.
Montana, Idaho and Arizona
15, plow steel, 27½, galv. iron rigging and guy rope.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight	$5 75	$8 15	$7 00	$7 00	$7 00
Assorted	5.85	8 40	7 15	7 15	7 25

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars..... $2.35@$4 00 Steel bars..... $4.27@ $4 50

COAL DIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Chicago	Denver
$0.10	$0.16½	$0.18	$0.11½	$0 15	$0.18

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@14c.	13c.	20c.	14½
Hollow	17@20c.	...	...	21c.

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galv.	Iron Inches	Iron Black	Iron Galv.
to 3	54 to 57½	41½ to 44	⅛	5½ to 5½	+ 1½ to 11½
			¼	19½ to 9½	1½ to 11½
			⅜ to 1½	24½ to 34½	8 to 18½

LAP WELD

2	47 to 50½	34½ to 38	2	20½ to 28½	6½ to 14½
2½ to 6	50 to 53½	37½ to 41	2½ to 6	22½ to 30½	9½ to 17½

BUTT WELD, EXTRA STRONG, PLAIN ENDS

2 to 3	53 to 56½	40½ to 44	¼ to 1½	24½ to 34½	9½ to 19½

LAP WELD, EXTRA STRONG, PLAIN ENDS

2	45 to 48½	33½ to 37	2	21½ to 29½	8½ to 16½
2½ to 4	48 to 51½	3½ to 40	2½ to 4	23½ to 31½	11½ to 31½
4½ to 6	47 to 50½	35½ to 39	4½ to 6	22½ to 30½	10½ to 18½
7 to 8	43 to 46½	29½ to 33	7 to 8	14½ to 22½	2½ to 10½
9 to 12	38 to 41½	24½ to 28	9 to 12	9½ to 17½	5½ to+2½

STEEL—From warehouses at the places named the following discounts hold for steel pipe:

	Black — New York	Black — Cleveland	Black — Chicago
⅜ to 3 in. butt welded	38%	30%	54@40%
3½ to 6 in. lap welded	33%	41%	50@40%

	Galvanized — New York	Galvanized — Cleveland	Galvanized — Chicago
⅜ to 3 in. butt welded	22%	30%	40@30%
3½ to 6 in. lap welded	18%	26%	37½@27½%

Malleable fittings, Class B and C, from New York stock sell at list plus 23%. Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	+$1 25	$1 50	List	$2 25	+$1 15	$1 0
Hot pressed hexagon	+ 1 25	1 50	List	2 25	+ 1 15	85
Cold punched square	+ 1 25	1 50	List	2 25	+ 1 15	1 00
Cold punched hexagon	+ 1 25	1 50	List	2 25	+ 1 15	1 00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30	50 10%
Chicago	40	50%
Cleveland	50	60–10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+10%	25%	+ 20
Larger and longer up to 1 in. by 30 in.	Net List	25	10

WASHERS—From warehouse at the places named the following amount is deducted from list price.

For wrought-iron washers:

New York ... List Cleveland ... $2 50 Chicago..... $1 90

For cast-iron washers the base price per 100 lb. is as follows:
New York ... $7 00 Cleveland ... $4 50 Chicago..... $5.50

CONSTRUCTION MATERIALS

PREPARED ROOFING—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at manufacturing points.

	New York — 1-Ply c.l.	New York — 2-Ply l.c.l.	New York — 3-Ply c.l.	Philadelphia — 1-Ply c.l.	Philadelphia — 2-Ply l.c.l.	Philadelphia — 3-Ply c.l.
No. 1 grade	$2 50	$3 00	$3 55	$2 40	$2 90	$3 45
No. 2 grade	2 25	2 70	3.20	2 15	2 00	3 10

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $4 25 per roll in carload lots and $4.50 for smaller quantities.

Shingles, red and green slate finish, cost $8 75 per square in carloads; $9 00 in smaller quantities, in Philadelphia.

ROOFING MATERIALS—Prices per ton f.o.b. New York and Chicago:

Tar felt (14 lb. per square of 100 sq.ft.), per roll	$3 30
Tar pitch (in 400-lb. barrels), per 100 lb	2 25
Asphalt pitch (in barrels), per ton	56 50
Asphalt felt (light), per ton	132 00
Asphalt felt (heavy), per ton	138 00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
Minneapolis	$0 1192	$0 2086	$0 3278
Seattle	13	.175	.30
Los Angeles	10	.125	...
Cincinnati	.125	.2186	.8286

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under				12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$73.00	$70.00	....	$65.00	$85.00	$75 00
Kansas City	51 00	51.25	$51.25	51.25	60.00	51 25
Seattle	....	32.00	.....	....	....	32.00
New Orleans	49 00	....	.....	.....	55 00	.....
Baltimore	72.50	....	.....	.....	82 50	....
Cincinnati	45.00	50 00	50 00	.....	55 00	55 00
Montreal	87.00	87.00	70.00	85.00	79.00*	110.00
Los Angeles†	....	57.00	....	.....	....	59 00
Detroit	57.00	....	....	.....	67.25	67 25
Denver	.....	43.75	....	.....	.....	44.75

	1-In. Rough, 10-In. x 16-Ft. and under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$110 00	$102.00	$52 00	$105 00	
Kansas City	102.00	106 50	106.50	113.00	$112 75
Seattle	....	37 50	.....	....	38 50
New Orleans	....	42 00	.....	46 50	..
Baltimore (box)	52.50@ 60	....	....	54 64	..
Cincinnati	50 00	55 00	50 00	45 00	50 00
Montreal	80 00	80 00	70 00	85.00	85 00
Los Angeles	....	58.00	....	....	....
Detroit	43 00	....	43.00	....	44 00
Denver	....	37.75	....	....	38.25

*Montreal—Up to 22 ft.; over which, $3.00 per M. increase up to 30 ft.

NAILS—the followiog quotations are per keg from warehouse:

	Mill Pittsburgh	Denver	Chicago	San Francisco
Wire	$4 25	$5 40	$4 45	$6 45
Cut	..	5 90	8@ 11	8 95

PORTLAND CEMENT—These prices are for barrels in carload lots, *without bags.*

	Current	One Month Ago	One Year Ago
New York (delivered)	$4 10	$4 10	$2 30
Jersey City (delivered)	3 55	4 39	2 27
Chicago	2 35	2 35	2 00
Pittsburgh	2 42	2 42	2 05
Cleveland	2 73	2 73	2 32
Denver	3 25	3 25	3 12
Los Angeles	3 10	3 10	2 78
San Francisco	3 09	3.09	2.43

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 200-lb. Barrel	
	Finished	Common	Finished	Common
New York	$21 00	$20.00	$3 80 at plant	$3 60*
Kansas City	27 20	26.20	2 50	2 40
Chicago	....	....	....	1 65
St. Louis	27 00	21.00	....	2 50
San Francisco	25 40	22 00	....	2 25
Minneapolis	29 50	23 00	2 00†	1 85†
Denver	32 00	....	1 05 (bu.)	.....

NOTE—Refund of 10c per barrel, with 25c per ton off on hydrated.
* 300-lb. barrels. † 180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	Year Ago	Current	Year Ago
Raw per barrel (5 bbl. lots)	$1.07	$2 15	$1 20	$2 37
5-gal. cans	1 22	2 30	1 45	2 57
1-gal. cans	1.32			

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		One Year Ago		Current		1 Yr. Ago	
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil		
100-lb. kegs	15 50	17 00	13 00	14 50	15 50	13 00		
25- and 50-lb. kegs.	15 75	17 25	13 25	14 75	15 75	13 25		
12½-lb. kegs.	16 00	17 50	13 50	15 00	16 00	13 50		
5-lb. cans	18 50	20 00	15 00	16 50	18 50	15 00		
1-lb. cans	20 50	22 00	16 00	17 50	20 50	16 00		

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	50-Ft. Lengths
Underwriters' 2½ in.		$0.85 per ft.
Common, 2½-in.		30%

	AIR		
	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0 60	$0.40	$0 30

STEAM—DISCOUNTS FROM LIST

First grade 20% Second grade 30% Third grade 45%

LEATHER BELTING—Present discounts from fair quantities (1 doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30%	25%	20%

RAWHIDE LACING—For cut, be t grade, 25%, 2nd grade, 30%. For laces in sides, 79c. per sq.ft.; 2nd, 75c. For semi-tanned: cut, 40%; sides, 83c. per sq. ft.

MANILA ROPE—For rope smaller than ½-in. the price is ½ to $0 02 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0 01. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜ in., 6; ½-in., 4½; ⅝-in., 3½-in., 2 ft. 10 in.; ¾-in., 2 ft. 4 in. Following is price per pound for ¼ in. and larger, in 1200-ft. coils:

New York	29	Kansas City	$0 30½
Cincinnati	35	Seattle	26
Chicago	27	St. Louis	26½
Minneapolis	29½	Denver	30
San Francisco	27	Los Angeles	31

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1 00
Asbestos for high-pressure steam	1 70
Duck and rubber for piston packing	1 00
Flax, regular	1 20
Flax, waterproofed	1 70
Compressed asbestos sheet	90
Wire insertion asbestos sheet	1.50
Rubber sheet	.50
Rubber sheet, ware insertion	.70
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1 40
Asbestos wick, ½- and 1-lb. balls	1 10

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$2 00	$2 25
Chicago—Creosoted	2 25	2 50
San Francisco—Douglas fir, green	1 35	90
San Francisco—Douglas fir, creosoted	2 50	1 92

Prices per tie at Missouri mills: St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0 80	No. 1	$0 60
No. 2	90	No. 2	70
No. 3	1 00	No. 3	80
No. 4	1 25		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago In. Bbl.	Chicago Carloads
Pure steam-distilled pine oil, sp gr 0 93-0 94	$1 85	$1 90	$1 85
Pure destructively distilled pine oil	1 45	1 90	1 85
Pine tar oil, sp gr 1.025-1 035	.45	34	32
Crude turpentine, sp gr 0 900-0.970	1 75	1 30	1 17
Hardwood creosote, sp gr. 0.96-0 99*	35	....	..

*F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11 00 15 50	13 00	16 00	11 00-14 00
Colored mixed	7 00 10 50	9 00 12 00	12 00	9 50 12 00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x13
Cleveland	$55 00	$45 00
Chicago	41 00	43 53

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb keg for black powder:

	Low Freezing	Gelatin			Black
	20%	40%	60%	80%	Powder
New York		$0 3325	$0 3625		$2 30
Kansas City	$0 2475	.27	30	.34	2 40
Seattle	.18	205	225	.29½	2 60
Chicago	.2175	.2525	2975	34	2 45
Minneapolis	.2272	.2629	2935		2 90
St. Louis	.25	285	315	.3575	2 60
Denver	.2250	26	29	.3325	2 80
Los Angeles	.22	27	31		2 95
Atlanta	.2575	2975	3225	.3650	2 55
Cincinnati	.2275	2525	2725		2 30
Montreal	30	32	37	.38	4 10

CHEMICALS

SODIUM CYANIDE—New York price is 28@32c. per lb.; Chicago, 30c St. Louis, 34c.; Birmingham, 45c., Denver, 40c

SODIUM SULPHIDE—New York price per pound is 7c.@ 7½c. for concentrated Chicago, 5c. for concentrated, 3½c. for crystals. Denver price is 8c. for crystals St. Louis, concentrated 10½c., crystals 11c. Concentrated comes in 500-lb. drums crystals in 440 lb. bbl.

ZINC DUST—For 350 mesh the New York price is 12@ 13c. per lb. Chicago 12½c.

ALUMINUM DUST—Chicago price is $1.10 per lb.; Birmingham, $1 52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union Single 25-Lb. Drums	Union 25-Lb Ton Lots
East of the Mississippi, North of Chattanooga	$106 00	$101 00	$1 52	$1 45
Southeastern portion U. S. A.	115 50	110 50	1 63	1 60
Texas (except El Paso)	124 00	119 00	1 74	1 71
El Paso, Texas	128 00	121 00	1 77	1 75
Denver, Col.	124 00	119 00	1 74	1 71
West Coast	129 00	124 00	1 81	1 75

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Engineering and Mining Journal

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METALS NON-METALS PETROLEUM

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Volume 110 New York, November 20, 1920 *Number* 21

Is the Mining Industry Classifiable Under Public Works?

ONE of the questions which will come up before the next Congress and the next Administration is the creation of a new Department of Public Works. Engineers as a whole are strongly behind this movement, believing that the establishment of such a department would be a concrete recognition of the dignity and importance of the engineering profession, and that it would make for greater co-ordination and efficiency in the government at Washington.

What should be our attitude on the subject? First, let us say, believing that public-spiritedness begins at home, that we are primarily interested in our own industry. This industry—the mining industry—has not been overburdened with champions; and when we speak for any special interest, it will be on behalf of our own.

Our most immediate care in the government organization, therefore, is for the two bureaus in the Interior Department that represent the mining industry, the Bureau of Mines and the Geological Survey. It is planned to incorporate these in the new Department of Public Works. Is the mining industry a branch of public works? What connection has it? Considering the subject analytically and honestly, we find the industry of mining remote from the problem of public works. Mining is a great and basic industry, producing raw materials: in this it is analogous to agriculture, the other great basic industry. Is it, then, proposed to merge the Department of Agriculture, which represents farming, into the Department of Public Works? Of course not. Who ever suggested such a thing? Why, then, incorporate the Bureau of Mines and the Geological Survey, which represent mining, into such a classification? Is the Bureau of Fisheries, which covers a third, though smaller, similar basic industry, going into the Department of Public Works? What a foolish question! Why, then, the Bureau of Mines?

The answer is very simple, and the reason is very stupid. A man educated to all the needs of the mining industry is called a mining engineer: but a man educated to all the needs of the agricultural industry is not called an agricultural engineer (although he might be, with great propriety) but an agriculturist. The fact that the educated miner is called an engineer created in his mind a supposititious nearest adherence to all engineers—to the electrical and mechanical and civil engineers—rather than to his own industry. Now, the electrical and mechanical and civil engineers are not concerned primarily in the production of raw material, but in construction: and it is they in whose field falls the whole subject of Public Works—construction of public buildings, irrigation, reclamation, dam building, government railroads, canals, river and harbor improvements, and the like.

If we were electrical or mechanical or civil engineers, we would probably be enthusiastic for the proposed Department of Public Works. We do not know; we cannot thus project our personality. But with that possibility in mind, we do not oppose the plan. Unless we greatly mistake, we have, as being concerned with the mining industry, no great interest in it; and the main reaction that we have is of the impending misfortune of having the bureaus representing the mining industry in the government swallowed up in it, under a ridiculously and palpably false classification. We of the mining industry would gain nothing from the change: it would be changing horses crossing a stream, and to a less reliable nag. Our position in the Interior Department is more genuine and distinctive than it would be in a Public Works Department. We are better off as we are. And if the two bureaus could be guided and co-ordinated under a single Assistant Secretary of the Interior, we should be as well off as we can perhaps hope to be, unless we could secure the creation of a special Department of Mines.

The Bureau of Mines, we believe, has no activities which fall under the head of Public Works. The Geological Survey has had and has such activities, but they are collateral, or are homeless orphans that are temporarily sheltered by the Survey, and do not cover the mining industry; and we take it that the economic justification of the Geological Survey is first and last its benefit to the mineral industry. Such an orphan is the Super-Power Survey—and if a Department of Public Works should be created the Super-Power Survey should be transferred to it.

The reclamation work of the government was likewise started under the Geological Survey, but was pruned away from it in recognition of its essentially alien character. There is even no reason why the construction of the base maps of the Geological Survey should not be taken over by a Public Works Department if one were created. It belongs there: the Geological Survey has to make these maps because it finds no base maps ready for its use. But in perceiving the proper classification of some of the collateral jobs of the Geological Survey as belonging to Public Works, let us not make the blunder of grouping the mining industry under that category!

The Broken Hills Silver Corporation

THE Broken Hills Silver Corporation of Nevada, which was the subject of an article in our issue of Nov. 13, is sending out monthly mine reports for the purpose of selling stock. These are signed by Mr. Arthur Perry Thompson as consulting geologist and engineer.

In the report for October we note that the first car of ore has been shipped—thirty-five tons averaging $216 a ton. Mr. Thompson states quite frankly and conspicuously that "This shipment represents results of *high-grading operations*, for a period of twenty-five

days, in the rich stopes," etc. "Stopes were started along the vein at points where high-grade ore was most plentiful." "The extraction of high-grade ore . . . has required constant care in sorting the high-grade product from a much greater volume of low-grade, *milling ore generally comprising the bulk of the vein.*"

"From one to two tons of high-grade ore are now mined daily from the Belmont Incline stopes."

With these thoroughly honest and tempered facts, Mr. Thompson embarks on that most difficult of all things, a forecast: "It is not too much to expect that, with the complete development of the cross-vein at the 150-ft. level *and the downward continuation of rich ore* such as is being mined on the 75-ft. level, a production of ten tons or more per day of $240 ore, or at the rate of $72,000 per month, *may be* attained. *Favorable developments on the 150-ft. level* will even increase these figures."

Here, then, is where the consulting geologist and engineer gets off the pathways of conservatism. *If* the cross-vein development is favorable; *if* the rich ore, *if* developed further on the 75-ft. level, goes down, we *may* be able to high-grade ten tons a day, picking the eyes out of the milling-ore vein.

If wishes were horses, beggars might ride. The experienced mining engineer will not detect evidence of anything that looks like a mine in reading this report. Granted that this consummation is reached, that ten tons of $240 ore—where does Mr. Thompson get that figure of $240?—is mined out, how much will the total cost of that ore be, with all the sinking, crosscutting, and drifting necessary?

Mr. C. H. McIntosh, president of the Fidelity Finance & Funding Co. (which is the George Graham Rice organization), solves the question of cost and profit easily in a circular letter offering stock for sale. Quoting Mr. Thompson's report, as above, Mr. McIntosh says: "It *may be estimated* that net annual profits on a gross production at the rate of $72,000 a month would be at least $600,000 a year. This would be equal to 200 per cent per annum on the par of the entire capitalization of the Broken Hills Silver Corporation."

Therefore, "we feel sure you will agree with us that the speculation now inherent in the stock at such a low price as 13c. a share is extraordinary."

We do most heartily agree: it is a most extraordinary speculation to invest at 13c. a share, on the evidence of this report: so extraordinary that we should call it a thousand-to-one shot that we should never see our 13c. again. Any man who buys mining stock on the strength of thirty-five tons of ore, high-graded from rich chlorides and sulphides near the surface, belongs manifestly to the classification concerning which an erstwhile contemporary sagely declared that one was born every minute.

Mr. Thompson's report contains no misstatement, although his forecasts are optimistic. But his report is evidently intended to play into the game of George Graham Rice, McIntosh, and others, to unload the stock at a profit. It will also be observed that Mr. McIntosh makes no false statement—he quotes certain assumptions only, and then remarks that the stock is a speculation.

So we submit to Mr. Thompson, as a geologist and engineer, that his position in co-operating with a plan to sell stock in a prospect, on the glittering figures of unwarranted assumptions, is not professionally an ethical one.

Aiding Coal Conservation

THE effect in this country of the British coal strike, although temporary, was significant and emphasizes the necessity for the careful consideration of our own coal problem. Extended limitation of coal production abroad naturally places a greater demand on our export tonnage, with the result that the competition forces higher domestic prices, and we face a condition which, judged at least by our household standards, is highly undesirable.

According to figures given by the *Statist*, the aggregate world's shortage of coal in the coming year, without reckoning the British shutdown, will be about 72,000,000 tons. The present normal production of the United States is stated by this same authority to be 30,000,000 tons in excess of its consumption of 600,000,000 tons. Although it is gratifying to know that we are credited with being on the safe side of the ledger, statistics are not always to be taken at their face value, and other factors, such as transportation, labor conditions, and a possible increase in foreign demand, are to be considered.

In some quarters the appointment of a National Coal Controller and the prompt limitation of coal exports are advocated; others are of the opinion that we should "keep our coal at home." The latter idea we reject on general principles, believing that the acceptance of the plan for "prompt limitation" is more in accordance with American ideals. The foregoing suggestions deserve immediate consideration, and undoubtedly offer a solution of the coal problem as we have it today. However, it is not with legislative matters alone that coal consumers must concern themselves, for such measures can relieve the situation only in part. The immediate need is for the conservation of what we already have, and it is to that effort that industry must bend its energy.

In an address recently delivered before the American Iron and Steel Institute, Mr. George Otis Smith characterized coal as "the staff of life to the industrial world," and demonstrated the need for fuel economy in every branch of industry. It is a notable fact, as pointed out by Mr. Smith, that the motors used in the steel industry aggregate nearly one-third of the power of all the motors installed in the United States. Such a statement makes pertinent the question, To what extent can electric power be further utilized in other undertakings?

The mining industry has already successfully effected the substitution of electric power in many instances, and the central power station idea is gaining ground. There remains, however, much to be done in this direction. For example, we still have, in some sections, the small hand-fired boiler, wasteful in the use of more than its rightful share of coal, which stands as an example of needless extravagance and represents a serious drain upon the coal production of the country.

Perhaps it is not generally known that 30 per cent of the fuel burned in the ordinary mine boiler plant is absolutely wasted. But such is the fact, and this waste does not include the losses in power that are incurred through leaks and defective connections. Furthermore there is the low average load, caused by intermittent hoisting and other operations, to which is due the real plant loss. With power furnished by a central steam or electric plant, such a loss would be compensated, and not only a saving effected in coal but in plant operation as well.

A Little Knowledge Is Dangerous

IN OUR news columns we gave a short account of a mine accident which took place on Sept. 30 in the mine of the Calaveras Copper Co., at Copperopolis, Cal. The successive stages, according to an accurate account, were, first, a fire in the mine buildings in the near vicinity of the Union shaft; second, the spread of the fire to the shaft collar; third, the withdrawal of all of the men from the mine. The fire spread to the upper part of the shaft and extended downward a sufficient distance to fill the mine with gas. In the morning an ex-soldier wearing an army gas mask attempted to reach the 1,200 level of the Discovery shaft, the main working shaft of the mine. His purpose was to open an air valve. This man did not return, and two men, wearing ordinary dust respirators, started for the 1,200 level to rescue the first. One of these men got back alive, but suffering from the effects of the gas.

In a previous editorial we have pointed out the limitations of the army gas mask. It will not remove carbon monoxide gas. Carbon monoxide gas exists in greater or less amount in all gases resulting from mine fires. Only a person who has had experience with mine fires understands the rapidity with which the air in a mine is polluted with poisonous gases resulting from the more or less incomplete combustion which is characteristic of all mine fires. Carbon monoxide is extremely toxic in small amounts. It is quickly fatal in large quantities. The only safe apparatus is the oxygen breathing apparatus, and this is safe only when in proper condition, with an adequate supply of oxygen, and in the hands of experienced persons.

We cannot point out too emphatically the imperative necessity that all managers and superintendents of mines prohibit the wearing of army gas masks, respirators, and all other apparatus except the oxygen breathing apparatus where mines filled with gases resulting from a fire are to be entered.

Marketing Non-Metallic Minerals

METAL miners have a superior advantage in marketing their ores. Many custom smelters are willing to take odd lots of ore, even though they are sometimes pitifully small. Nevertheless, the custom smelter is anxious to get long-term contracts, as the fulfillment of such contracts tends to stabilize his business to a marked degree. As a rule he is sympathetic with the small producer and finds it good business to help him.

The marketing of non-metallic minerals, on the other hand, with some exceptions, is not so easy for the small or occasional producer. Their value rests to a considerable degree in the control of the market that has been established either for the minerals or for the products manufactured therefrom. Manufacturers and marketers of such products are primarily interested in securing steady flows of raw mineral, as the demand for their products is often severely restricted. Thus, long-term contracts are in vogue. Three years or even five years is not uncommon as a length of contract.

Again, processes of manufacture are not easily adjusted to take care of variations in the quality of raw materials. An established operation producing a raw mineral of uniform quality is in an excellent position to dispose of its product, and usually does so on the basis of a contract. The discoverer of a new deposit may find the market completely closed, either because it is dubious whether he can supply the mineral continuously or for the reason that his prospective customers fear a variation in quality. He may know that the mineral is selling for a certain price, but it may require persistent effort for him to dispose of his fifty-ton lot. To get into a more favorable position—granting that other factors, such as proximity to markets, transportation facilities, labor supply and general operating conditions, are not adverse—he must develop his deposit sufficiently to sustain a steady production for a period of years. He is then in a position to bid on contracts or has the alternative of entering into the manufacture and sale of the products from his mineral. The latter involves a manufacturing plant and a sales organization. It is obvious that a business of this kind requires time for its development, as it usually competes with concerns already established.

The important point to the discoverer of a non-metallic mineral deposit is the control of sufficient capital fully to develop the tonnage possibilities of his deposit as well as to establish thoroughly its quality. Even then he may be unable to break into the existing market, on account of the presence of long-term contracts. There is the possibility of doing business through the principals owning a contract, but, needless to say, this can be done only at the sacrifice of some of the profits. It may thus be necessary for him to wait for more favorable conditions or to embark into the manufacturing business himself. It is worthy of note that there are mineral brokers or agents who deal in odd lots of certain non-metallic minerals. By persistent search the small producer can get in touch with them, and may sell a small lot to advantage. Certain chemical manufacturing companies are also interested at intervals in different non-metallic minerals, and correspondence may be effective in leading up to a sale.

Specie Payments

THE Commercial Trust Co. of New York City recently refused the request of a depositor for a ten-dollar gold piece, saying that the company was not paying out any gold, but was keeping what it had in reserve. The Corn Exchange Bank, on the other hand, acceded to the request of a depositor for a twenty-dollar gold piece.

What is the attitude of your bank, friend reader? If gold is so scarce with the bankers, should they not assist in increasing the production? Yet their association refuses to consider a large production necessary.

If a gold reserve is good for a bank, is it not good for its clients? If the banks regard gold as more precious than paper, do they not acknowledge the cheaper value of the currency which they do hand over the counter?

Our Market Reviews

AMONG the various features which have been introduced into *Engineering and Mining Journal* during 1920, one of the most appreciated is our reviews of metal markets and prices. As an example, our page discussion on the copper situation in our issue of Oct. 30 was copied, with appropriate credit, either in full or in part, by the *New York Commercial*, the *New York Journal of Commerce*, and the *American Metal Market*. Shorter summaries of our copper market news in the same issue were made by the *New York Tribune* and the *New York Post*, among other papers.

WHAT OTHERS THINK

A Desperate American

Your editorial discussions of economic and political matters are very sane and interesting. Recent issues have touched on the immigration question as well as the need for the assimilation of foreign immigrants. It must be conceded that in normal times the supply of native labor is insufficient to perform the necessary work of the country and therefore it is necessary to make up the deficit from foreign countries. In the earlier times our immigrants came mostly from the British Islands, Scandinavia, and Germany, and, due to the enormous areas of unsettled lands available for free appropriation, and also to a natural taste for rural life, these newcomers soon scattered and became an integral part of their communities and of the nation.

Latterly this increment to our society has been chiefly made up of Slavs and southeastern Europeans. They, as well as the newcomers from the north European countries, have been drawn from a lower class of society than formerly. The conditions they meet on arrival here are very different from those that obtained twenty years ago. Nearly all go into industrial communities and form colonies with others of their own race. From a selfish standpoint, the fact that they form colonies or the economic conditions in which they live is immaterial (most of us have arrived at the point of exasperation, where we do not care what their moral, physical, or spiritual condition may be), but in addition to the fact that they form colonies is the more alarming fact that they form political groups. Our office seekers, for the most part business failures and self-seekers or themselves foreign born, pander to these groups and combine them all against the native-born American.

Those of us who live in industrial centers are ruled by a wild ignorant mob of half-matured foreigners, the scum of their own countries. In this community the vote of the American is scattered and unorganized, and he has no voice in the conduct of the local government. A roster of the office holders, both elective and appointive, will show 90 per cent of one foreign race. The people of this race that now come here are ignorant, bigoted, intolerant, and lawless. Revolution is a common word in their mouths. In the coming election it is almost a foregone conclusion that the most vile, radical, and anarchistic element in the whole country is about to be voted into power in the county, if not in the whole state. It is commonly stated that an American has no chance here in a controversy or in court against a foreign-born citizen. When the latter gets into trouble his political broker gets on the job immediately and pulls the wires to his own, and all other, foreign potentates in power. This discrimination extends to the public schools and to a great extent to the salaried positions in commercial life.

Such conditions are intolerable to people of decent upbringing, and if the Bolsheviki ticket is elected it will probably mean that all of us who can do so will leave this splendid prostrate carcass for the jackals to fight over, or else that we must combine against our elected officers and their rabble of foreign vermin and protect our families and property by violence.

There seems to be no immediate remedy for such a condition, but there is a very potent remedy against its recurrence. Let us have needful immigration but restrict the franchise. No foreign-born resident should ever be given a vote, no matter what his length of residence, unless he distinguishes himself in some line of endeavor. In this way citizenship would be a prize, and all desirable foreigners would work and conduct themselves to the end that they might receive such a reward.

It is not important whether the foreigners are assimilated or not if we can outvote them and control our own institutions.

I would like to see this matter advocated in your editorial page. AN AMERICAN.

Butte, Montana.

Mining Opportunities in Siberia

In the article entitled "The Mining Opportunities in Siberia," appearing in the issue of *Engineering and Mining Journal* of Aug. 14, 1920, the suggestion appears to be made that mining in Siberia was formerly conducted on "concessions," particularly where foreigners were concerned. Speaking for the metal-mining industry, I am not aware that metalliferous land concessions have ever been granted to foreigners in Siberia, with possibly one exception. In certain areas, namely south Altai, and in the Nerchinsk district, Cabinet Lands have been leased to foreigners through the medium of Russian companies specially formed for the purpose. Concessions so leased would not have totaled 1 per cent as compared with the mineral lands opened for location by private persons in Siberia during the early part of the nineteenth century.

The Russian law allowing of the locating and patenting of mineral lands by individuals is a just and fair one, based presumably on the Spanish law. It is not saddled by the law of the apex. In 1898 and 1899 I located and patented in my own name several claims for gold dredging on the Serebranka Creek, Perm Government, at nominal expense and with no particular difficulty. Any Siberian or Russian peasant possessing the ordinary civil rights could have done the same.

The gold-mining enterprises with which I have been associated in Siberia have been on mineral territory to which titles were held by the law of claims regularly staked, surveyed, and patented. In the principal east Siberian goldfields the larger enterprises were initiated by private individuals or small groups. These men, Siberian merchants and miners, were no more assisted by government concessions or subsidies than is the American metal miner in the Western States or in Alaska. Claims located in the "Northern Taigá" district of Yenesei, and in the Olekma district of the Lena drainage, in the 40's are still held and operated under the laws of the Mining Department, or at least were worked up to 1916.

It is doubtful if Sibiryakof, Trapeznikof, Bazanof, Gromof, Bazilevsky, and others of the fine old pioneers of the Yenesei and Vitim gold districts ever heard of "concessions." They merely took advantage of the Mining Law applicable to the public lands of Siberia.

Your correspondent, Mr. Narodny, and his authority, Mr. Leonoff, appear to be correct in their contention that "co-operation" appeals to the Siberian mind. Most of the ventures of groups of Siberian miners were denominated "partnerships," the Russian word being built up from the root "tovarish," meaning a pal or comrade. These "partnerships" were not only recognized by the Mining Law, but in some cases their shares were dealt in on the St. Petersburg stock exchange. These associations had an interesting prototype in the groups of Irkutsk merchants of the eighteenth century, which fitted out ships at Okhotsk and Petropavlovsk for the purpose of obtaining furs on the Alaska coast. The furs were brought back overland from the Pacific ports to Irkutsk, and then sent to Kiakhta, on the Mongolian frontier, where they were sold to Chinese merchants.

Thus it would appear that the apologists responsible for the article, in the instance of "concessions," attack a position which is practically non-existent, and as regards "co-operation" they at considerable length defend an axiom which is not opposed. At least this criticism applies so far as their remarks concern the mining industry.

C. W. PURINGTON

Hakodate, Japan.

Amalgamation in Tube Mills

Having recently seen considerable discussion concerning amalgamation in tube mills, the following may be of interest:

Since the use of cyanidation and flotation has become so successful, amalgamation has gradually been placed in the discard. However, there are still many who advocate it. In a great many cases even now amalgamation should undoubtedly be used. In general, if it is possible to get an extraction of 60 per cent or more it may be best to consider this method. This is particularly true if the gold is contained in coarse particles.

It is often claimed that amalgamation is not possible because the gold is "rusty." Rusty gold can be amalgamated if given the proper treatment. Rusty gold is gold coated with an oxide, not alloyed with another metal, as I understand it. Such gold may be amalgamated if given a good scouring and immediately exposed to quick [quicksilver] under proper conditions.

At the Gold Hill & Iowa Mines, Quartzburg, Idaho, it has been definitely proved that amalgamation can be successfully done in tube mills. I think, also, that the days of the stamp mill are numbered. There are certain factors, however, that should be brought to the attention of the tube mill amalgamator.

The ore at this plant is an antimonial gold-bearing quartz contained in a rhyolite porphyry gangue. Small stringers of quartz are interwoven throughout the ground mass. The ore carries very little zinc, no lead, no copper, very little silver, and from 2 to 3 per cent concentrates, which are principally iron pyrites. The antimony is less than one-tenth of 1 per cent. It is soft and easily crushed. Panning tests show very little free gold unless the particles are first rubbed briskly in a pan, preferably with an iron rod. The antimony is always a sure sign of good ore in this property.

Former treatment with stamps, with inside amalgamation, never gave an extraction to exceed 55 per cent. Fine screens were used, but the resulting amalgam was composed of the coarser particles, whereas the fine gold generally went into the tailings. The gold is often coarse, but there is always some fine. When examined under the glass, or sometimes even with the unaided eye, it will be noted that the gold is coated with a film of antimony or with a combination of antimony and sulphur. This coating is glassy, hard, and brittle.

In treating this ore for the last ten years, during which time we have handled a large tonnage, certain points have been brought to our attention forcefully. First, and important, is the fact that the gold *must be scoured*. This should not be confused with hammered. It was noted that the old arrastres gave good extraction on these ores. We have therefore, in a way, tried to imitate these old-fashioned machines. This has led to the use of the tube mill run on arrastre schedule. By this I mean run at such a speed that the charge will slide. We have found the Hardinge conical mill especially adapted to this class of work. It is possible to crush over 175 tons per day through an eight-foot mill when used as a secondary crusher and amalgamator. We pay special attention to feeding a certain quantity of grits into this mill with the charge. These grits are simply pieces of hard ore which are allowed to by-pass the ball mill which is used as a primary crusher ahead of the Hardinge mill. They are pieces of ore of from ½ to 1¼ in.

The flow sheet of the mill (See Fig. 1) is: Grizzly, Blake crusher set to two inches, rolls set to ¾ in., cylindrical tube mill 5 x 4, lined with Komata lining and using Adamantine pebbles, which come from Sioux City, Iowa. This mill discharges a product of about 8 or 10 mesh into the Hardinge mill, which also has the same lining and uses the same charge, with the exception that the pebbles are smaller. Both tube mills are run at a speed that allows the charge to slide, the Hardinge being run at 18 r.p.m. only. Quick is fed into

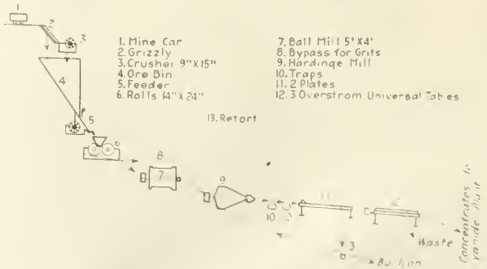


FIG. 1. MILL FLOW SHEET GOLD HILL & IOWA MINES CO.

the scoop of the Hardinge. No amalgamation is attempted in the cylindical mill, and that is considered as a crusher only.

The discharge from the Hardinge is through an amalgamator bolted on the discharge trunnion. (See Fig. 2.) A brief description of this amalgamator, which is a modification of the regular Hardinge amalgamator furnished with the mill, is as follows:

A copper plate (*A*), which the millmen call the "stovepipe," is put into the discharge end. This plate is bolted by three small bolts that allow it to be easily taken out for cleaning. When the bolt is out it is possible to spring the plate enough to allow its easy removal. This is accomplished by making it like a stove-

pipe before riveting and making the bolt that acts as one of the bolts that hold it on pass through both thicknesses of copper. Also, inside this so-called stovepipe we use four or five riffles of about ¾ in. height. These are placed parallel to the axis of the machine. We use no screen. The stovepipe passes back four or five inches into the amalgamator. Amalgam forms at *C*, also at *X* and *Y*. Some is found also inside the tube at *A* and back of the riffles, *B*.

From the amalgamator the pulp runs through traps and then over stationary plates as in the ordinary stamp mill. There is nothing special concerning the plate amalgam excepting that we run the plates comparatively hard and use Sapolio to dress the plates every eight hours. The method of using this is to give the same treatment as in cleaning a window, but allowing the white lather to remain until the water is running over the plate and then finishing with a whisk broom used so that the brushing is done lengthwise of the plate. This prevents the fine concentrates from sticking to the plates. A safety box is used when dressing the plates to catch any loose amalgam that may escape.

From the plates the pulp passes over Overstrom Universal concentrating tables, where a small portion of

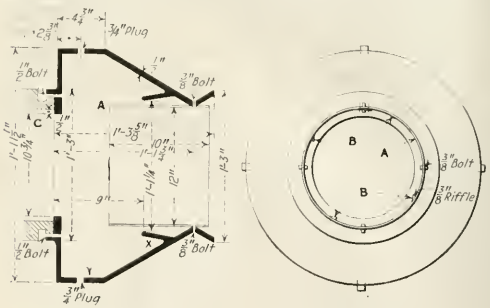


FIG. 2. HARDINGE AMALGAMATOR AT THE GOLD HILL MILL

the sands is allowed to go into the concentrate. This allows a closer saving of the gold to be made and helps in the cyanide plant by supplying grits for the tube mill where fine grinding is practiced. Excellent results are shown in the cyanide plant on this concentrate after agitation in Pachuca tanks.

Returning again to amalgamation, quick is fed into the scoop of the Hardinge. This quick is "doped" with sodium, by adding enough metallic sodium to make it amalgamate the end of a small file, then diluting it a little with quick. This quick is prepared daily, and must be fresh.

Frequent pannings of the feed going into the Hardinge serve as a guide to the quick feed. The condition of the head plates acts as a direct indicator of the feed. When the plate is hard and white more quick is needed, which should be applied by more frequent feeding instead of feeding in large doses. Should the plates be too dry free gold will show on the concentrators.

The pulp is run much thinner for amalgamation than for ordinary fine grinding. We have tried running the mill in closed circuit, but got poor results. A spray of water shot into the discharge end of the mill at the point where the pebble charge comes to the trunnion will help the capacity.

The shape of the conical mill is especially adapted for amalgamation, as classification is always going on. The particles of gold have to climb the incline before being discharged. This gives a chance for them to receive the grinding action similar to the arrastre. They come into contact with the quick in the amalgamator when they are free from oxidation and bright. The quick fed into the mill also finds its way up the incline until it reaches the point of the cone where action is less violent, and the result is that a pasty amalgam is formed, which goes into the larger opening of the amalgamator, where it is trapped until ready to be cleaned up. This pasty amalgam catches fine gold or other amalgam that tries to get by.

One of the most interesting points noticed in this practice is the fact that when steel balls were tried for amalgamating the results were unsatisfactory. Amalgamation was then a failure. Investigation showed the following conditions: If a particle of gold is laid on a polished anvil and hit with a smooth-faced hammer, and the resulting particle is then put into a bath of quick, it will not amalgamate. Again, if a similar particle of gold was laid on a piece of grindstone and rubbed with another rock, the surface of the gold was brightened and roughed so that amalgamation was instantaneous. In running with steel balls and steel liners the gold discharged was hammered and small disks were discharged which would not amalgamate under any condition that we were able to produce. Careful examination under a strong glass showed that the particles had a hard shell which prevented direct action of the quick on the gold.

In practice now we use Jasper Stone Co. pebbles and use lifter bars in the Hardinge. A large portion of the amalgam is taken from the back of these bars. We found after trying speeds of from 29 to 18 r.p.m. that we got best results with the slower speed, 18 r.p.m.

Objection has been made that it is hard to clean up a system such as we suggest. We find that we can make a thorough cleanup every month within three or four hours. The running time of the mill will exceed 90 per cent. A more thorough cleanup is made when replacing the lining, which is generally once a year. Very little amalgam remains in the charge after it is run down. Comparatively little amalgam remains behind the lining plates, as these are backed by one-inch boards, which act as a pad and allow little to get behind. The door is opened once a month and amalgam is scraped from the cracks, but the charge is not removed, as the mill can be rocked enough to allow practically all the inside to be reached. Part of the coarser pebbles are removed to make more room during this operation. Nothing is done with the sands during monthly cleanups, but when relining, the sand charge is fed into the scoop after putting in new liners. An extraction of better than 85 per cent is made by these methods, which I think will compare favorably in cost with any cyanide or flotation process.

Boiled down, our experience has shown that the gold should be scoured and not hammered; that immediate union with the quick is essential before oxidation takes place; that pasty amalgam should be thrown into a quiet place away from too violent action of the pulp; that quick must be kept active; that a thin pulp acts better for amalgamation; and that one must grind lots of good ore to make a living these days, when gold values are placed below those of spuds and candy.

Quartzburg, Idaho. E. E. CARTER,
Manager Gold Hill Mines.

The United Verde Copper Co., Jerome, Ariz.

GENERAL VIEW OF SWITCHBACK CONSTRUCTION, UNITED VERDE MINE
To the lower right of the picture can be seen the recently constructed baseball grounds, the park being entirely on filled ground made from stripping waste.

GENERAL VIEW OF STEAM-SHOVEL OPERATIONS AT UNITED VERDE, SHOWING SHOVELS WORKING ON 160-FT. AND 300-FT. LEVELS

JACHACUNOCOLLO, OR THE GREAT SNOW MOUNTAIN, SEEN FROM THE CHOJÑACOTA MINE. A TYPICAL VIEW OF THE QUIMSA CRUZ RANGE

Tin Mines of the Quimsa Cruz Range In Bolivia*

The Geology and Mine Workings of a Promising Area, in the Development of Which American Enterprise Is Taking a Prominent Part—Geological Conditions Comparatively Simple, With the Veins Occurring in Both Igneous and Sedimentary Rocks

BY JOSEPH T. SINGEWALD, JR.
Written for *Engineering and Mining Journal*

THE Quimsa Cruz Range is a series of high, glacier, and snow-covered peaks forming the crest of the eastern range of the Andes in Bolivia between La Paz and Oruro (see sketch on following page). It is bounded on the north by the gorge of La Paz River, where it cuts its way through the Andes at an elevation of 6,500 ft., and on the south by a pass 15,000 ft. in elevation between it and the less lofty Santa Vela Cruz Mountains. Between these two passes is an almost uninterrupted series of icy peaks, many of them exceeding 20,000 ft. in elevation. So rugged is the topography and so rigorous the climate that, though highly mineralized, the region is one of the least developed and least explored of the Bolivian tin-bearing areas. It is now, however, attracting much attention, and promises to become one of the leading tin-mining regions of Bolivia.

GEOLOGY AND MINES OF THE RANGE

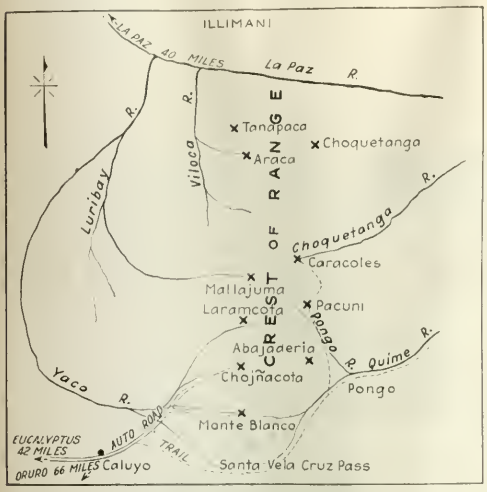
In its general features the geology of the range is relatively simple. The crest and the upper part of the eastern slopes consist of granite. The whole of the western slopes and the lower part of the eastern slopes are made up of Silurian and Lower Devonian highly metamorphosed shales, with intercalations of quartzites and sandstones. The range has been subjected to considerable tectonic disturbances, and both granite and sediments have been highly fractured. Many of the fractures are the seat of tin veins and occasionally of tungsten veins.

The ores are of the normal tin type, characterized by the presence of cassiterite and, in some of the veins, wolframite, as the only ore minerals of value. The argentiferous sulphides of the more complex type of Bolivian silver-tin ores are lacking, and there is little or no bismuth. The pneumatolytic minerals are represented by an abundance of tourmaline.

The active mines on the west side of the range are, from north to south, the Tanapaca, Araca, Chojñacota, and Monte Blanco; on the east side the Caracoles and Pacuni. Less important mines are the Mallajuma, Laramcota, Choquetanga, and Abajaderia. The Tanapaca and Araca mines are sixty-six miles from La Paz by a trail that follows La Paz River. The other mines have their outlet by way of Caluyo to Eucalyptus, a station on the Antofagasta and Bolivia railway between La Paz and Oruro. Between Eucalyptus and Caluyo, a distance of forty-two miles across the high plateau, is an automobile road, which continues beyond nearly to Monte Blanco and Chojñacota. Mines on the east side of the range have their outlet through the Santa Vela Cruz pass to Caluyo. This trail has been rather poor, but since the Guggenheim Brothers have entered that region they have greatly improved the trail and are constructing a road to Caracoles.

*George Huntington Williams Memorial Publication No. 2.

The Empresa Minera Tanapaca represents a consolidation of two small mines which belonged to Louis Pando and Hugo Zalles and is now under option to the International Mining Co., which is closely identified with W. R. Grace & Co. Two veins, the Potosí and the Alliança, are being worked. They lie on the slopes of the first group of peaks west of the main ridge of the Choquetanga Range. The latter peaks consist of granite, and, judging by the huge boulders that have been



SKETCH OF QUIMSA CRUZ REGION, BOLIVIA

carried down from them, the rock is a biotite-tourmaline granite porphyry. The country rock of the Tanapaca mine is hard, highly metamorphosed shale or slate with interbedded quartzite.

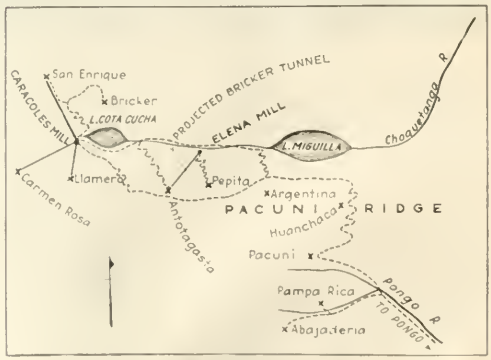
The Potosí vein has a width of from 18 in. to 3 ft. The filling consists of soft, iron-stained material, or "llampu," with an average tin content of 4 to 5 per cent. The ore is treated in the Tarujhumaña mill, which is equipped with two water-driven arrastres and a series of buddles for each. The tailings of this mill carry 2 per cent tin. The production is at the rate of twelve tons of concentrates monthly. The elevation of the mine and mill is nearly 15,000 ft.

A mile south of the workings on the Potosí vein are those on the Alliança. The vein filling consists chiefly of cassiterite, quartz, and iron hydroxides, and some pyrite in the lower part of the workings. The orebody has a width of as much as 2½ ft. and an average tin content of 10 per cent. It follows a contact of slate and quartzite, with the former on the hanging wall. Often the hanging wall part of the vein consist of mashed shale with many quartz stringers. On the foot wall is a band of solid quartz. The relative importance of these two members varies from point to point, and at many places one or the other is entirely lacking. A short distance south of the Alliança vein is the Mocoya mill, in which the ore is treated. The mill is equipped with a Chilean mill, jigs, Ferrari tables, and buddles. Scarcity of water in the winter months prevents the utilization of part of the machinery in that season, and the ore is then sent direct to the buddles from the Chilean mill. The production is ten to twelve tons of concentrates per month.

The property of the Empresa de Estaño de Araca is about three miles south of the Tanapaca mine near the head of a deep valley, immediately beneath the snow and glacier-covered Choquetanga peaks. The mill and administration buildings are situated at an elevation of about 13,500 ft., in a branch of the Viloca River, and the mines lie 2,000 ft. higher, on the north side of the stream. The Central vein was the first tin vein worked in this region. It was discovered in 1900 by José Bueno, a gold miner of the Araca district, from whom it was acquired by Harrison and Boettiger. The operation of the blacklist during the war caused a reorganization as a Chilean company under the name Empresa de Estaño de Araca. Nevertheless, the mine was kept on the blacklist, and its production consequently was considerably hampered. Whereas the pre-war production had reached 150 tons of barilla[1] monthly, in 1919 the mine was producing at the rate of only 100 tons. Nearly one-half of the production comes from the operations of contractors, who concentrate with the crude native quimbaletes (crude ore mills) maritatas, or hand jigs, and buddles.

The country rock in the immediate vicinity of the veins is a thick series of Lower Devonian shales, in which a few sandstone and quartzite beds are interstratified. The veins are not far distant, however, from the granite constituting the summit of the range. The shales are cut by a network of veins, the principal ones being the Central and the Pireo. Southeast of the Pireo are several veins on which little work has been done, and between the Pireo and Central are other subordinate veins. A number of veins northwest of the Central have been more productive, notably the Esperanza and Jinebra.

The Pireo and Central veins have been followed several hundred meters along the strike. The maximum width of stopeable ore has been 50 ft.; and it generally is more than 3 ft. For the most part the vein walls are not well defined, though in some places the mineraliza-



SKETCH MAP OF CARACOLES AND VICINITY

tion is confined between definite fracture planes. Much of the ore resembles slate at first glance, but it has a higher lustre and a cassiterite brown color. The typical ore is consequently extremely fine-grained and compact. Nevertheless, there are druses with excellent cassiterite crystals, some an inch or more in diameter. In fact, these veins are noted above all other Bolivian localities

[1] A 60 per cent tin concentrate.

for the occurrence of crystallized cassiterite. Intersections of the principal veins and secondary veins are generally the loci of large and rich oreshoots. The mode of occurrence of the cassiterite is, therefore, as wide bands or streaks of "guia," that is, high-grade ore, as minute veinlets penetrating the shale, and as a replacement of the shale. Associated with the cassiterite are quartz, the hydroxides of iron, and country rock. No tourmaline was seen, but this mineral is said to be encountered occasionally in small quantity.

The San José mill is connected with the mine by aërial tram. After crushing, the ore is ground with stamps and Krupp ball mills and concentrated on jigs, Humboldt and Ferrari tables and buddles to a final concentrate carrying 60 per cent tin. About one-half of the concentrate is recovered on the jigs and one-fourth each from the tables and buddles. The average tenor of the crude ore is about 4 per cent tin.

The veins are inclosed in a thick series of shales which vary in character from hard, thick-bedded shales like those at Araca to thin-bedded, fissile, black shales. Interstratified with the shales are sandstones and quartzites. Northeast of the veins the dip flattens as the crest of an anticline is approached. Fragments of the granitic rock that come down from the neighboring peaks of the main range consist of a uniformly medium-grained rock, unlike the coarse porphyrite rock seen at Araca.

Two principal veins are being worked, the Ferrecio and the San Luis. The two veins are separated by an E.-W. fault, and the San Luis lies on the north side of the fault. Adjoining the Ferrecio vein are five smaller veins, but most of the development work has been done on the San Luis vein, which averages 4 to 6 ft. wide. In general it is wider and richer in the soft fissile shales and narrower and poorer in the hard shales. It is not a fissure filling, but a zone of crushing in which the fractures have been filled with the ore minerals. The vein minerals are white quartz, which is commonly well crystallized; cassiterite, which is prone to occur in grains intercrystallized with the quartz; considerable black sphalerite, chalcopyrite, which is widespread but not abundant in amount; a little arsenopyrite and pyrite, and the hydroxides of iron. The fragments of shale are not usually mineralized as at Araca, so that the ore is distinctly brecciated in texture and much more coarsely crystallized. Younger than the previously mentioned minerals is siderite. It occurs chiefly in veinlets outside of the vein walls and as crystals superimposed on quartz within the vein.

THE TARUJHUMAÑA MILL AT TANAPACA, A BOLIVIAN TIN MINE IN ITS INFANCY

THE CHOJÑACOTA TIN VEINS, THEIR EXPLOITATION AND GEOLOGY

The mine and mill of the Compañía General de Minas en Bolivia, a Bolivian company, are in the Chojñacota Cañon (Green Lake), a branch of the Yaco River, at the foot of an immense glacier which flows from Jachacunocollo Peak (The Great Snow Mountain). The elevation of the mill is 15,700 ft., and that of the mine 17,000 ft. Chojñacota lies about twenty miles south of Araca. The first veins to be worked here were on the ridge on the south side of the canyon, but they are now abandoned. The veins on the north side were discovered about six years ago. Four years ago a small mill was erected, and it is now being remodeled and considerably enlarged. In 1919 the daily production was increased to twenty-five tons of ore running 10 to 12 per cent tin, which yielded 2½ tons of concentrate with a tin content of 70 per cent. The company expects to increase the output to 150 tons of ore daily.

The mine is connected with the mill by a 4,000-ft. aërial tram. The ore is crushed and then ground in Hardinge mills. The mill pulp is concentrated on jigs, tables, and buddles. Wilfley, Deister, and Ferrari tables are in use.

The Monte Blanco property was acquired by the

Empresa Minera Monte Blanco, a Chilean company, soon after the discovery of the veins, and a mill was erected fifteen years ago. The mill is situated in the next canyon south of the Chojñacota mine, known as Soracachi, at an elevation of 16,000 ft. It lies between two glacial lakes, Huallatani and Iscayuni. The upper lake, Huallatani, has a length of 1½ miles, a width of about 1,000 yards, and a fall of 450 feet, so that it is capable of supplying an enormous amount of power. The monthly production of the property is thirty tons of concentrate with a tin content of 66 per cent. The average grade of the ore treated is only a little over 2 per cent tin.

The country rock of the Monte Blanco veins is identical with that at Chojñacota. The veins are in a ridge on the south side of Lake Huallatani, which forms the divide between the Soracachi canyon and a canyon which flows on the eastern side of the Quimsa Cruz Range, that is, at the southern extremity of the high snowy ridge of that range. The mine workings are at elevations of 17,000 to 18,000 ft. The active workings are divided into three sections or mines, called respectively the Santa Fé, Serreno, and San Luis.

In the Santa Fé there are three principal veins, the average width of which is 1 ft., and which follow well-defined fracture planes cutting shales and quartzites alike, and are either simple fissure veins or lode fissures. There is much vein quartz and considerable tourmaline occurring in tufts of radiating crystals in the quartz and cassiterite. Some of the cassiterite is dark in color, but most of it is chocolate brown to lighter. But little pyrite occurs in these veins.

Markedly different in character is the Serreno orebody, which has a maximum width of 130 ft., the ore occurring in a white quartzite, interbedded in hard shales. The orebody is a stockwork in the white quartzite and has a very irregular shape and transitional boundaries. Its long direction seems to be parallel to the strike of the strata. The quartzite has been shattered into a network of minute fractures which are filled with the ore minerals. Locally, the fractures are parallel and give rise to an ore with sheeted structure. Where such fractures are minute and closely spaced, the ore has a banded appearance. Some of the fractures are filled with cassiterite, others with tourmaline, and in many the two minerals are mixed. Tourmaline also occurs in small bunches with cassiterite disseminated through them. Recently, a similar orebody, called the Donoso, has been discovered northeast of the Serreno.

Connection between the mine and mill is by a 2,000-yd. tramway along the ridge and an aërial tram between the mill and the terminus of the tramway. Shorter aërial trams bring the ore down from the mines to the tramway. The ore is ground in Huntington and Chilean mills, and concentrated on jigs, Butchart, Overstrom, and Deister tables, and buddles. The mill tailings carry 0.8 per cent tin, and are reworked in a small separate mill and finally discharged into Lake Iscayuni with a tin content of 0.5 per cent.

The Caracoles Veins Occur in Granite

The Empresa Minera Caracoles embraced a large group of claims at the head of one of the branches of the Choquetanga valley, directly across the range and a little to the north of Chojñacota. The property was being developed by Bricker and Guzman until purchased by the Guggenheim Brothers about eleven months ago. The country rock of the vicinity is a medium-grained biotite granite which also carries a little pyrrhotite. The granite is characterized by a well-developed system of parallel joint planes or sheeting. In places the fractures are only a few inches apart, and rarely is the interval more than a foot or two.

The tin veins cut the main system of fractures at a very acute angle and are numerous. They are usually grouped in systems and are not as a rule the filling of a single isolated fissure. These veins and the Pacuni veins are distinct from the rest of the veins in the Quimsa Cruz Range, in that they occur in the granite instead of in the sedimentaries. The characteristics of the fissures in the sedimentaries are lack of persistence and a tendency to split up, due to the variation in the physical character of the beds of the sedimentary series. The greater homogeneity and brittleness of the granite are believed to be factors favoring more persistent and well-defined fracturing. The veins of this part of the range are, consequently, regarded as more promising than those of the rest of the range. Another feature of many of the veins is that they show up far better underground than is indicated by their outcrops.

The principal veins, or vein systems, are the Huanchaca, the Pepita, the Antofagasta, the Llamero, the Carmen Rosa, and the San Enrique. A little work has also been done on the Bricker vein. The Antofagasta vein is connected by an aërial tram with the Elena mill, and the San Enrique, Carmen Rosa, and Llamero veins are connected with the Caracoles mill. The two mills are in the valley about a mile apart. The Elena mill has been dismantled by the new owners. The Caracoles mill is equipped with crusher, two Hardinge mills, three tables, and buddles. The production of the two mills in 1919 was thirty to forty tons of tin concentrates monthly. The Caracoles mill is at an elevation of nearly 16,000 ft., and the mine workings are still higher. The relative positions of the mills and mines are shown on the sketch on page 987. A new mill to serve the entire property is to be erected at a lower elevation in the Choquetanga valley.

ENTRANCE TO THE ANGOSTURA, A GORGE OF LA PAZ RIVER, WHERE IT SAWS ITS WAY THROUGH THE MAIN RANGE OF THE ANDES BETWEEN THE CHOQUETANGA PEAKS AND ILLIMANI

The San Enrique vein is being developed by an adit. Several branch veins leave the main vein, the width of which varies from 1½ to 6½ ft. Tourmaline with a little quartz and arsenopyrite are the principal gangue minerals. Hand-sorted ore is said to contain 10 per cent tin. The vein walls are decomposed granite, which is usually tough and gouge-like, but still preserves the granitic texture.

THE MONTE BLANCO MILL. A MODERN TIN MILL AT AN ALTITUDE OF NEARLY 16,000 FT. LOWER DEVONIAN SHALES CONSTITUTE THE COUNTRY ROCK

The Carmen Rosa vein is being developed by two adits. Its width is quite irregular and reaches a maximum of over 6 ft. in one shoot. The filling is essentially tourmaline, in which are veinlets of quartz with much sphalerite and some pyrite. The tin content of the ore is said to average 8 per cent.

The Llamero vein has been but little developed and is frozen to the granite walls. At the entrance to the adit the vein is about 6 ft. wide, but it includes some granite horses. The filling is chiefly tourmaline, though there is also drusy quartz and some sphalerite. The ore is said to average 8 per cent tin.

The three veins just described were being actively exploited in 1919. The new owners regard them with less favor, however, and are concentrating their attention to the vicinity of the Antofagasta and Pepita veins, where a deep crosscut tunnel is to be driven from the bottom of the valley a short distance above the old Elena mill.

The Pacuni Veins Contain Tungsten and Tin

The property of the Empresa Minera Pacuni Blanca N. Dillon is located on the southern slope of the Serrania de Pacuni and has also been purchased by the Guggenheim Brothers. The mill is at an elevation of about 15,000 ft. The mine is still higher and the vertical interval between the lowest and highest workings is about 1,500 ft. The veins are tungsten veins, and at the height of the tungsten boom the mine produced thirty-five to forty tons of 70 per cent tungsten oxide concentrates monthly. The concentrates contain about 2 per cent tin. The mill has been completely dismantled since the acquisition of the property by the Guggenheims, and the ore will be treated at the new mill to be erected in the Choquetanga valley.

The principal veins are the Blanca and the Inca. They are cut at right angles by a tin vein, the Veta Grande, which is now also being developed. The tungsten veins are nearly parallel to the main system of sheeting in the granite. The Blanca vein averages 2 to 2½ ft. in width. The filling is chiefly coarsely crystallized quartz and wolframite, with a little tourmaline and pyrite. The Inca vein lies east of the Blanca. Its width ranges between 10 in. and 1½ ft. Its filling is like that of the Blanca in some places, but in others it is softer and iron-stained, and even consists of "llampu," or soft oxidized ore. The average grade of the Pacuni ore is given at 12 per cent tungsten oxide.

The Potash Industry of India

Potash production in India, according to *Commerce Reports*, is a fairly old-established industry, and in the last ten years the annual production has varied between 15,000 and 25,000 tons. This yield might be increased by the adoption of improved plant and the concentration of the salt manufacture, as well as by the recovery of potash from the mother liquors and from the blast-furnace gases.

So far no good quality of phosphate of lime has been found in India suitable for the production of superphosphates, most of the phosphate having been found in the form of nodules containing a high percentage of carbonate. These, consequently, are unsuitable for the usual sulphuric-acid treatment.

The deposits of mixed phosphates of lime and aluminum found in parts of Bengal are also not suited for the acid treatment. There are, however, particularly rich and suitable deposits along the Red Sea, which could be shipped to the west coast ports, and these would supply all, or at any rate a large part, of the demand, provided suitable plant were obtainable and ample supplies of sulphuric acid were forthcoming.

Smelter Laboratory of the United Verde Extension

Most of the Disagreeable Features of Older Construction Eliminated — Large Windows and Glass Partitions Assure Ample Light — Filtrate Launders and Stands for Dispensing Burettes Convenient Accessories

By H. O. Hammond
Chief Chemist, United Verde Extension Mining Co., Clemenceau, Ariz.

Written for *Engineering and Mining Journal*

ONE of the newer smelter laboratories in the West is that at the United Verde Extension Mining Co. smelter, situated in the Verde Valley, approximately seven miles from Jerome, Ariz. Operations here were begun in July, 1918. The smelting equipment includes one blast furnace and two pulverized-coal reverberatories, with a three-stand converter installation. There are also six roasting furnaces.

The laboratory is one of a group of brick buildings at the entrance to the plant, comprising, in addition, a general office, change house, and time office. It has a single story, with basement and flat roof. The inside dimensions of the building are 44 x 70 ft. Much time was given to the design of the interior, particularly to the arrangement of rooms and placing of apparatus, so that maximum convenience and accessibility would be assured for the routine laboratory operations. All the rooms have ample windows, and to a large extent the partitions between them are glass paneled. The walls and ceilings are of plaster, tinted in buff and light blue-gray, with the exception of the main chemical laboratory and fire assay room, which are ceiled with wood. The woodwork was given three coats of Toch Bros. laboratory enamel, ivory tint. This gives a very pleasing effect, does not discolor, and can be kept immaculate. The floors are of pine, stained. The fire, assay and furnace rooms have concrete floors.

Hot and cold water is available at each sink, and the distilled water used for analysis is heated by electric immersion coils in five-gallon nickel-plated urns with block tin lining.

The outstanding features of the laboratory include down-draft hoods, solid concrete balance tables, waste-liquor launders under filtering stands, large revolving stands for dispensing burettes, a special room for use as a research or experimental laboratory, unusually large storage rooms in the basement for various supplies, and a lunch and locker room for the chemists.

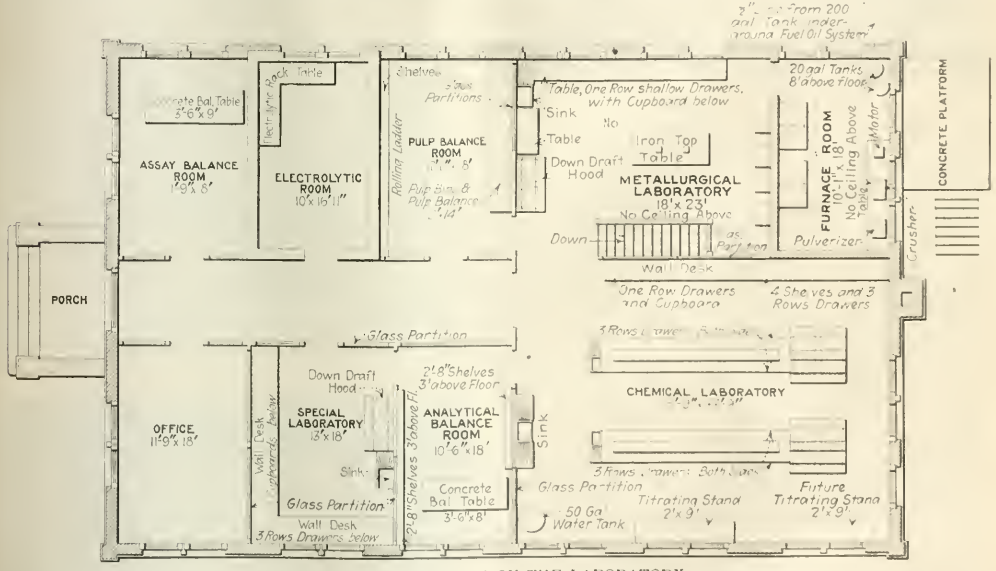


FIG. 1. FLOOR PLAN OF THE LABORATORY

Fig. 1, a floor plan of the laboratory, shows the general layout of the rooms. Upon entering the building, at the right of the hall is the office. Across the hall, to the left, is the fine-balance room. The equipment here consists of Heusser, Keller and Becker balances, placed on an all-concrete balance table, surfaced with neat cement, with foundation pier in the basement. In addition, this room contains the recording apparatus for the meteorological station instruments, which are mounted out of doors. These instruments give a continuous record of wind direction and velocity, sunshine, rainfall and barometric pressure. The outdoor station includes a hygro-thermograph, maximum and minimum thermometers, stationary and sling psychrometers, and a rain gage.

Adjoining the balance room is the electrolytic room,

with tables and rack for copper electrolysis. Stationary electrodes only are used. A motor-generator set, switchboard, and meter panel complete this room. The plant circuit is alternating current, and the motor generator charges direct current to a group of twenty-two storage battery cells (placed in the basement), which supply the current for electrolysis. This room is a vault, with solid concrete walls, roof, and floor. Bars are placed at the windows, and the door is of plate steel with Yale deadlock. These precautions were taken as a means of protection for the laboratory supply of platinum.

The special laboratory is completely fitted with a

FIG. 2. A VIEW IN THE MAIN CHEMICAL LABORATORY

down-draft hood for two 18 x 24-in. electric hot plates, tables, filtering racks, burette stand, stoneware sink, and ample drawers, cupboards, and shelves. Special glassware and chemicals are conveniently kept in a small cupboard with glass doors. Further equipment consists of a bomb calorimeter, gas apparatus, lamp bank, filter pump, and Thwing pyrometer. This room provides space for the conducting of research or investigation work without obstructing or interfering with the regular analytical work of the office. A swing door leads from the special laboratory into the analytical weighing room, which also has a large, solid concrete center table, upon which are the balances. This room leads into the main chemical laboratory through a glass-paneled swing door.

Directly across the hall from the analytical weighing room is the assay pulp room, where the crucible charges are weighed and prepared for fire fusion. A long table against the wall provides room for the pulp balance, for mixing charges, and like operations. Underneath a portion of this table are large bins for the storage of crucibles, and above is the flux box, divided into compartments and fitted with hinged lids. Along the entire wall, adjacent to the vault, are shelves, subdivided into compartments, for storage of sample pulps. A traveling ladder makes them accessible. This room opens into the metallurgical laboratory and furnace room, which is separated from the main chemical laboratory by a glass partition with a double, open doorway between.

The main chemical laboratory is a room 35 x 26 ft. The two work tables are set lengthwise with the room, with a double down-draft hood at the end of each table, containing two 18 x 24-in. electric hot plates for each side of each table. These tables (see Fig. 2) are fitted with drawers and cupboards, and have small stoneware sinks (12 x 18 in.) at the ends opposite from the hoods. These sinks catch the flow from the waste-liquor launder, which is of ½-in. lead, painted with asphaltum, and which passes directly under the stationary filter rack. The waste liquor passes out through a lead pipe ¾ in. thick into a tile sewer main. Light wooden strips fit over the launder, flush with the table top. These strips can be inserted when the filtrate is to be saved or removed when the filtrate is not desired. Provision is made for flushing these launders, which have a slight gradient, with tap water. A light shelf is mounted along the center of the table, two feet above the table top, for keeping at hand solution and reagent bottles. Above the shelf is placed a hot-water urn for distilled water, which is conducted along the table through a ¾-in. block tin pipe.

At the table end adjacent to the hood is set the revolving stand for dispensing burettes (see Fig. 3), and it has proved a most useful adjunct. There is only one stand to each table, as it is equally accessible from either side. The stands are of wood, 24 in. in diameter, and hold twelve 250 or 500 c.c. dispensing burettes. The use of the dispensing burette has proved to be far superior to the system using reagent bottles and graduates. It is quicker, easier, and less wasteful. The burettes rest in slots, cut into the edge of an upper and lower circular wooden section. A small fiber catch on the upper section holds each burette in place. The upper section is adjustable for height, thus accommodating burettes of different lengths. The lower one is fixed. A circular lead pan, 3 in. deep, is set beneath, to catch any drippings or accidental flow.

The down-draft hoods are constructed of ½-in. asbestos transite board, mounted on steel angle-iron construction. The floors of the hoods are of concrete. No glass is used. An exhaust flue 3 in. wide extends along the back, inside the hood, and opens near the top. The draft, connecting all the hoods in the building, is maintained by a No. 5 Buffalo blower, mounted in the basement and operated by electric motor at a speed approximating 1,400 r.p.m. Each hood exhaust flue is provided with a damper, which is kept closed when the hood is not in use, thereby increasing the draft in the others. The connecting flues, which are run under the flooring,

FIG. 3. REVOLVING STAND FOR DISPENSING BURETTES AND DOWN-DRAFT HOOD

are of transite construction, coated on the interior with paraffin paint, to prevent corrosion. The joints of the flues were sealed with an asbestos fiber cement. A brick stack at the rear of the building serves to lead off the fumes of the exhaust from the blower.

Along one wall is a wall desk with drawers and cupboards, surmounted at one end by a large cabinet with glass doors, which is kept stocked with all chemicals and smaller supplies in current use. Acids are

dispensed from the regulation three-quart bottles furnished by the manufacturer. These are fitted with glass delivery tubes and aspirator bulbs. These bottles are kept on a small table with a lead top.

Further equipment in this room consists of a titrating burette stand of seven burettes. The standard solutions in use on this stand are kept in cupboards beneath and away from the light, being forced into the burettes by bulb pressure. There is a 30-gal. copper water tank, tin lined, for distilled water, and a large main sink of stoneware with drain boards at each end. Samples are dried in a Freas automatic electric drying oven.

The fire assay laboratory (see Fig. 4) has four Case muffle oil-burning furnaces. These are set up in the rear of an 8-in. brick wall, thereby reducing the heat radiation. The muffle apertures, only, appear in this room. An iron table, with shelf below, serves the assay operations. At one side of the room is a down-draft hood, with electric hot plate for the parting operation. Adjoining is a wall table with filter stand and a stoneware sink; also a small wall desk with drawers and cupboards. The hood has also mounted in it, and separated by a partition from the hot plate, a Hoskins electric muffle furnace, F. D. No. 204. The heating of this furnace is varied and controlled by a wall rheostat.

FIG. 4. THE FURNACE ROOM

The draft can be regulated by a damper set in the hood flue.

A swing door leads into the furnace room proper, where are the Case furnaces, burners, low-pressure blowers, motors and oil tanks, and pipe connections. A 26-deg. Bé oil is used and has proved satisfactory with no pre-heating. A 200-gal. steel tank is buried in the ground outside the rear of the building at a shallow depth and is connected with a filter pipe from the surface. The fuel oil is pumped from this tank by a small rotary hand pump, situated in the basement, to two 20-gal. service tanks in the furnace room, which are placed slightly higher than the top of the furnaces. A 60-in. stack takes the waste gases from the furnace hoods. An increased draft was obtained here by placing swing aprons of sheet iron from the sides of the hoods and fitted close down about the top of the furnace body. This room also contains an Iler cupel-making machine and shelf cabinet for cupel storage. The room has a concrete floor and ceiling and is well ventilated.

The basement contains a lavatory and shower-bath room; also a locker and lunch room, roomy and well lighted. A small room is used for the storage battery mounted under a hood connecting with the down-draft system. One large room the total width of the building serves as a general storeroom for all supplies and heavy bulk stock not in current use. The samples and chemicals are kept in a separate dark vault. Additional space is devoted to a small crusher and pulverizer, power driven, a hand grinding mill for fluxes, a large revolving mixer, a bucking board, and long workbench.

The building is heated throughout with steam, supplied from the power plant to radiators in each room on the main floor. The basement is heated sufficiently from the exposed steam mains.

After two years' use, this laboratory has proved in every way to be entirely satisfactory for the purposes for which it was designed.

Fluorspar in 1919

PRODUCTION

Reports received from most of the principal producers of fluorspar, according to Hubert W. Davis, of the U. S. Geological Survey, indicate that the total shipments from domestic mines in 1919 amounted to about 122,000 short tons, valued at $3,102,000, as compared with 263,817 tons, valued at $5,465,481, in 1918. These figures show a decrease in quantity of 54 per cent and a decrease in value of 43 per cent. The general average price per ton f.o.b. at mines or shipping points for all grades of fluorspar in 1919 was $25.43, which is $4.71 per ton more than the average price received in 1918. The average price received in 1919 was higher than the average quoted price during the year, because a considerable quantity of gravel spar was so'd in 1918 for delivery in 1919 at prices between $30 and $35 a ton. On the other hand, the average price reported in 1918 was lower than the average price quoted during that year, because a considerable quantity of gravel spar was being delivered on old contracts at prices between $5 and $10 a ton. Kentucky and Illinois fluorspar was quoted during practically the whole of 1919 at $25 a ton f.o.b. at mines for 85 per cent washed gravel spar, and at $22.50 a ton for 80 per cent similar material, but according to reports these prices were often shaded.

IMPORTS

The imports of fluorspar into the United States in 1919 were 6,943 short tons, valued at $107,631, as compared with 12,572 tons, valued at $169,364, in 1918, a decrease in quantity of 45 per cent and in value of 36 per cent. The value at the foreign ports of shipment assigned to the imports in 1919 averaged $15.50 a ton, as compared with $13.47 in 1918, an increase of $2.03 a ton. Of the imports in 1919, England furnished 6,041 tons, valued at $94,099 or $15.58 a ton at the British port of shipment, and Canada furnished 902 tons, valued at $13,532, or $15 a ton.

The imports of fluorspar into the United States during the first three months of 1920 amounted to 3,820 short tons, valued at $37,233, or $9.75 a ton at the ports of shipment. During this period a small quantity of fluorspar was received from Germany.

Reported Diamond Deposits in British East Africa

A recent report from Nairobi, British East Africa, says that within thirty miles of the consulate what three experts pronounce as diamonds have been found. All the claims of the negotiators have been pegged out.

Transportation in Sze-Chuan, China

Development of Possible Industries Retarded by Adverse Conditions—Railroads Lacking—All Machinery and Supplies Carried by River, Coolie or on Pack Animals—Labor Scarce in Some Districts in Consequence

By J. A. T. Robertson
Written for *Engineering and Mining Journal*

ANY expansion in China's mining industry must come largely from further development of known deposits. This will require a change in economic conditions. I confess that I went to China with the impression that the introduction of Western machinery and methods would decrease costs sufficiently to permit the opening of deposits that cannot be worked under present conditions; but I soon found that many the greatest possibilities of expansion. But although the Chinese have never developed a suitable pump they have been familiar with foreign pumping machinery for a long time, and that they have not used it more extensively is solely because of present economic conditions. It appears to me that improvement in transportation will be one of the biggest factors in changing economic conditions in China.

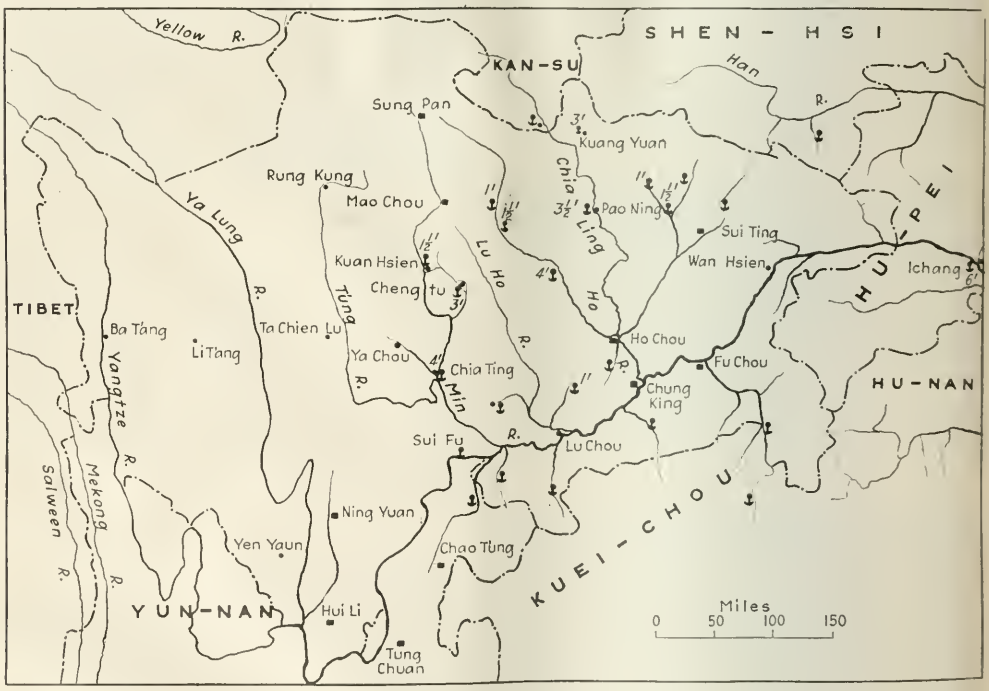


FIG. 1. MAP OF SZE-CHUAN PROVINCE, CHINA

deposits are being successfully worked on a small scale that are obviously too small to justify capital expenditure for a modern plant. Also, in a great many operations the methods employed are far more economical than would appear to the casual observer. For example, after seeing the Chinese recover silver by direct cupellation from lead bullion containing only about 15 ounces per ton, and washing gold from gravel that an American miner could hardly dredge, it did not take long to force the realization that the wholesale application of foreign machinery is not what is needed.

The Chinese have never been able to contend with any volume of water below the natural drainage levels; therefore very little is known of the possible extension of ore with depth. In my opinion this offers one of

North of Chung King there are some very promising iron deposits that have been worked over a large area. The ore is smelted in charcoal furnaces near by. When the wood has been used up in an area within which the charcoal can be profitably transported to the smelter the workings are abandoned and a new mine is developed and furnaces are built at some other place on the range where wood is available for charcoal burning. This is only one of numerous instances that could be cited in which present transportation costs prevent the development of possible mining industries.

The copper smelter at Peh-Hsui-Ho operated only about half time because of lack of ore. The smelter was built as near to the mines as possible, but it was found impossible to get enough carriers to bring down more

than half the tonnage of ore that the smelter could treat. It sounds funny to talk of labor shortage in China, but I have known it to be quite acute in numerous mining districts of the Province of Sze-Chuan, which has a population of from sixty to seventy millions. Bishop James W. Bashford, who was an authority on things Chinese, estimated that 15 to 20 per cent of male Chinese are engaged in transportation. When this is compared with conditions in Great Britain, which is somewhat of a common carrier, where 6 to 8 per cent of adult labor is engaged in transportation, and with countries such as Austria, that transport only their

FIG. 2. A JUNK BEING TOWED UP-STREAM

own goods, where 2 or 3 per cent of the adult labor is thus engaged, it is not hard to understand the high cost of transportation or the shortage of labor in other industries.

Because transportation costs are such a vital factor in mining I am presenting these notes for the benefit of those interested in mining development in China. Although they refer specifically to Sze-Chuan, they represent conditions in a large part of the interior. The costs given are those obtaining in the summer of 1916, the last year I was in China, and are in United States currency figured on a value of 50c. for the Chinese silver dollar, which was the rate of exchange at the time. Since then the Chinese silver dollar has appreciated greatly in value, actually exceeding the United States dollar for a while in 1919; and even conservative China has not escaped the general increase in cost of everything during the last four years. Therefore present costs would be much higher than the figures given.

No Railroads in Sze-Chuan—River Transport Instead

Sze-Chuan, the largest of the eighteen provinces of China, is practically cut off from the rest of the country by mountain ranges. There is not a mile of railroad in the province, nor even anywhere near its borders. The only connection with the outside world is by way of that great highway of Central China, the Yang-tze River. Fortunately, the province, whose name means Four Rivers, has been well provided with waterways navigable for native craft. The accompanying sketch map shows some of the principal streams and head of navigation for boats of various draft. It will be noticed that this does not apply to the western part of the province, which is very rugged and whose streams flow so swiftly that it is often difficult to even ferry across them in their quieter stretches. However, in some cases, such as from Chia Ting to Ya Chow, bamboo rafts are used to extend navigation beyond the limits of any kind of boat.

Most freight is transferred to river steamers at Shanghai, although ocean freighters do ascend the river to Hankow, 600 miles from the sea. Here all freight is again transferred to smaller river craft, whose destination is Ichang, about 1,100 miles from Shanghai. Freight on crated machinery, sent from New York to Ichang, was $22 per ship's ton. From Ichang to Chung King, a distance of about 500 miles, there are a number of shallow-draft steamers plying about eight months of the year. Most heavy freight goes up from Ichang by native junk, requiring one month or more, depending on the height of the water and the prevailing winds, as against from four to six days by steamer. At Chung King it must again be transferred to smaller native boats and may be transferred once or twice again before it reaches its destination. This is exceedingly slow, and the risk of loss on the river is great.

Anything that will be damaged by water should be packed in tin-lined cases or cans and hermetically sealed, for not many wrecks in the smaller streams are total losses. I remember one instance when a boat which happened to have my year's supply of sugar and white flour was wrecked just below Chia Ting. It had fallen behind the other boats, and our representative was not there; so the captain walked up to Chengtu, four days' journey, to ask if we wanted him to fish the cargo out of the river and transfer to another boat. Although the cargo was under water about ten days, I lost only one 10-lb. tin of sugar, and it had had a nail driven into it in boxing. But one is exceedingly fortunate if his freight can be delivered by river, for then weight of the individual piece is not so important. If the destination is any distance from a navigable stream the

FIG. 3. A TOWING PARTY OF COOLIES

weight and size of the largest piece is of the utmost importance, a fact that is demonstrated by numerous heavy pieces of machinery I have seen rusting by the roadside where they were abandoned. The following costs per ton mile represent conditions:

TRANSPORTATION COSTS PER TON MILE IN SZE CHUAN IN 1916

Trip	Cost Per Ton Mile
Ichang to Chung King, by steamer	$0.0128–$0.0635
Ichang to Chung King, by native junk	0.0275
Chung King to Chia Ting, by native junk	0.011
Chung King to Chengtu, by native junk	0.012
Chung King to Tzu Liu Ching, by native junk	0.012
Chia Ting to Ya Chow, by bamboo raft	0.065
Down river freight	0.007– 0.01

The province where not actually mountainous is so hilly that in four years' travel I never saw a wagon road where an ox cart could be used, and even the wheelbarrow is limited to local use in a few of the valleys and basins. After leaving the waterways one has the choice of transport by coolie or pack animal, although in many districts the "Union of Carrying Coolies" will not allow the pack animals to come down out of the more mountainous sections, so one must choose coolies. For pack animals the limit for a single piece is 250 lb., but the usual loads vary from 160 to 220 lb., which the natives prefer to have divided in two equal parts.

With coolies probably the cheapest method is the back load or "beh." I have seen one man carrying well over 300 pounds in this way over rough mountain trails, but it is very slow. The quickest method of transport by coolie is the carrying pole, by means of which a man will carry 100 lb., 50 lb. on each end of the pole, from twenty-five to thirty miles a day. Where the roads are very hilly the load should be reduced to not over 40 lb. on each end. The maximum weight of a package to be carried by coolies is usually a question of cost. If one can afford to use enough men large

FIG. 4. REPAIRING A JUNK EN ROUTE. THE CARGO IS STOWED ON THE BANK UNDER THE SAIL

pieces can be carried. One man carries 100 lb.; two men, 160 lb.; three men 210 lb.; four men 260 lb.; and so on in about that proportion. But the greatest expense comes in the extra time needed by a large number of men. For example, from Ya Chow to Ning Yuan is considered a twelve-day trip, although it is usually made in ten days; but a load requiring ten or twelve men takes sixteen to twenty days.

Transportation by pack mule costs $0.088 to $0.15 per ton mile, depending on roads and load. Transportation by coolie, carrying on back, costs $0.10 per ton mile and up; by coolie, carrying a 100-lb. load on a pole, $0.125 to $0.20. Native express (coolie), the limit of weight being 90 lb., costs $0.129 per ton mile; heavier pieces are accepted at increasing rates, which soon double and treble.

Ontario's Siderite and Pig-Iron Production

Shipments of siderite ore from the Magpie mine by the Algoma Steel Corporation, and of briquettes produced from magnetitic ore by Moose Mountain, Ltd., Hutton Township, Ontario, totaled 13,962 short tons, valued at $74,073, from Jan. 1 to June 30, 1920, according to the Ontario Department of Mines. The first-mentioned used its entire output in the blast furnaces of the corporation at Sault Ste. Marie; the latter shipped its product to Quebec and the United States. The new Helen mine of the Algoma Steel Corporation has been diamond drilled, and it is estimated that over 100,000,000 tons of siderite are available for mining.

The pig-iron output by the Algoma Steel Corporation at Sault Ste. Marie, the Steel Co. of Canada at Hamilton, and the Canadian Furnace Co. at Port Colborne was 321,826 short tons, valued at $8,255,916. Only 58,387 tons, or 8.94 per cent of the total of 653,137 tons of ore charged to the seven furnaces in blast, was of domestic origin, the remainder being imported from the United States. Furnaces of the Midland Iron and Steel Co., the Parry Sound Iron Co., and the Standard Iron Co. were not operated during the period. The output of steel from pig iron was 337,048 tons, valued at $1,661,570. These figures do not include any secondary steel produced in the electric furnace from scrap iron and turnings.

Spain's Mineral Production

The output of the principal Spanish minerals during 1913, 1917, and 1918 was as follows, according to Consul General Carlton Bailey Hurst:

Minerals	1913 Metric Tons	1917 Metric Tons	1918 Metric Tons
Iron	9,861,668	5,551,071	4,692,651
Soft coal	3,78[illegible],214	5,047,213	6,134,986
Copper ([illegible])	2,26[illegible],691	1,90[illegible],341	1,007,707
Iron pyrites	92,913	37[illegible],918	590,008
Common salt	60,429	781,10[illegible]	320,531
Lignite	27[illegible],791	637,841	726,348
Lead	279,078	240,3[illegible]8	21[illegible],133
Anthracit	232,517	324,756	37[illegible],216
Zinc	117,831	122,845	10[illegible],958
Sulphur	6[illegible],653	84,929	7[illegible],3[illegible]0
Quicksilver	1,950	18,65	1[illegible],537
Manganese	21,594	57,74	7[illegible],714
Silver-bearing le[illegible]d	23,600	13,218	[illegible],505
Ocher	600	780	700
Silver	402	96	9[illegible]2

a Includes copper ore and ferrocupreous pyrites
b Includes rock salt and products of salt works

Iron ore was mined in nineteen provinces of Spain during 1918, comprising a total of 430 productive concessions, 107 of which were located in Vizcaya. Great Britain was the chief purchaser of iron ore from Spain before the war, and, with Germany, The Netherlands, and France, took large shipments. However, owing to the blockade, this export was reduced, Great Britain remaining practically the only purchaser. The result is that, although less ore has been mined, large stocks have accumulated. The chaotic condition of European iron industries in 1919, and restriction placed on the export from Spain of unmanufactured iron and steel, have tended to reduce production in the local iron mines.

It is conservatively estimated that the output of copper pyrites in Spain represented about 60 per cent of the world's production in 1918, and the Spanish mines are now in a position to produce more than before the war. Domestic consumption, which decreased owing to the limited development of chemical industries, promises in the near future to be greater through the establishment of new chemical enterprises.

The lead crisis resulting from the war threatened to paralyze lead mining, and early in 1919 the government authorized a committee to fix selling prices each month. It also granted a loan of 6,000,000 pesetas to the federated lead miners to meet the deficit caused by selling at the fixed price below the cost of exploitation. The demand for the suppression of the tax of 3 per cent on sales of lead ore was not conceded, but the export tax on certain lead ores was abolished.

Metallurgists of Note

Dorsey A. Lyon

By Paul Wooton

DORSEY A. LYON, supervisor of the experiment stations of the U. S. Bureau of Mines, is said to know more mining and metallurgical men than any other individual in the United States. Throughout his entire career his duties have required travel between mining centers. The cumulative results are that literally thousands of men engaged in the mining industry have a personal acquaintance with Mr. Lyon. Practically his entire life has been spent in the Far West. He was thirty years old when he made his first trip east of Chicago. Mr. Lyon was born in Bureau County, Ill., in 1871. His early years were spent in western Kansas, where his parents moved soon after he was born. In this frontier environment he was reared. He received his entire elementary education from his mother. Later the family moved to Texas and then to New Mexico. Young Lyon studied at Drury College, in Springfield, Mo., and later at Stanford University, from which he was graduated in 1898. During his senior year he was student-instructor in chemistry. Following his graduation Mr. Lyon accepted a position as instructor in the geology of mining at the University of Washington. Later, when the school of mines was started in connection with that institution, he was its first dean, being succeeded by Milnor Roberts, the present dean. Mr. Lyon then took post-graduate work at Harvard University, where he obtained his master's degree in metallurgy in 1902. Immediately thereafter he accepted employment with the U. S. Mining & Smelting Co. in Utah, which was building its plant at Midvale—then called Bingham Junction. At this plant his first practical experience was in what Mr. Lyon terms "muscular metallurgy." He assisted with the construction of the plant and later was placed in charge of the feed floor.

DORSEY A. LYON

To fill an urgent vacancy at the staff of Stanford University, Mr. Lyon was borrowed until an instructor could be found. His stay proved longer than he had intended, lasting from 1903 to 1908. During the summers of 1905 and 1906 he conducted large-scale experiments with the electric furnace in connection with the smelting of copper ores. Later he began work with the electric furnace in the treatment of iron ores. He was in charge of extensive work of this character from 1907 to 1911. In the latter year he went abroad to study the use being made of the electric furnace in Sweden. On his return he spent some time in the Harvard laboratory studying the possibilities of reducing iron ore by oil. It happened that Mr. Lyon was doing his electric furnace work at the same time that Dr. F. G. Cottrell was developing his electrical precipitator. Each was much interested in the work of the other and they frequently collaborated in efforts to work out certain of the problems which they were meeting. When the Bureau of Mines was established, Dr. Holmes had Mr. Lyon slated as the Bureau's metallurgist. It happened just at that time that Mr. Lyon was working under contract for an English company, but at the expiration of this contract in March, 1912, he accepted a detail from the Bureau on some metallurgical experiments, which he conducted at the Harvard laboratory. On July 1, 1913, he received a Presidential appointment as metallurgist in charge of the Bureau's electric-furnace work.

In 1914 the Bureau of Mines undertook its first co-operative work. An agreement for metallurgical research was made with the University of Utah. One of the conditions of the agreement was that the investigations be supervised by a metallurgist of the Bureau of Mines. This work, which paved the way for the extensive co-operative investigations being directed by the Bureau, occupied most of Mr. Lyon's attention until 1917, when he was made superintendent of the Seattle Experiment Station. Later he became supervisor of the experiment stations, the position which he still retains.

Mr. Lyon, besides being a co-author of several bulletins of the Bureau of Mines dealing with the use of the electric furnace in metallurgical work, has written from time to time for various technical publications. He is a member of the A. I. M. E., the Mining and Metallurgical Society of America, the British Iron and Steel Institute, the Cosmos Club, and other societies.

By The Way

Confusing

"If the casual reader ran across the words 'lepidolite' and 'amblygonite' in a theological paper, he might mistake them for the names of tribes of the Philistines," says a Little Rock paper; "if he found them in a paper on fossils he might suppose they meant some kinds of armored reptiles that ranged the swamps of the Cretaceous period. A companion word, 'spodumene,' though it ends with 'mene,' would mean nothing to him." To these names of lithium minerals may be added "natalite," which is something new and not a mineral. It is a liquid manufactured in Natal from refuse of sugar-cane mills and is used extensively as a motor fuel in South Africa to meet the shortage of gasoline there. Natalite has possibilities, to judge from its description. There is no reason why it could not be manufactured in the sugar-cane fields of Louisiana.

A Gas Explosion

Something new in the manner of shuffling off this mortal coil was mentioned in the columns of the *Rocky Mountain News* recently. A peculiar explanation is given of the death at Gunnison, Col., of a certain George W. Johnson, a former resident of Pueblo. "At the time of his death," says the *News* item, "Johnson was believed to have died from heart failure. Now physicians say he was killed by an explosion of gas in his throat. Johnson had gone to the Sawtooth mine, in which he was interested, to examine a new ore found there. Early in the morning two shots had been fired within the mine, workers planning to stay away for nine hours until the gas would clear. At 2:30 p.m. Johnson entered, and shortly after an explosion was heard. He staggered from the mine and died soon after. Gas is supposed to have remained in the man's throat and to have exploded as he came into the pure air." It is not seemly to make light of such an occurrence. But, if such a thing can be, it is somewhat surprising that many accidents of the same sort did not take place all over the country just before election.

The Simple Life

In the very early days of gold diggings, miners did not require much outfit or many tools; and, under the circumstances, locomotion was easy. A single suit of clothes, consisting of woolen shirt, thick pantaloons, heavy boots, and slouch hat, often served for a long time without changing. Add to this the leather belt, usually carrying a revolver and always a bowie or butcher knife, and the man was in full dress. If he traveled on foot, he carried a roll of blankets for his bed, a knapsack of provisions consisting generally of pork and beans, a little flour and salt, perhaps a little coffee or tea, a dish or two for cooking, a large iron or tin pan for washing gold, a shovel and sometimes a pick. If he traveled with a horse or mule, and particularly if he had an extra pack animal, his outfit was more extensive, embracing larger and more varied supplies of provisions, more cooking utensils, more clothing and bedding, and many other tools and implements. When several traveled together and had pack animals, they ordinarily carried a tent; but often they were satisfied with brush booths hastily thrown together, or slept in the open air around their campfire.

Gold

E. Gould Buffum is quoted in Hittel's "History of California" as giving the following animated description of working a crevice on Weber Creek in the early part of December, 1848: "I shall never forget the delight with which I first struck and worked out a crevice. It was the second day after our installation in our little log hut—the first having been employed in what is called 'prospecting' or searching for the most favorable place at which to commence operations. I had slung pick, shovel, and bar upon my shoulder and trudged merrily away to a ravine about a mile from our house. Pick, shovel, and bar did their duty, and I soon had a large rock in view. Getting down into the excavation I had made, and seating myself upon the rock, I commenced a careful search for a crevice, and at last found one extending longitudinally along the rock. It appeared to be filled with a hard, bluish clay and gravel, which I took out with my knife; and there at the bottom, strewn along the whole length of the rock, was bright, yellow gold, in little pieces about the size and shape of a grain of barley. Eureka! oh, how my heart beat! I sat still and looked at it some minutes before I touched it, greedily drinking in the pleasure of gazing upon gold that was in my very grasp and feeling a sort of independent bravado in allowing it to remain there. When my eyes were sufficiently feasted, I scooped it out with the point of my knife and an iron spoon and, placing it in my pan, ran home with it much delighted. I weighed it and found that my first day's labor in the mines had made me thirty-one dollars richer than I was in the morning."

What Is a Bureaucrat?

Anything that ends in *crat* is not a popular term to apply to one nowadays, whether it be bureaucrat, aristocrat, plutocrat—even, possibly since the election, Democrat. Still, when we read our Washington correspondent's write-up of Dorsey Lyon, the energetic superintendent of our mining experiment stations, we feel that he can hardly escape the first if not the last of these terms. When a man is born in Bureau County (Ill.), dined, possibly, off the bureau after parental correction (not being tall enough for the mantel piece), punched a burro in the Far West, burrowed into the electric furnace at Harvard, was borrowed from Harvard by Stanford, and finally joined the Bureau of Mines, which, from the custom of transmitting the directorship from father to son (spiritually speaking) has been compared with the pocket boroughs of England, can he hope to escape this classification?

Improving Arizona

Following the example set by James Douglas in bestowing the name of "Clemenceau" on his townsite camp in the Verde Valley of Arizona, John C. Greenway has named the New Cornelia swimming pool at Ajo "Dauville." The spelling of this new name will probably be Anglicized into "Doughville" in the course of time, and all will readily understand that it was given in honor of the doughboys whom Colonel Greenway led over the top.

CONSULTATION

Money in the United States

"Although I realize that the *Engineering and Mining Journal* is not a purely financial organ, I shall appreciate it if you would give me an idea of the stock of money in the United States at the present time, and how it compares with a similar period in 1919?"

The following table is taken from the circulation statement of the Treasury Department, and furnishes a comparison between present monetary conditions and those of a similar period last year:

	Nov. 1, 1920	Nov. 1, 1919
Gold Coin (including bullion in Treasury)	$2,739,043,566	$2,872,525,066
Gold Certificates	.....	.....
Standard Silver Dollars	269,857,494	308,145,759
Silver Certificates	.....	.....
Subsidiary Silver	264,697,830	245,127,765
United States Notes	346,681,016	346,681,016
Federal Reserve Notes .....(a)	3,663,517,685	2,958,700,375
Federal Reserve Bank Notes	238,601,900	267,986,800
National Bank Notes	732,549,629	722,394,325
Total	$8,254,949,120	$7,721,561,106

(a) Includes own Federal Reserve Notes held by Federal Reserve Banks.

Mining Bonds and Leases

"Will you be good enough to advise me concerning the method of operation of a 'bond and lease'? I very frequently see this term used in connection with mining properties, and I would appreciate knowing in full detail just what this means and how it is worked out practically."

The term "bond and lease" as applied to mining operations is a common expression covering a contract in the industry whereby the owner of a mining claim or claims contracts to sell his property at a stipulated price and to deliver a valid deed therefor at any time before the expiration of the lease.

The ordinary mining lease is merely a simple contract by which the mine owner grants to the lessee, with perhaps some restrictions, the exclusive right to do a certain piece of work, for which the lessor is to receive payment in the form of a proportion of the net returns. The distinction between a mining lease and an ordinary business lease is that the mine owner shares risk as well as profit. The "bond" element of a "bond and lease" is the supplementary provision by which the purchase of the property can be effected. A bond and lease usually gives the lessee ample time in which to determine the merits of a property, and in the event of disappointment in its character the contract may be terminated. From the owner's or lessee's standpoint a lease will help to develop the mine through someone else's efforts, whereas a bond and lease will insure a sale should the development prove satisfactory. Furthermore, profits or royalties to the owner are net.

The question of royalties is usually decided upon a sliding-scale basis; that is, varying with the gross value of the ore produced and sold, and is computed on the net smelter returns after the necessary haulage, freight, and treatment charges are deducted. Thus, in the Leadville district, Colorado, ore running under $10 per ton may be subject to a royalty of 10 per cent; ore running from $10 to $15 per ton, 15 per cent; $15 to $20 per ton, 20 per cent; over $20, 25 per cent.

Frequently, clauses are introduced in the contract covering the question of forfeiture or abandonment of the work, so that there may be included a specification that a certain minimum amount of work shall be done each year. The ownership of plant or improvements erected upon the mining premises, the disposal of the dumps remaining on the property; that is, the time allowed to lessee in which to dispose of his ore after the expiration of his lease; the size of workings, such as shafts and drifts and other regulations covering mining, are in a definite lease all carefully considered and an equitable contract is drawn up.

There are no hard and fast or accepted rules which a standard lease may be said to follow. Mining customs vary greatly, and what may be considered a proper stipulation and agreement in Cripple Creek may provoke considerable criticism in Grass Valley.

The following is a specimen form of a mining lease:

A SPECIMEN MINING LEASE

This Indenture, Made this ..... day of .... A. D., 19.. *between* ..... of ..... lessor, and .... . of ....., lessee;

Witnesseth: That the said lessor, for and in consideration of the royalties hereinafter reserved, and the covenants and agreements hereinafter expressed, and by the said lessee to be kept and performed, ha.. granted, demised and let, and by these presents do.. grant, demise and let, unto the said lessee, all the following described mine and mining property, situated in ..... mining district, county of ....., State of ....., to wit: (Here follows description of the property) ..... Together with the appurtenances, to have and to hold unto the said lessee for the term of ..... from the date hereof, expiring at noon on the ..... day of .... 19...., unless sooner forfeited or determined through the violation of any covenant hereinafter against the said tenant ..... reserved.

And in consideration of the said demise the said lessee does covenant and agree with said lessor as follows, to wit: To enter upon said mine or premises, and work the same in the manner necessary to good and economical mining, so as to take out the greatest amount of ore possible, with due regard to the development and preservation of the said premises as a workable mine, and to the special covenants hereinafter reserved. (Here insert special conditions and agreements of lease, work to be done, royalties and other reservations.)

In Witness Whereof, etc., the said lessor and lessee have hereunto set their hand and seal . . . . . the day and year first above written.

Signed, Sealed and Delivered
in the Presence of

..... [Seal]
..... [Seal]

If it is desired to incorporate into the lease an option covering the sale of the property, the following form of a working bond may be used at the end of the mining lease given above and before the concluding paragraph:

A SPECIMEN OPTION

And in consideration of the foregoing lease and the expenditures to be made thereunder and the well and faithful keeping of the covenants thereof, the said lessee shall have the right to purchase the said premises, together with all improvements, etc. for the sum of ..... dollars ($.....), to be distributed in the following payments: On or before the ..... day of ..... 19..... the sum of ..... to be paid (designate manner and place of payment), and on or before the ..... day of ..... 19..... the sum of ..... (Here insert conditions of payment.)

Time being of the essence of this contract as to such payments, and upon the tender of such payments the lessor will execute, acknowledge and deliver at his own cost, good and sufficient deeds to the lessee, or such person or company as the lessee shall nominate, conveying the said premises clear of incumbrance. (Deeds to the property are generally placed in escrow with some bank or responsible party, to whom payments are made when due under the agreement, and who delivers the deeds when payments are completed.)

The forfeiture, surrender, or termination of the above lease for any cause shall render the option void, and the above mentioned payments may not thereafter be tendered.

It is expressly agreed and understood that this agreement shall be considered as an option to purchase only, and not as obligating the said lessee to purchase said property.

In Witness Whereof, etc. (See close of Mining Lease.)

THE PETROLEUM INDUSTRY

The Overdrilling of Oil Fields

Discontinuation of a Practice Which Results in the Early Exhaustion and Reduced Productivity Of Wells Advocated

Written for *Engineering and Mining Journal*

OVERDRILLING in an oil field—that is, the drilling of too many oil wells in a given area—produces such seriously detrimental results to the field that it should be prohibited by legislation. Its affects are, first, to cause the oil pressure over a much larger area to subside rapidly, necessitating pumping where wells would otherwise have flowed; second, it causes the oil-bearing stratum or strata within the drilled area to be so rapidly exhausted that a maximum recovery of oil cannot be made; third, it usually permits the salt water to break into the field prematurely, and once there it irresistibly encroaches on the area still underlaid by oil-bearing formations, causing producing wells to go to water much sooner than they should under normal conditions, thus greatly lowering the total production of the field. To these losses must be added the big expense of drilling wells that are unnecessary for the economic working of the area.

CAUSES OF OVERDRILLING

Following an oil-field boom the control of the land is usually split up among a number of companies, each holding leases on many tracts of small acreage. Drilling on one tract nearly always necessitates offset drilling on others, and when oil is discovered there is a rush to obtain a share of the liquid mineral. As a result, a whole field may be overdrilled in a short time. Many of the north Texas oil fields have been most injuriously affected by this bad practice. Burkburnett may be cited as a specific instance of an entire field being in considerable degree harmed through overdrilling.

A different situation appears to be developing at West Columbia, Brazoria County, Tex. The area referred to is a fifty-acre tract lying over a mile northwest of the main field, and although it cannot now be said that this area is overdrilled, the development work under way appears to indicate that it may be in the near future. The history of this small outlying tract is unusual. On July 30, 1920, the Texas Co. brought in its No. 1 Abrams well, on the Abrams lease tract of about 1,380 acres, and about a mile northwest of the main field. The well came in flowing approximately 15,000 bbl. of oil daily, and later increased to a maximum of about 27,000 bbl., from which it later declined to 7,500 bbl. It is rumored that the Texas Co. was not "ready" for this well to be brought in, and the whole crew was discharged.

THE RUSH FOR LEASES

Naturally, this great oil discovery created a new demand for leases, and lease bonuses, even on areas a considerable distance away, rose abnormally. But the only "close-in stuff" consisted of a fifty-acre patch on the north edge of the Abrams ground at a distance of nearly a quarter of a mile north of the Abrams well. Nine different companies, exclusive of the Texas Co., each acquired part of this area, the Humble Oil & Refining Co. holding the largest part, or eighteen acres.

Six companies immediately began drilling as fast as derricks could be built and rigs hauled to the ground. Already the Humble company has completed two wells, the first making an initial production of 1,000 bbl. and the second 1,500 bbl. daily, and is drilling a third. The Monarch Oil & Refining Co. has completed one well making 1,000 bbl. initial production, and is drilling a second well, and the Gulf Production Co. has completed its No. 1 Masterson well, which came in flowing at the rate of 10,000 bbl. per day for a short time, soon sanded up, and later came back flowing 2,000 bbl. daily. In addition to these wells several others are being drilled on the tract, and immediately across the line to the south the Texas Co. is already drilling two offset wells.

This is an instance where, in a few weeks, almost the maximum number of wells for the economic extraction of the oil from this acreage has been drilled or partly drilled, and where several oil companies are pitted against each other in an effort to obtain the maximum amount of oil possible in the shortest space of time. It presents a condition that will almost inevitably lead to overdrilling, and which can be averted only by agreement among the companies or by state or national regulation. Already water in large quantity has appeared in the Monarch company's well. This well has been killed and will be cemented, as it is believed the water is coming in from the bottom.

If this small acreage were the entire field, the damage by overdrilling here would not be so serious, but, as pointed out, the life of the entire field, or at least much of it, can be shortened and the total production reduced by this bad practice. By all means let there be enacted regulations governing overdrilling.

The Japanese Oil Monopoly

Commercial Attaché James F. Abbott, at Tokyo, advises that no proposal looking toward a Japanese government monopoly of petroleum will be made until parliament convenes in January. While nothing definite has been decided upon, the proposed monopoly is likely to affect all Japanese possessions as well as the oil fields in Japan proper.

Japan produced only about one-half of 1 per cent of the world's crude petroleum in 1919, and its production has shown a steady decline since 1916, when 123,558,416 gal. were produced. The production for 1917 dropped to 119,576,223 gal. and that for 1918 to 102,110,650 gal.

The figures for the full year 1919 are not yet available, but basing estimates on the first nine months' production of 67,737,796 gal., the total production for 1919 will not reach much more than 90,000,000 gal.

The oil monopoly is being proposed largely to guarantee supplies for the navy, and new wells have been bored at Nairya and Kosenho, in Formosa, with rather

indifferent results. The Echigo fields, which produce about 60 per cent of Japan's supply, showed a decline of about 10 per cent in production during 1919. Decline in production is attributed somewhat to increased difficulty of importing well-boring apparatus since the armistice, and this has undoubtedly impeded the development of new resources.

Bureau of Mines Petroleum Experiment Station at Bartlesville, Okla.*

Investigations by Oil Technologists Cover Wide Scope And Are of Great Assistance to Operators Engaged In Production and Refining of Petroleum

THE Secretary of the Interior in the early part of 1918 approved the establishment of the Petroleum Experiment Station at Bartlesville, Okla., upon the condition that the city furnish the site and guarantee $50,000 for the erection of the buildings. A site of five acres and the necessary construction fund were furnished by the Bartlesville Chamber of Commerce.

The buildings consist of an administration and laboratory building, both of brick construction. The former is a two-story structure of eight rooms. A large room occupying over half of the main floor is devoted to the library, reception room, and clerical force. The remaining rooms comprise a drafting room and six offices occupied by the staff assigned to this station. The laboratory is a one-story brick building and contains a well-equipped chemical and physical laboratory; also a machine shop and mechanical laboratory. In addition to the main buildings there now are on the property an experimental refinery, a blueprint house, and a storehouse. These latter buildings are all of sheet-iron construction.

Oil-Field Development Problems

The petroleum experiment station at Bartlesville was established by the Bureau of Mines for the purpose of co-operating with those actively engaged in the petroleum industry. It might be termed a laboratory for practical research and for solving problems, devising new methods, preventing wastes, effecting economies, and for collecting and disseminating information. Investigations are not limited to any one branch of the industry nor to any one part of the country. Wherever opportunities appear for increasing efficiency, whether in the drilling of wells, in the producing or transportation of oil and gas, in the storing, refining or utilization of oil and its products, they may be considered. With the funds available, an effort is made to select problems in which a maximum number in the industry will be affected, and it is not possible to work on minor problems of interest to one company only.

Congress provides $25,000 annually for salaries and operating expenses of the station. In addition, certain men are headquartered there and are paid from other funds, so that the Government appropriates annually close to $35,000 for support of the station. At present it receives an annual appropriation of $12,500 from the State of Oklahoma. In addition, during 1920 the Bureau received $1,000 from the Ardmore Chamber of Commerce for continuation of an investigation in the Hewitt oil field, near Ardmore, Okla., thus making a total of approximately $50,000 which is expended each year through this station. This money provides for fifteen employees, ten of whom are technically trained men.

With its limited personnel and funds, the Bureau has considered that in connection with oil-field development problems the greatest benefit can be derived by working up a new field and turning the results of the investigation over to the operators and then moving to another new field. This work consists of gathering available information, making maps showing well locations and elevations, structure contour maps, geologic cross sections, peg models, and similar work, all of which helps to reveal the underground conditions of the oil fields. From these the stratigraphic location of the oil, water, and gas sands is determined, so that it is possible to predict the proper depths for landing casing to keep the water from the well and to avoid drilling too deep. By a study of the casing depths in wells already drilled, it may be found that water cased off may have access to upper oil or gas sands, thereby doing great damage. Likewise it may be discovered that an oil or gas sand has been cased off behind the pipe, and that the oil or gas is migrating between the wall of the hole and the pipe into barren sands, or sands where the oil, gas, or water is under less pressure, where it is wasting. This work often demonstrates the manner in which corrective measures may be applied; also, how to avoid wastes in the future. It includes a study based on engineering principles for increasing production, conserving oil and gas, and the economic development of the field. This work is of an educational nature, with the object of pointing out to the operators the advantages to be derived by applying engineering principles to underground operations. The Bureau engineers have worked on the Comanche, Walters, and Hewitt oil fields. An investigation of the underground conditions in the Walters oil and gas field was completed in the early part of the year, and a report made up and distributed through the Bartlesville Chamber of Commerce. Recommendations were made on efficient methods of operation, designed to increase the ultimate production of this field.

It is conservatively estimated that approximately 80 per cent of the oil remains in the sands and is not recovered by present production practices. Too little attention has been given to the proper methods of increasing the production in old wells and for learning best production practices under varying conditions to obtain a greater recovery. An investigation is being made covering both natural and mechanical factors affecting production, with the object of ascertaining methods which may be of value for increasing the percentage of oil recovered from the oil sands.

Evaporation Losses Investigated

An extensive investigation of the evaporation losses on Mid-Continent crude oils has just been completed, and the information so obtained will be published by the Bureau of Mines. As a continuation of this, work will be carried on to devise practical means for preventing and saving the evaporation losses. These particular losses can be materially reduced at a nominal cost, and the problem is now being attacked so as to provide practical means for avoiding the bulk of this waste.

During the last year the Bureau of Mines at Bartlesville has done considerable work on the recovery of gasoline from residual gas of compression plants. The

*Abstracted from an article by A. W. Ambrose in *Monthly Reports of Investigations* (October), Bureau of Mines.

report of this investigation has recently been published as Technical Paper 232, of the U. S. Bureau of Mines. In thirty compression plants in Oklahoma there was found to be an average of 0.337 gal. of gasoline per thousand cubic feet. This amounted to more than 5,000 gal. of gasoline a day that was not recovered by these plants. Following this investigation certain recommendations were made to some companies, which installed equipment at a nominal cost that perhaps will increase the gasoline output of this state practically 600,000 gal. during 1920. It is important to note that this increase will be from residual gases, which heretofore had gone to waste.

Refinery Investigations of the Bureau

A part of the experimental refinery at the Bureau of Mines station has been completed, and a series of experiments have been started to determine the best operating methods in order to obtain results corresponding to those obtained in large-scale plants; also, to check the efficiency of large-scale operation. It is planned to vary operating conditions to obtain data on the rates of distillation, temperature of condenser, fuel consumption, methods of treating, and like matters.

It is proposed to complete the experimental refinery now in operation at the Bartlesville station; to complete investigations now going on for recovering gasoline from waste tail-house gases and for making cleaner separation between gasoline and kerosene; to carry on experiments on the cracking of light fuel oils in order to obtain more gasoline from the crude; to experiment on methods of reducing refining losses, and to improve the quality of refined products; and to determine if high-grade lubricating stocks cannot be obtained from Mid-Continent crude oils, because of the shortage of lubricating stocks from Pennsylvania oils. In general, the purpose of these investigations is to increase the recovery of the more valuable products from crude oil and to improve their quality, particularly as to the crude oils of Kansas, Oklahoma, Texas, and Louisiana, from which state approximately two-thirds of our present production is obtained.

Queensland Gas Expected To Give Higher Yield of Petroleum

Special Correspondence

In *Engineering and Mining Journal* of Nov. 6, 1920, some particulars were given of the efforts that have been and are now being made to find petroleum at Roma, in Queensland, and of a heavy flow of gas, showing undoubted evidence of petrol, that was encountered last August. Later advices show that this gas, on being tested by the government analyst at a comparatively light pressure, gave 1.2 pints of petrol per 1,000 cu.ft. of gas. When the bore has been further cleared and arrangements have been completed for obtaining a pressure and temperature which are considered in America as giving the best results it is almost certain that the petrol content will be found to be considerably higher.

Some wild estimates have been made as to the quantity of gas that is escaping, and equally inaccurate calculations are being made as to the value of the late development, but these estimates are pure guesses, as nothing has been done to prove the quantity of the flow. In fact the volume of the flow is not considered material, as at present it is occurring only under conditions that are temporary, and can no doubt be increased, possibly to an almost unlimited extent, by further boring. What can be stated, however, is that in America, where petrol is selling at one-third the price now ruling in Australia, large quantities have been profitably extracted from gas carrying no more than 1 pint per 1,000 cu.ft. of gas, and there is little doubt that in the gas at Roma the state has an asset that can at any time be turned to profitable account, even if oil should never be found. This is the opinion of W. E. Cameron, the local government geologist, who has made a special study of the subject and has had charge of the geological side of the Queensland oil prospecting from the inception of the state bore at Roma.

It is a notable coincidence that of four bores put down at Roma—the first two for artesian water—three have become obstructed, and two of them have been abandoned for this reason. When the flow of gas that was lighting the town from No. 2 bore suddenly gave out, and attempts were then made to carry this bore deeper, the hole was found, mysteriously enough, to be choked at several places with some large pieces of solid iron that defied all efforts to remove it.

Excessive Use of Oil for Ships Opposed by Pirrie

Lord William James Pirrie, chairman of the shipbuilding firm of Harland & Wolff, recently gave out an interview regarding the future of oil as a fuel for sea-going vessels.

Lord Pirrie urged American shipowners to go slow in converting their steamers into oil burners, and said that in view of the present limited supply of this type of fuel it would not surprise him if this Government placed restrictions on the use of oil when other fuels were available.

"Until Mexico gets into a more settled state," said Lord Pirrie, "I feel that there is great insecurity in launching too large a program calling for vessels using oil as a fuel.

"Every possible step should be taken to prevent waste and to conserve the supply. This can only be done effectively by the adoption of the internal-combustion engine. It is, however, a great responsibility for any shipbuilder to advocate this type of propulsion under present conditions, for if oil could not be obtained in the trades in which such vessels were employed, they would be absolutely useless."

French Tariff on Prospecting Machinery Temporarily Suspended

At the request of the French commissary general for motor fuels and petroleum, the Ministry of Finances has just issued a temporary authorization for the free admission of prospecting machinery used in searching for petroleum, writes the *Écho des Mines et de la Métallurgie*. This measure is designed to encourage the initiative of all who desire to take an active part in the exploration of France's subterranean resources with a view to presenting France with a home supply of oil and of the products derived from it.

Photographs From Oil Fields

Copyright by Ewing Galloway, N. Y

AN OIL TANK FIRE IN THE CUSHING FIELD, OKLAHOMA

The cannon in the foreground was used to shoot through the tank below the blaze lines, thereby leasening the danger of a bubbling that would cause the oil to run over the embankment around the tank and ignite other tanks.

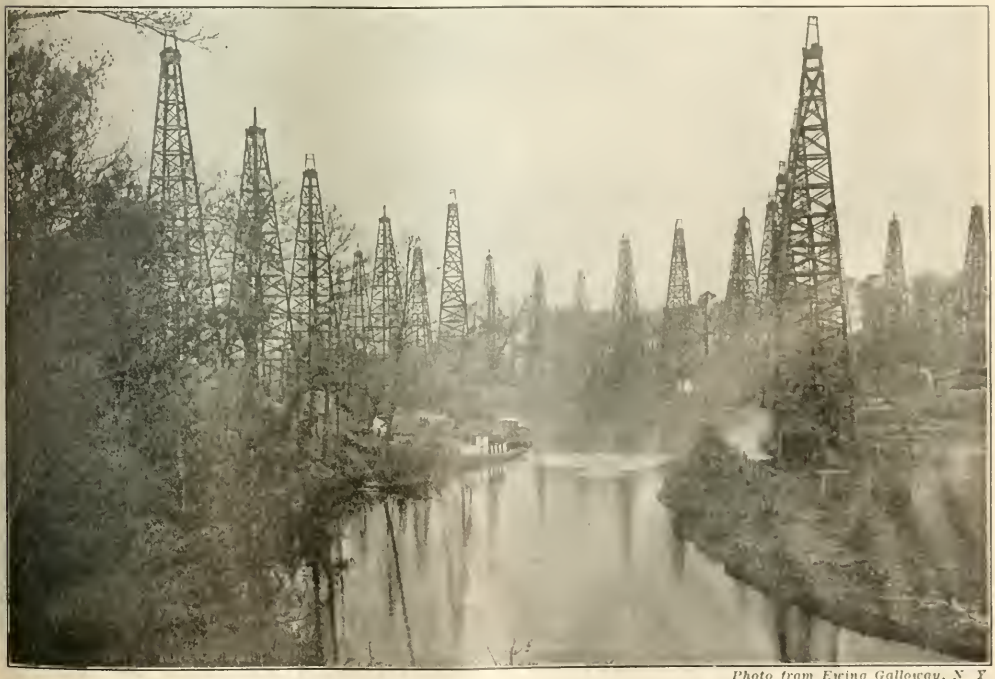


Photo from Ewing Galloway, N. Y

A FOREST OF OIL DERRICKS IN THE GOOSE CREEK FIELD IN TEXAS

NEWS FROM THE OIL FIELDS

Christian County Takes Place in Kentucky Producing Districts

From Our Special Correspondent

Christian County, Ky., is the newest field to announce development. Two wells have been drilled in the northeast corner to about 400 ft., with a third hole just south of White Plains. The two which are completed will produce about five barrels each. Three wells have been drilled near Crofton, in the northern part of the county, one to a depth of 1,580 ft. and the two others to 600 ft. The shallow ones have a good showing of oil, and the deep well will pump about ten barrels a day. In all there are nine wells recently completed in Christian County, with several rigs expected to move in within the next few months. Wayne County, which was one of the first counties in the state to produce crude oil in paying quantities, has recently brought in a 300-bbl. well.

Well No. 1 of the Future Oil & Gas Co. in Warren County, after being shot, developed into a gusher and is now producing 250 bbl. a day. Well No. 3 on the Whittaker-Kelley lease was shot and 150 ft. of oil stood in the well the following morning. This well is estimated at 30 bbl.

The well of the Major Jones Oil Co., No. 3, on the W. H. Hobbs lease in Lee County, pumped 30 bbl. in twelve hours. In the Mount Aërial section of Allen County activities continue, and some good wells will soon be brought in. The Texas Granite Oil Co. brought in its best well in the White Quarry section on the Harold W. Bublett lease.

In the Kentucky-Tennesse fields during October, 257 wells were completed, with eighteen dry holes and two gas wells, the new production being 8,606 barrels.

Progress Notes From Arkansas

From Our Special Correspondent

The Heilborn Oil Co., of Tulsa, Okla., has let a contract for a well to Messrs. Bewley & Bell, of Little Rock, Ark., to be located in the N. E. ¼ of S. E. ¼, Sec. 30-9-14, Dallas County. Actual drilling started the first week in November.

Home Oil & Gas Co. of El Dorado, Union County, Ark., is to drill on E. ½ of N. W. ¼ Sec. 1-18-16, Union County, Ark. This is the same section on which the Constantin Refining Co. brought in a gas well in May of this year.

The White Oil Corporation is to drill on the N. ½ of N. W. ¼, Sec. 12-18-16. A derrick has already been erected.

Well No. 2 of the Constantin Refining Co., in N. W. ¼ of N. E. ¼, Sec. 12-18-16, cemented 10-in. casing at 1,300 ft. The Arkansas Light & Power Co. is using gas from Constantin No. 1 well for fuel in its El Dorado plant.

Order Defines Royalties on Dominion Petroleum Leases

From Our Special Correspondent

Representations have been made to the Canadian government that owing to the uncertainty as to the amount of the royalty to be paid on the products of petroleum and natural gas locations, under dominion leases, development was retarded, as investors hesitated to increase large expenditures without knowing what tax might be placed upon the oil. An Order-in-Council issued Oct. 29 modifies the former order of Dec. 3, 1919, which provided that after Jan. 1, 1930, royalties might be fixed by the government from time to time, by enacting that for a period of five years after the date upon which the Minister of the Interior may decide that oil in commercial quantity has been discovered the royalty shall not exceed 5 per cent of the output, or the sales of the products of the location as may be decided by the minister, nor less than 2½ per cent of such sales; that for a further period of five years the royalty shall not exceed 10 per cent of the sales of the products of the location, nor be less than 5 per cent, and that thereafter the royalty shall be 10 per cent of the sales.

Wyoming Operators Anticipating Reserve Opening

From Our Special Correspondent

New rigs are being placed in the Salt Creek field, Wyoming, daily by various companies, to be ready to drill if the Government opens the reserve area to leasing.

The Big Muddy field pipe lines are handling an average of over 5,000 bbl. daily from the following companies: Merritt Oil, 3,100 bbl.; Ohio Oil, 1,160 bbl.; Midwest Refining, 345 bbl.; Texas Co., 150 bbl. Parts of these productions belong, through lease ownership, to other companies.

The Petrogras Corporation reports the sale of all its holdings in the Dry Piney field, Lincoln County, to Clinton & Lackey, who have started drilling. The Petrogras Corporation is acquiring leases in the Osage field.

A well of the Pyramid Oil Co. in the Fossil field of Lincoln County has just been completed and is now standing full of oil. The well will be bailed as soon as storage capacity is provided.

The first test of the Producers & Refiners Corporation in the Williams Park district, Routt County, Col., has proved dry at a depth of 1,200 ft. It is probable that the well will be abandoned and a second well drilled elsewhere on the 16,000-acre lease. This land is twenty miles southwest of Steamboat Springs on what is known as "Twenty-Mile Dome."

Texas First Oil Producing State During October

From Our Special Correspondent

During October Texas produced at the rate of over 350,000 bbl. of oil daily and advanced to first place among the oil-producing states. The big gain is due largely to the two great Texas Co. wells at West Columbia, Brazoria County, and the north-extension wells of that field, and to the general gain all over Stephens County, especially in the Breckenridge district. Stephens County is now the leading oil-producing county of the state. The total production for the month would have been larger if lack of storage and transportation facilities in the Breckenridge field had not necessitated slowing down of drilling operations.

The United States Shipping Board has accepted the bids of the Texas Oil Co., of New York, to furnish one year's estimated supply of lubricating oils, amounting to 2,770,870 gal., at prices ranging from $0.47 to $0.78 per gal. Deliveries are to start at once and are to be made at Atlantic and Gulf ports.

The Gulf Export & Trading Co. lost its barge "Ankla" near Tampico in the recent Gulf hurricane, while in tow of the seamer "Colonel Roosevelt." Both boats were blown ashore, but the steamer was refloated. Another barge of 1,100-ton capacity will be built to replace the one lost.

The Attorney General's department has handed a decision to Land Commissioner J. T. Robinson that all oil and gas royalties and rentals received on "State Land" consisting of islands, salt-water lakes, bays, inlets, marshes, and reefs within tide-water limits and the Gulf, shall be divided, two-thirds to the permanent school fund and one-third to the general revenue fund. Also that royalties and rentals on land belonging to the permanent fund of the University of Texas shall be apportioned to that institution.

A spectacular fire occurred in the West Columbia oil field on Nov. 2, when the gas escaping from the Texas Co.'s No. 51 Hogg well became ignited by the heat generated by friction. The reflection of the fire in the sky could be seen for over fifty miles. This well, 300 ft from the flow pit of the No. 49 Hogg well, blew in unexpectedly at 2,254 ft The No. 49 Hogg is flowing thousand of barrels of oil daily, but it was saved from ignition.

Blue Ridge, Fort Bend County, i still of paramount interest on the Gul Coast, and the scramble for leases con tinues, although the big well of th Texas Co., west of the dome, choke and quit flowing after having bee pinched down to 500 bbl. daily. Storag facilities will now be provided and th well cleared.

Book Reviews

A Textbook of Geology. Part I. Physical Geology. By Louis V. Pirsson. Second, revised edition. Cloth; pp. 470; 6 x 9. New York. John Wiley & Sons, Inc., 1920. Price, $3.

This noteworthy volume puts in its appearance after the death of the able author, whose preface is dated May, 1919. It is a fitting memorial, and we recommend it for the use of colleges and schools, and for the general reader who desires a grasp of geologic thought. The language of the book is delightfully clear, unnecessary technical words are omitted, and those which are used are carefully defined: yet the treatment is painstaking, thoughtful, and thorough. If any one wishes to be inducted into the principles of geology, this is decidedly the book to recommend. The principal geologic processes, so far as worked out by investigation, are explained thoroughly and patiently.

The author, himself known principally as a petrologist, has not emphasized the igneous rocks especially in this volume: possibly he has leaned over backward a little in this respect, and emphasizes somewhat the simple and picturesque phenomena of physiography, glacial geology, and the other divisions of what has been humorously called "superficial geology." A conservative and judicial attitude is maintained in the presence of conflicting views concerning any problem, as is fitting in the case of a textbook. The author has, rather, the habit of observing, after citing divergent views, that the cause of the phenomenon in question is probably complex, and that each explanation may apply in different cases. We are inclined to regard this in several instances as undue optimism, and to believe that in most instances one or the other of the views is correct and the other wrong.

A textbook is a difficult thing to manage, on account of the vast ground to be covered and the necessity of familiarity with each division. The chapter on ore deposits is perhaps unduly short (forty-three pages). Possibly the author has gone as far as the scheme of the volume warrants, but the student or reader will need other literature to form any adequate idea of ore deposits.

Certain ideas which are textbook habitués and are borrowed from one to the other are inevitable, especially in a book written by a university professor. An example of this is the reproduction, in a modified form, of the diagram originally published by Leconte (p. 377) showing the origin of the Sierra Nevada, the Wasatch Range of Utah and the intervening desert ranges, as the result of relatively recent collapse into faulted blocks of a great arch or geanticline which, before the collapse, reached over this whole span. Now, it is well known that the Sierra Nevada fault-block originated as early as the close of the Cretaceous, and has been repeatedly subdued by erosion and uplifted again, since that time: so that the broken-arch theory is quite without foundation and opposed to facts.

No study is more essential to general culture than geology, as taught by a volume of this admirable type. The study should be a prescribed one, not only in universities, but in preparatory schools. It is more essential to a general education than many of the subjects at present prescribed. J. E. S.

The Mineral Industry. Its Statistics, Technology and Trade During 1919. Edited by G. A. Roush and Allison Butts. Cloth, 6½ x 9½; pp. 902. McGraw-Hill Book Co., New York. Price, $10.

The twenty-eighth volume of this important book has just been issued. Like the previous volumes it contains comprehensive reviews of about fifty of the most important mineral industries during the year covered. Statistics for preceding years are also given. The information presented is international in character, though, being an American publication, of course domestic activities receive the most space. It is an extremely handy reference book, largely a condensation of published statistics and technical information.

E. H. R.

Technical Papers

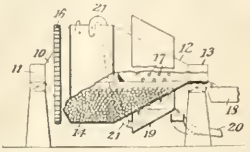
Talc—The method of mining and milling employed at the talc deposits of George H. Gillespie & Co. at Madoc, Ont., is described in the U. S. Bureau of Mines *Reports of Investigations*, Serial No. 2,162, five pages. It may be obtained by addressing the Bureau at Washington, D. C. Bolting through silk cloth is successfully done at this mill.

Theory of Flotation—In the August issue of the *Journal of the Chemical, Metallurgical and Mining Society of South Africa* (Johannesburg, price 3s. 6d.) is published a seven-page article entitled "A Resumé of Literature on the Theory of Flotation, With Critical Notes." The phenomenon of flotation cannot be said to be understood, but this article gives a good summary of the opinions held by writers on the subject.

Philippine Mineral Resources—The Bureau of Science of the Philippine government, at Manila, has issued a 75-page illustrated booklet entitled "The Mineral Resources of the Philippine Islands for the Years 1917 and 1918." The principal mineral products are gold, coal, sulphur, asbestos, and manganese. Iron and asphalt may exist in commercial quantities. Much of the archipelago is unexplored, and the known mining fields are undeveloped. Foreign capital is required. The pamphlet would be much easier to look over if the pages had been cut. The illustrations, on heavy paper, are particularly clear, though at least two are printed upside down.

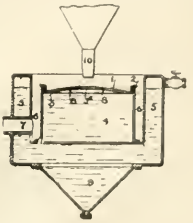
Recent Patents

Conical Mill—No. 1,355,474. Harry W. Hardinge, New York, N. Y. Perforations are made in the conical part of a Hardinge mill through which the pulp discharges into an outer drum, rotating with the mill. The fine material



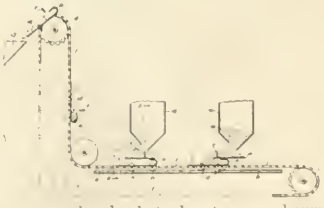
overflows from this drum and the oversize is returned to the mill for further reduction.

Concentrating Jig. No. 1,354,550. Georg Glockemeier, Luderitzbucht, South Africa. A jig with a sieve



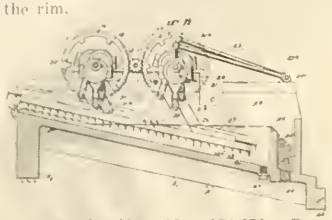
domed upward and a concentrate discharge in an annular zone near the center.

Conveyor—No. 1,355,180. David W. Starkey, Chicago, Ill. A system which combines the features of a belt con-



veyor and a bucket elevator, as shown in the illustration.

Thickener. No. 1,355,071. Charles Allen, El Paso, Tex. This type of Allen cone has a float, actuated by the density of the pulp, which controls the amount of discharge passing over the rim.



Drag Classifier. N. 1,354,676. Benjamin A. Mitchell, Garfield, Utah. An apparatus of the Dorr type with a different mechanism.

ECHOES FROM THE FRATERNITY

Mining and Metallurgical Society Gold Medal Awarded to E. A. Cappelen Smith

A. L. Walker and H. F. Guggenheim Discuss Life and Work of Chuquicamata's Master Metallurgist

The award of the Mining and Metallurgical Society gold medal for the year 1920 was made to E. A. Cappelen Smith for distinguished service in the art of hydrometallurgy on Wednesday evening, Oct. 10, at a dinner held at the Hotel Commodore in New York, in the presence of over 150 members, guests and their families. The toastmaster was Dr. E. P. Mathewson, and speeches were made by Dr. Arthur L. Walker and Harry F. Guggenheim, and on the presentation of the medal by Waldemar Lindgren, president of the society.

Dr. Walker told of the coming of Mr. Smith to this country from Norway, his native country; his wanderings, following his profession as a metallurgist, to Anaconda and other parts of the West; then finally back to the East Coast; how he built up a reputation as a progressive and courageous metallurgist, which finally led to his being selected to solve the treatment problems of the great Chuquicamata orebody, in Chile. Dr. Walker's speech was freely interspersed with witty remarks and kept the audience in good humor during the not too circumstantial account of Mr. Smith's professional history.

Harry F. Guggenheim sketched briefly and vividly the fact that the ore deposit at Chuquicamata had been known for hundreds of years; that it had first been worked by the Incas and, after the conquest, by the Spaniards; that the rich ores had been exhausted, and though the color of the rock proclaimed to every comer "Here is copper," it awaited the touch of adventurous science to transform the desert into the abode of industry. This had been accomplished by the scientific staff of M. Guggenheim's Sons, and in this the solution of the metallurgical problem by Cappelen Smith was one of the most important features. As the result, plants capable of treating 10,000 tons of ore a day, from an ore reserve that would last over a hundred years, have been constructed; 4,000 workers are employed in the enterprise; and a modern mining town had taken the place of the empty waste. In short, Mr. Guggenheim remarked, a soul had been born in the desert.

Mr. Lindgren, in presenting the medal to Mr. Smith, acknowledged his own unfamiliarity with metallurgy, although he claimed once to have, by superhuman efforts, kept a lead furnace running for three days. "Eventually," he remarked philosophically, "she froze."

In accepting the honor conferred by the society, Mr. Smith displayed both modesty and humor, pointing out that the achievements at Chuquicamata had been the result of enthusiastic team work on the part of the staff, under the captaincy of Pope Yeatman, and recounting some of his experiences since coming to the United States. He paid a feeling tribute to the equal opportunity and generous appreciation given foreigners in this country, only provided they would work. He had found it difficult to convince people that he had not changed his name from what it was in Norway; and had noted with amusement the struggles of his friends in this country with the geography of Europe. He had been dubbed "Swede Smith" in Anaconda, to distinguish him from the rest of the family; and finally, as a concession to his tales about the rugged mountains of his native land, "that Swede from Switzerland."

GOLD MEDAL OF MINING AND METALLURGICAL SOCIETY OF AMERICA

At the speakers' table, besides the above mentioned, were G. P. Bartholomew and Dr. R. H. Richards.

Site for National Academy of Sciences Building Secured

National Research Council Will Have Share in the Home To Be Built by the Carnegie Corporation

A site for the new building in Washington which is to serve as a home for the National Academy of Sciences and the National Research Council has recently been obtained. It comprises the entire block bounded by B and C Sts. and Twenty-first and Twenty-second Sts., N. W., and faces southward on the Lincoln Memorial in Potomac Park. The Academy and the Council have been enabled to secure this site, costing about $200,000, through the generosity of about twenty friends and supporters. Funds for the erection of the building have been provided by the Carnegie Corporation of New York.

American Engineering Council Representatives Named by A. I. M. E.

F. A. E. S. Membership Increasing But A. S. C. E. Decides To Stay Out

At a meeting of the executive committee of the American Institute of Mining and Metallurgical Engineers on Oct. 28, 1920, the following were designated as representatives of that institute on American Engineering Council: Herbert C. Hoover, J. Parke Channing, Arthur S. Dwight, Edwin Ludlow, Allen H. Rogers, Philip N. Moore, J. V. W. Reynders and Joseph W. Richards.

At its recent regular meetings the Grand Rapids Engineering Society, of Michigan, accepted the invitation to become a charter member of the Federated Societies; and the advisory council of Iowa Engineering Society made unanimous recommendations that that society also accept. The council designated J. H. Dunlap as its representative to the meeting of American Engineering Council in Washington, D. C., Nov. 18, 19 and 20.

The American Society of Civil Engineers' referendum on the question recently decided by 3,300 to 2,300 to refrain from becoming a charter member of the Federated American Engineering Societies. Already seventeen organizations have definitely accepted charter memberships and more than forty-five representatives are entitled to seats on American Engineering Council.

Utah Chapter of A. A. E. Hears C. J. Ullrich at Annual Banquet

About two hundred engineers of Salt Lake and other Utah cities attended the annual banquet of the Utah Chapter of the American Association of Engineers in Salt Lake City, Utah, Oct. 17.

W. A. Richmond, president of the Utah Chapter, was master of ceremonies and introduced C. J. Ullrich, assistant state engineer, who spoke on the growth of the American Association of Engineers from its first meeting in 1915 until today, when it has a membership of 21,000. It is dedicated, he said, to service—service of the engineering profession, of the community, and of the nation. Its purpose is unity

A Copy of the Temporary Mining Laws of Persia, dated Oct. 2, 1917, is in the hands of the U. S. Bureau of Foreign and Domestic Commerce, Washington, D. C. *U. S. Commerce Reports* for Oct. 22, states that it will be made available on applying to the bureau or its district co-operative offices and referring to File No. NE-15.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Maine Courts To Adjudicate Arizona Conversion

Claims of Arizona Commercial Mining Co. Against Iron Cap Copper Co. Before Supreme Judicial Body

Two Maine corporations operating mines on contiguous claims in Arizona have taken their controversy over ore into the Supreme Judicial Court of Maine. The same controversy was first brought into the Massachusetts courts, and after hearing there dismissed because the parties were non-residents.

In the suit the Arizona Commercial Copper Mining Co. alleges that the Iron Cap Copper Co. has taken, converted, and sold some 250,000 tons of its ore and asks for the money had and received by the defendant for same.

Complainant's bill charges the Iron Cap Co. with taking the ores during the preceding six years by way of the Iron Cap shaft, the Williams shaft, and other shafts on the property occupied by the latter, and underground workings, said ores coming from those portions of the veins, lodes and ledges which had their top or apex upon the mining claim owned by the complainant, and wholly within the complainant's surface lines, such veins, lodes, or ledges being at the time in the actual possession of complainant.

Defendant denied that it had taken any ores except those extracted from veins, lodes, and ledges in Arizona, as to which it has in good faith at all times openly and to the knowledge of complainant claimed title and ownership; and contended that the workings and all means of access thereto have been in the exclusive occupation, possession, and control of the defendant.

The court said that in Maine the landlord owns all within the limits of his land from the center of the earth to the high heavens. His bound areas are planes produced by projecting his boundary lines vertically downward and upward. But in the case of mining claims derived from the public domain the boundaries are governed by the "apex law" (Rev. Statutes U.S. 2322). This law is stated to be that one who secures a mining claim on a public domain is entitled not only to the exclusive enjoyment of the surface but to all veins and lodes throughout their entire depth, the top or apex of which lies inside the surface lines, although such veins and lodes may so far depart from the perpendicular in their course as to extend outside the vertical side lines of the surface location.

On the question of the court's jurisdiction it was said that no suit can be maintained in one state to determine directly the title to real property in another state. But the Maine courts have jurisdiction of a suit between Maine corporations arising out of conversion of ore in Arizona where title to the land was only incidentally involved and the action, being one for money relief, was transitory.

The court found that the complainant presented a good cause of action against defendant.

California District Court Dismisses Government's Bill

Holds Development Work of Oil Companies Was Made in Good Faith—Work on Claim for Benefit of Group Sufficient

In the suit of the United States against the Standard Oil Co., Syndicate Petroleum Co., Pyramid Oil Co., and a number of others, to restrain waste and depletion of the oil contents of certain California oil lands included in the area described in the Presidential withdrawal order of Sept. 27, 1909, the District Court dismissed the Government's bill. No discovery had been made at the date of this withdrawal, but the court finds that defendants were bona fide occupants or claimants of the property, diligently searching for oil at that time, and therefore protected by the saving clause of the Pickett Act (Comp. St. No. 4523-4525). It found that at the date of withdrawal defendant had twenty-four strings of tools in operation, as many as the available water supply would permit, had expended in developing and preparing to develop the property $500,000 and had 183 men on its payroll and $280,000 worth of tools and materials on hand, $36,000 of which was received and unloaded on the day of withdrawal. Its operations were continued unceasingly after the withdrawal date, the force was increased, additional material assembled, the water plant enlarged and extended along with completion of gas mains and telephone system, and defendant prepared for the drilling of twenty additional wells, prosecuting all such work to a discovery of oil.

No work was being done on the identical quarter section of land in controversy at the time of the withdrawal; but the court was convinced that the work being done on the contiguous claims was intended to and did directly benefit all the claims.

The established law respecting such claims was stated to be "that where two or more contiguous ones are held by the same person or persons work done in good faith upon any one of them, or outside the boundaries of either of them, which directly tends to the development or benefit of all of the claims for mining purposes, should be held applicable to each and all of such claims." (245 Fed. 523.)

Loses Suit Against North American Oil Consolidated

California Lands Held Valid Locations Prior to President's Order of Sept. 27, 1909, and Protected by Pickett Act

The United States Circuit Court of Appeals, Ninth Circuit, has affirmed the decree of the District Court for the Southern District of California, dismissing the suit by the United States against the North American Oil Consolidated, Pioneer Midway Oil Co., the Union Oil Co. of California, and the Producers' Transportation Co., and a rehearing was denied the Government.

The Government had sought a decree adjudging that the defendants had no right or interest in a certain section of the then public land of the United States known as Section 2, Township 32 South, of Range 23 East of the Mount Diablo base and meridian, or in any of the oil, gas, or other mineral contained therein, for the appointment of a receiver of the property, or for an injunction and an accounting.

The court found that the lands involved were valid locations under the mineral land laws at the time the President made the withdrawal order of Sept. 27, 1909 (36 Stat. 847) and were therefore excluded from such order, and, further, that the lands and their contents were protected by the Pickett Act.

Missouri Court Disallows Claim of Breach of Warranty

Judgment against the Adams-Hicks Zinc & Lead Corporation for the full sales price of shells sold it by the Central Foundry Co. has been affirmed in the Missouri Court of Appeals in Springfield. The shells were bought for use in its mining plant as part of the machinery for crushing mineral-bearing rock. The mining company alleged that these shells were sold to it under a warranty that such shells would each crush not less than a specifield number of tons of rock, and agreeing to make reductions in the price in proportion to any failure in that respect.

The mining company filed a counterclaim for the alleged failure of the warranty as to the shells or rolls. The jury denied these claims and gave verdict for plaintiff for the full purchase price as agreed. The agent selling the rolls testified that he made no representation or warranty as to the shells crushing any particular amount of rock. The mining company appealed from the holding of the trial court that the burden of proof was upon it to prove that the seller warranted the shells sold to buyer would each crush the quantity of rock as claimed by it. This holding was affirmed on the appeal.

MEN YOU SHOULD KNOW ABOUT

C. L. Graves, mining operator of Cusihuriachie, Mexico, has been to Chicago for two weeks on business.

J. T. Pardee has returned to Washington after making a geologic study of glacial placers in western Montana.

Eugene Stebinger again is in Washington after an extended visit to Bolivia, where he did geological work.

F. C. Calkins has returned to Washington after several months' field work in the Cottonwood district of Utah.

F. Leslie Ransome is on his way to Arizona for several months' field work in the Oatman and other districts in that state.

George C. Martin has completed geologic field work in the mining region on the Kuskokwim and lower Yukon rivers, Alaska.

L. M. Prindle has completed a study of the geology of the Bennington and Hoosick quadrangles for the U. S. Geological Survey.

William B. Milliken, mining engineer, and graduate of Colorado School of Mines, has an office in Mining Exchange Building, Denver, Col.

S. H. Cathcart, who spent the field season investigating the mineral deposits of Seward Peninsula, Alaska, has returned to Washington.

Anna I. Jonas has returned to Washington after having made a study of the limestone in York County, Pennsylvania, for the U. S. Geological Survey.

John H. White, field engineer for the American Metal Co., Ltd., of London and Denver, Col., was in Reno, Nev., for several days the last of October.

E. E. McCarthy, of New York, an official of the Yukon Gold Co., recently visited the company's dredge operating on Prichard Creek, near Murray, Idaho.

C. E. Van Ostrand has returned to Washington after having taken records of deep temperatures in thirty-four oil wells in Wyoming, California, and Texas fields.

Ernest N. Patty, of the Washington State Geological Survey, has been investigating some manganese deposits in the Olympic Range of northwestern Washington.

Wilbur A. Nelson, State Geologist of Tennessee, was in Washington recently in connection with the economic survey which is being made of the basin of the Tennessee River.

Ira B. Joralemon, of Bisbee, Ariz., geologist of the Calumet & Arizona Mining Co., passed through El Paso, Tex., recently from examining mining properties in Mexico.

Wm. H. Paul, mining engineer of New York City, formerly in Chihuahua, is now in charge of chrome mines in Guatemala controlled by United Fruit Co. interests. His address is Guatemala City.

Lapsley W. Hope has resigned his position as superintendent of the Eureka-Holly Mining Co., Nevada, to accept a similar position with the Ocoee Copper Co., at Ducktown, Tenn.

F. W. Draper, general manager of the Louisiana Consolidated Mining Co., of Nevada, has returned to the mine at Tybo after spending a month in New York in consultation with the directors.

George Clothier, government mining engineer of Stewart, B. C., has returned from his final tour of the Salmon River section, Portland Canal Mining Division. He now is preparing his annual report.

Col. H. H. Yuill, of Bainbridge, Seymour & Co., mining engineers, 645 Salisbury House, London Wall, London, returned to England about Nov. 1, after his trip to examine properties in British Columbia.

Dr. J. W. Beede, professor of geology in the University of Texas, has returned from the Mackenzie River valley, where he spent the summer prospecting in the interest of independent oil operators.

Herbert Hoover and **Theodore Hoover** will move their San Francisco offices on Dec. 1, from the Mills Building to the Balfour Building. Associated with them are Jas. M. Hyde, David McClure, and H. W. Turner.

F. W. Bradley, of San Francisco, president of the Bunker Hill & Sullivan Mining & Concentrating Co., is at Kellogg, Idaho, where he will remain about two weeks, inspecting the mining and smelting operations of the company.

R. H. Sutton is now general superintendent of a group of mines near Concepción del Oro, Zacatecas, Mexico, for Cia. Minera Nazareno y Catasillas, S. A. Mr. Sutton was formerly assistant mine superintendent for Cananea Consolidated Copper Co., at Cananea.

E. H. Hamilton and **E. A. Anderson**, general manager and chief engineer respectively of the U. S. Smelting, Mining & Refining Co., Midvale, Utah, have been inspecting various processes in use at the Anaconda Copper Mining Co's. Washoe reduction works at Anaconda, Mont.

Prof. G. A. Overstrom, who sailed from San Francisco in September, is now at Tul Mi Chung, Suan Concession, Korea, in the interests of the Seoul Mining Co. Professor Overstrom visited Honolulu and Yokohama on his way to Korea and is not expected to return before January.

Archie H. Jones, metallurgical engineer, of Salt Lake City, Utah, is in New York City on business connected with a large mill that his company has designed for a New Mexico property. Mr. Jones recently organized the A. H. Jones Co., metallurgical engineers, of Salt Lake City, which has taken over the business of Charles Butters & Co.

A. B. McCallum, who a short time ago resigned as chairman of the Research Council of Canada, has been appointed to a professional chair at McGill University, Montreal, Quebec. Dr. McLennan, of Toronto University, is named as Dr. McCallum's successor on the Research Council, which is to be reorganized. His work as a scientific adviser to the British Admiralty during the war attracted wide attention.

SOCIETY MEETINGS

The 1920 Annual Meeting of the American Society of Mechanical Engineers will be held at Engineering Societies Building, 29 West 39th St., New York City, on Dec. 7 to 10. The keynote of the meeting will be Transportation and the foremost authorities in its various fields will discuss its problems. Other engineering problems will also receive due attention.

The Utah Section of the American Institute of Electrical Engineers met on the evening of Tuesday, Nov. 16, in the assembly room of the Commercial Club, Salt Lake City. P. A. Jeanne discussed inductive interference problems, and E. G. Holding, manager of the Holding Electrical Co., spoke on "Early Electrical Experience in Utah." Joseph F. Merrill was chairman of the meeting.

OBITUARY

Robert H. Remington, a junior engineer on the staff of the U. S. Geological Survey, was drowned on Nov. 8 while trying to cross a river on the island of Maui, of the Hawaii group.

Captain Charles Kendall, head mining captain for the Quincy Mining Co., dropped dead at his home on Oct. 26. He was born in Cornwall, England, 65 years ago, coming to the United States when a young man and entering the employ of the Franklin Mining Co. at their Pewabik mine. He went to the Quincy Co. when it purchased the Pewabik property.

Captain Thomas Hooper, a pioneer mining man of the Michigan copper country, died suddenly on Oct. 28, in his 79th year. He was born in Cornwall, England, and came to the United States in 1859, when he entered the employ of the Quincy Mining Co. as a miner. He later took up mine development in Ontonagon County, where he was associated with the Union mines, Ontonagon Silver mine, Ironsdale Copper Co., White Pine Co., and from 1899 to 1906 the manager of the Victoria Copper Co. Since 1906 he had spent his time in mine examination, making his headquarters at his home in Cresco, Iowa.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Calumet & Hecla Reduces Wages

Low Prices, Excess Production and High Costs Force Retrenchments in Michigan Copper Country

A 15 per cent reduction in all wages and salaries, effective Nov. 16, was announced Nov. 12 by Calumet & Hecla and its subsidiary companies. The Osceola branch of the Calumet & Hecla at White Pine and La Salle, Mich., will be closed down and the forces of that company's other mines reduced. Low price of copper, limited market, unsold surplus, excess production and costs are responsible, and it is estimated that 1,500 men will be thrown out of work.

Such a step was not taken without due deliberation, but it is the only corrective move that can be made to put the Lake district on a normal basis

Bisbee Deportation Case Abruptly Dismissed

Prosecution of the defendants in the Bisbee deportation cases was ended Nov. 4, when charges of kidnapping, filed last year against 206 men, were dismissed by Judge Sam L. Pattee of the Superior Court at Tombstone, Ariz., upon the motion of County Attorney Robert N. French.

Inability to get many of the deported men to appear as witnesses and the fact that hundreds of Cochise County residents had asked him not to put the county to the expense of further prosecutions, said Mr. French, had made it necessary for him to at last ask for dismissal of the indictments.

The indictments dismissed included 159 men named in the "blanket case," which was to have been started Nov. 8, and individual indictments naming forty-seven defendants. Since the prosecution of the cases was started four of the defendants have died.

Schuylkill Mining Majority Stockholders Win Decision in Arizona Court

The Mohave County, Ariz., Superior Court recently rendered a decision in favor of F. A. Garbutt and the majority stockholders of the Schuylkill Mining Co. in the long squabble concerning the Tennessee mine, which was purchased from the Wallapai Mining Co. in March, 1918. If the minority stockholders under Burke do not take an appeal, which seems probable, this will close the long dispute and bring an early resumption of work in the old mine.

WEEKLY RÉSUMÉ

Calumet & Hecla, because of the continued low copper prices, has cut wages 15 per cent in an effort to bring cost of production nearer sales prices. Dismissal of the Bisbee deportation cases was ordered by the Superior Court at Tombstone, Ariz., on Nov. 4. International Nickel Co. has announced a reduction in output amounting to 25 per cent, due to the general business depression in the country, which brings production practically on a pre-war basis. Interstate-Callahan closed down, due presumably to the low price of zinc and a strike at the company's smelting agency, the Grasselli Chemical Co. The Tom Reed Gold Mines Co. has brought suit against the United Eastern Mining Co. over an important apex right. The largest known hoisting engine is now in operation for the Quincy Mining Co. In the Gogebic Range ore shipment has ceased for the season. Labor supply in the Porcupine district, Canada, has become more plentiful. The survey of a railroad location into the Flin Flon district has been authorized by the Manitoba government. A U. S. Government committee declares the erection of a smelter in Alaska inadvisable, because of an inadequate supply of fuel and ores. The Controller of the Treasury has refused to allow further payment on a War Minerals Relief claim after the award of the commission has been accepted.

International Nickel To Reduce Output One-Fourth

Announcement was made Nov. 6, by Vice-President J. L. Agnew of the International Nickel Co., Copper Cliff, Ont., of a twenty-five per cent reduction in the output of the company, or from 4,000 to 3,000 tons of nickel matte per month. One furnace is to be closed down, and the gradual general cutting down of the working force had already begun. Between two and three hundred men, a payroll reduction of $25,000 or $30,000 a month, are affected.

A general depression in business all over the United States is given as the reason for the reduction, and this latest decision of the company practically brings production to a pre-war basis.

Interstate-Callahan Mine Closes for Indefinite Period

The Interstate-Callahan mine closed down on Oct. 31, with the exception of twenty-five or thirty men retained on development work. This action was taken by the company on the request of the Grasselli Chemical Co., purchaser of the zinc product of the Interstate-Callahan, the Grasselli company smelting plants being tied up through a strike. The shutdown is for an indefinite period. The company employed about 350 men.

Tom Reed Sues United Eastern

Apex Rights in Faulted Big Jim Orebody Cause Dispute—Prominent Experts Called—Models Introduced

The suit over apex rights in the Big Jim orebody at Oatman, Mont., brought by the Tom Reed Gold Mines Co. against United Eastern Mining Co. in April, 1919, came to trial on Nov. 8 before Judge T. Elmo Bollinger of the Mohave County Superior Court, Arizona. The attorney for the Tom Reed company is Judge Curtiss H. Lindley, of San Francisco, Cal., and the United Eastern company has retained John P. Gray, of Cœur d'Alene, Idaho.

The dispute between the two companies has arisen through a confusion due to the fault system revealed in the Tom Reed mine, whereby the Big Jim orebody, which was purchased in 1917 by the United Eastern, has been dislocated and its northwestern prolongation has been obscured. A number of elaborately executed mine maps and models have been brought forward in connection with the testimony being heard. The witnesses called include prominent engineers and geologists, such as Andrew C. Lawson, Dr. W. H. Emmons of the Minnesota Geological Survey; H. V. Winchell, Oscar H. Hershey, Albert Burch, Walter H. Wiley, and J. A. Burgess, who is a former superintendent of the United Eastern mine. Testimony by the Tom Reed representatives was heard from Nov. 8 to 11; the United Eastern Mining Co. finished its testimony on Monday, Nov. 15, after which the summing up and the arguments by the two sides were heard. The decision is not to be expected for some time.

Copper Country Now Has Largest Hoist Known in Operation

Quincy Mining Co., at Hancock, Mich., on Nov. 10 placed the largest known hoisting engine in operation at No. 2 shaft. It is a Nordberg duplex cross-compound, condensing, steam hoist, with a total winding capacity of 13,300 ft. of 1⅛ in. steel cable, operating in balance at a maximum rope speed of 3,200 ft.-min. The four engines of the hoist are set at an angle of 45 deg. on a triangular frame with the 516,000 lb. drum at the top. The two high-pressure engines are connected to the crank pin on one end of the drum shaft and the two low-pressure engines on the other end, thus eliminating all vibration or pulsation of the hoisting cable. A

floor space of 60 x 54 ft. is required by the engine, which stands 60 ft. high, and weighs, with the condensing equipment, 1,765,000 lb. Its horsepower will vary from a normal of about 2,000 to a maximum of about 6,500. The building is particularly pleasing architecturally.

Shipping Season Closes on Gogebic Range

The shipping season has been closed for this year by cold weather and snow. On the Gogebic Range the thermometer has been down to 8 deg. F. several days so the ore was freezing in the cars, and the snowfall has amounted to about one foot. At the docks at Ashland, thirty-five miles from the range, the weather is always much milder but the storms have interfered with navigation on the lakes. Considering the delays during the first half of the shipping season the tonnage forwarded this year has been good, not record breaking, but as good as the average of recent years.

The Odanah Iron Co. has received a Presscott-Menominee duplex 6½-in. plunger pump to be driven through herringbone gears by an electric motor. It is to be placed on the seventeenth level of the Ottowa mine, but will not pump to surface.

Flin Flon Railway Survey Authorized

The Manitoba government has given the Canadian National Railways authority to proceed immediately with a survey for a railroad into the Flin Flon mine district north of The Pas. The survey will include an estimate of the cost of construction of the road, to be submitted to the Legislature at its next session. The survey is expected to be completed in three months.

Mukden District Rich in Minerals

The Mukden consular district has an area of about 89,000 square miles, a population of nearly 10,200,000, and comprises the greater part of South Manchuria, the principal trading centers being Mukden, Newchwang, Kirin, and Changchun. The climate is similar to that of Minnesota.

"The mining possibilities of this section of Manchuria are enormous" writes Consul General A. M. Pontius, "but present developments are limited. There have been reported coal, iron, gold, silver, copper, lead, zinc, asbestos, and magnesite. Coal is extensively mined, both by Japanese and Chinese. The Japanese are working large deposits with modern machinery, but the Chinese are still using crude native methods. The Japanese also are developing large deposits of iron ore. Copper ingots are produced at one mine with modern methods. Both alluvial and quartz gold are found in a number of places, but no large mines are in operation. Lead and zinc occur mainly as lenticular masses in limestone.

"Mining is still in a comparatively backward state in Manchuria. With more extended railway and road building it is certain that intelligent and extensive prospecting will be undertaken, and the chances for developing mines and industries allied to mining are good. Capital is needed, and the services of experienced engineers, and with these two prime requisities at hand the future of mining in this district should be bright."

Recent Production Reports

Miami Copper produced 4,582,293 lb. copper in October, compared with 4,549,140 in September.

Arizona Copper produced 2,800,000 lb. copper in October, compared with 3,000,000 in every other month thus far this year.

Cerro de Pasco produced 4,698,000 lb. copper in October, compared with 4,444,000 in Sepember.

Shattuck Arizona in October produced 206,772 lb. copper, 790,149 lb. lead, 39,254 oz. silver, and 436 oz. gold. Copper produced in September was 166,513 lb.

Phelps Dodge smelter at Douglas, Ariz., produced 7,126,000 lb. copper in October, compared with 7,998,000 in September. The Copper Queen yielded 4,366,000 lb. in October, Moctezuma 1,817,000, Burro Mountain 546,000 and custom ores 397,000 lb.

United Verde Extension Mining Co. produced 3,864,756 lb. of copper in October, compared with 3,327,644 in September, and with 3,760,892 lb. in October, 1919.

Utah Copper in October produced only 8,000,000 lb. copper, compared with 8,420,000 lb. in September; this is the lowest monthly production of the company since 1916.

Chino Copper produced in October, 3,933,435 lb., compared with a September figure of 5,161,894 lb.

Ray Consolidated's October output of 3,990,800 lb. of copper falls below its September production of 4,502,000 lb.

Nevada Consolidated produced 3,850,000 lb. of copper in October, compared with its September production of 4,650,000 lb.

Calumet & Arizona produced 2,484,000 lb. of copper during October, compared with 3,038,000 lb in September.

The Bureau of Foreign and Domestic Commerce reports that United States importations of Alaskan products for the month of October, 1920, included:

	Quantity	Value
Copper ore, matte, etc., tons	3,956	.....
Copper contents, lb.	4,984,219	$946,128
Platinum, oz.	17	1,955
Palladium, oz.	83	9,515
Gold ore	.....	282,706
Gold bullion, oz.	40,596	729,785
Silver ore	.....	62,429

North Butte Mining produced 1,390,829 lb. of copper in October, 55,306 oz. of silver, and 82 oz. of gold.

Kennecott Copper produced 10,816,000 lb. during October, compared with 8,878,000 lb. in September, and 9,789,320 lb. a year ago.

Rand Gold Production

The gold output of the Rand for October totaled 662,000 oz. fine, as against 682,000 oz. in September.

Special Australian Letter

Broken Hills Mines Still Idle—North Broken Hill Strong Holding Company

Melbourne, Oct. 18—The Broken Hill mines have not yet resumed operations. The special tribunal has given its decision but doubt exists as to the meaning of several passages, and although both parties have agreed to abide by the award neither side appears willing to give way until the chairman explains the meaning of the clauses in dispute.

Although no productive work was done at the North Broken Hill mine during the twelve months ended June 30, 1920, £68,144 was received from sales of products of previous terms and £37,264 from interest, rents and dividends. A sum of £9,038 was brought forward from previous account, £13,400 was transferred from debenture sinking fund reserve, and £1,498 out of provision for expenditure on a new plant remained in hand, making the available total £49,665, which was appropriated as follows: Debenture sinking fund reserve, £13,333; provision for new plant, £25,000, leaving £11,332 to be carried forward. The assets showed a surplus over liabilities of £469,777, as against £547,492 at the beginning of the term. The company now holds £150,000 worth of shares in the Electrolytic Zinc Co. and £20,000 in British Australian Lead Manufacturers Pty., Ltd. In all, shares in other companies (not included in the assets mentioned above) held on June 30 totaled £356,750.

The Gold Producers' Association, Ltd., sold 100,539 oz. of standard gold in September, including 17,232 oz. sold to manufacturing jewelers during the quarter ended Sept. 30. The average net price (estimated on the month's sales abroad) was £5 4s. 9d. per oz. standard, or £5 14s. 3d. per oz. fine.

The business of the Electrolytic Zinc Co. of Australasia Pty., Ltd., is to be taken over shortly by a limited liability company, which will have a nominal capital of £3,000,000. This reconstruction is being made with the object of extending the company's operations and providing capital for carrying out the agreement recently made with the Mt. Read and Roseberry Mines, Ltd., under which the Electrolytic Zinc Co. will undertake the mining and treatment of complex sulphide ores from the Read-Roseberry properties.

Trail Smelter Receipts

The ore received at the Trail, B. C., smelter during the week ending Nov. 7, 1920 amounted to 11,149 gross tons, distributed as follows:

Mine	Situation	Gross Tons
Florence,	Princess Creek	104
Horn Silver,	Similkameen	48
Iron Mask,	Kamloops	46
Josie,	Rossland	286
Knob Hill,	Republic	41
North Star,	Kimberley	173
Sally,	Beaverdell	40
White Bear	Rossland	61
Company mines	.....	10,350

Special London Letter

Credit Rationing Restrains Mining Ventures—Tin Mines Depressed—Lead Prospect Proved

London, Nov. 2—We are still in the throes of the coal strike, and the whole country is on the tiptoe of expectation as to the outcome of the ballot. South Wales and Lancashire seem opposed to the sliding scale as proposed, though other coalfields are reported to be in favor. The uncertainty created by this position has given a decided check to business. A few of the best-known industrial undertakings are bold enough to appeal to the public for additional capital, but mining companies in need of funds prefer to wait until the position is less obscure. With the rationing of credit by the banks, mining directors are compelled to move cautiously.

The Santa Gertrudis is ready to make an issue of notes—has been prepared, in fact, for some time—but failure cannot be risked. The proposition, however, is an attractive one, and there is not likely to be much difficulty. A further cablegram from the Esperanza reports satisfactory developments in different parts of the mine, but as the values are low relatively to the phenomenal gold and silver content of the Descubridora vein that caused the sensational advance in the price of the shares, the public and market speculators are disappointed. Had there been no Descubridora values the property would still have shown merit.

A few weeks ago I reported certain mineral discoveries in the Peak District of Derbyshire. Further exploration there has uncovered a lead vein, concerning the prospects of which hopeful views are entertained. As the deposit exists under some pleasure grounds, there does not seem much prospect at the moment of its being worked in this particular locality, though its extension is being proved outside the prohibited area.

The tin-mining industry in Cornwall is still in the dumps, owing to the fall in the price of the metal—which, by the way, has recovered several pounds per ton—and the difficulties created by the coal strike. One point is worth noting in connection with the Tincroft. This is a shallow mine, and the workers, in order to enable the company to tide over the present unfortunate position, voluntarily and spontaneously offered to contribute a substantial sum monthly toward making good any deficiency. Since the abolition of the "cost book" system of mining in the Duchy, this is the first instance of such co-operation on record. It is stated that the East Pool and Agar Company, which broke away from the tin ticketing, has temporarily returned to this system of disposing of its produce because the smelters who had been buying its production had ceased to do so. The principal buyers at the ticketings now are apparently Cornish smelting undertakings.

The National Mining Corporation, which, as its name implies, embraces a wide field of operations and has quite a hatful of propositions with which to deal, has issued a statement that there is no intention of making a further call on the shares, which are 10s. paid out of £1. The price is at a discount, largely because of the depreciation in some of the holdings.

The Village Main Reef is a London company owning a number of claims on the Witwatersrand. Last week an earthquake occurred, resulting doubtless from the tremendous excavations that have been made, and the fall of rock was so great that it has been officially decided to close down the mine for good. The profitable ore was all but exhausted, though the gold premium would have permitted operations for a few months longer. The capital is only £472,000, and the shareholders have received over £4,000,000 in dividends.

Queensland Notes

Brisbane, Oct. 15—Operations at the mines and smelters of the Mount Cuthbert Co. were resumed on Oct. 11, after having been idle since last June. As there have been promising developments recently in the company's mines the smelters are expected to have a successful run. The Mount Elliott Co., another of the three big concerns operating in the Cloncurry district, is still in a state of idleness. The Queensland gold mines—or what are left of them—continue to receive much assistance from the Gold Producers' Association, which distributes amongst its members the proceeds derived from the current premium on the sale of Australian gold. The net premium thus realized during the six months ended June, 1920, amounted to £752,623, and of this sum Queensland received £64,500, which is very acceptable at a time when the gold producer is much in need of help. Twice this year there have been increases in the monthly return of gold now in this state. These have been small, but any improvement at all has been such a rare thing for years past that it is not likely to escape notice. The operations of the once famous and the premier goldfield of the state have now been reduced to those of one company and a few small parties of tributers working on their own account in old mines. One Charters Towers company that has a brilliant past—the Brilliant Extended—has turned its attention to tin mining on the Kangaroo Hills field, north of Townsville. On the Gympie goldfield—which used to rank next to Charters Towers—two more companies "went bung" (as the Australian aboriginal would say of anything that is dead), and the monthly output of the field is now under 300 fine oz., as compared with some 6,000 oz. ten years ago.

On the Kangaroo Hills field, which is a tin-mining center, some Charters Towers people have for several months past been developing the Sardine tin mine. In the main shaft of this mine highly "payable" ore has been mined down to 120 ft., and levels taken out from a little lower than this are yielding ore up to 20 per cent of metal. In six months 264 tons of material crushed gave a return of 81 tons of black tin, equal to an extraction of 30¾ per cent—nearly all this ore being obtained from development work. Already the Sardine Tin Mining Co. has paid three dividends of 2s. each per share on 40,000 £1 shares.

Some are apt to look upon Queensland mining as dying because gold mining in the state is at a low ebb, but what is being brought forth in the Sardine tin mine is only another of many proofs which often crop up that in tin, copper, silver, lead, wolfram and molybdenite, the potentialities of the state are still great. At present, however, the mining industry generally, like most other industries, is greatly handicapped by the high cost of materials and high wages, with the added drawback of a scarcity of explosives.

The Palmer, one of the oldest and formerly a very rich goldfield in the extreme north of Queensland, is about to be reopened after lying dormant for many years. Gold was first discovered on this field in 1873, and, as an alluvial area, the extent, amount, and diffusion of its rich deposits transcended anything previously or since discovered in Queensland. Subsequent efforts to work the reefs from which the alluvial is supposed to have been derived failed because the crude methods adopted and the limited means available were quite inadequate to cope with the water difficulty, which proved greater here than in any other field in the state. About £1,000,000 worth of gold has been won from the field, mostly from alluvial workings. In the early days of reefing, picked stone yielded as much as 10 to 15 oz. per ton, but the average from 1877 to 1881 was 2 oz. 5 dwt., the yield over these five years showing a uniformity remarkable if not unprecedented. Some recent attempts to pump out some of the old mines and further prospect the reefs have failed for various reasons. Now, the government has taken the matter in hand and started operations. The plant of a company that did some work with government aid a few years ago has been taken over and a beginning made in dewatering the Louisa, the principal of the old mines. Reefs which gave such consistent yields over a number of years and were abandoned only because the water overwhelmed the crude means of coping with it, ought to be worth a thorough test with up-to-date appliances, especially in view of the falling gold yield of the state. This test, the government states, it is determined to prosecute.

The Canadian Advisory Council for Scientific and Industrial Research has made an appropriation to permit an investigation into the treatment of the silver-lead-zinc ores of British Columbia.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Alaskan Smelter Inadvisable

Government Committee Finds Shortage of Fuel and Ores Precludes Operating Successfully a Local Smelter

A special investigation of Alaskan copper ores made at the request of the Secretary of the Interior, John Barton Payne, was recently completed by Oliver C. Ralston, one of the Bureau of Mines metallurgists. His formal report has just been completed. His conclusions are.

1. Costs of mining and land transportation in Alaska are at present the principal items of expense in the treatment of its copper ores.

2. Under existing conditions, metallurgical treatment of some kind is necessary at localities as near the mines as possible.

3. Conditions are not favorable for a copper smelter in Alaska at present, although with the development of greater supplies of ore it is possible that other adverse conditions could be overcome.

4. Concentration mills or hydrometallurgical plants at the mines are recommended as the logical solution of existing difficulties.

Mr. Ralston's investigation leads him to think that not enough ores are mined and shipped in Alaska at present to support even a small smelter. He found that the type of ores in sight, which are not shipped, is of such character as not to encourage the immediate building of a smelter for their treatment. Conditions generally are such that smelting within the confines of the territory is almost certain to be expensive. He points out, further, that the higher grade fuels have not been developed to the point where a smelter could be assured definitely of a continuous supply of coal. At present, lignite is the only local fuel which can be obtained in sufficient quantities and at a reasonably low cost. He calls attention to the fact, however, that the region is one of excellent prospects and that conditions likely will be different at some future time.

The special examination is an outgrowth of the recommendation to the Secretary of the Interior by the Alaskan Advisory Committee, of which Alfred H. Brooks was chairman. The recommendation was made as a result of pleas put forward by many small mine owners that they could not develop their mines unless they could dispose of their ores to greater advantage. Some mining men in Alaska were of the opinion that a smelter in the territory would be very helpful. Mr. Ralston had not gone far with his investigation when it became evident to him that the chances for a smelter in Alaska are not particularly promising at this time. As a consequence, he looked into the matter of what should be done metallurgically with the copper ores of Alaska as developed at present.

Mr. Ralston reports that the only copper-mining operations which meet with much success in Alaska are those in which the ore is concentrated at the mine before shipment. Some problems in concentration are involved, such as separating chalcopyrite from the heavy pyrrhotite ores or from the massive magnetite ores, but Mr. Ralston gathered the information that flotation treatment of both these types of ores had been tested, with encouraging results. He advises that ores of that type, which do not yield to flotation concentration, should be tested by hydrometallurgical methods.

In discussing the matter of a smelter, Mr. Ralston eliminates the Ketchikan district, as its present production is small and it is within a short distance of a large smelter with relatively low smelting charges. The location which comes nearest to qualifying for a smelter, in Mr. Ralston's opinion, is at tidewater on Prince William Sound. There the question would be whether the ore could be smelted more cheaply at that point than in Tacoma. The freight rate to Tacoma probably does not average much over $4.50 per ton. Moreover, the total ore supply at present is hardly large enough to keep a single reverberatory furnace in operation. That fact alone would make for a high cost. Practically 95 per cent of the ore that is mined is shipped to the Tacoma smelter by the interests that own that plant. Mr. Ralston regards it as probable that this concern would not be interested in building another smelter, even if a slight saving in cost of operation were possible. Owing to the size and facilities of the Tacoma smelter, Mr. Ralston has doubt as to whether a small smelter in Alaska could compete, even with the great differential in its favor.

More War Minerals Awards

Payments aggregating $111,715.18 were recommended by the War Minerals Relief Commission during the week ended Nov. 6. The Southern Manganese Mining Corporation was given an award of $62,898.35, which was 67 per cent of the amount originally claimed. Cummings, Bender, Mahoney, and Corbett were given an award of $2,146.39 in their manganese claim. The amount awarded was 72 per cent of the amount asked. The Clark-Montana Realty Co. was awarded $43,535.60 on its manganese claim, 64 per cent of the amount originally requested. A review of the claim of Webb & Galbraith resulted in an award of $3,050.84, 38 per cent of the amount originally claimed. The claim had been disallowed in June. A. J. Schmidt was allowed an additional $84 on a review of his claim, on which $2,175.42 had been awarded previously.

Income-Tax Deductions for Depletion Allowed Only to Holders at Discovery

Based on an opinion rendered by Acting Attorney General Frierson, the Commissioner of Internal Revenue has rendered an income-tax decision to the effect that the deduction for depletion in the case of mines, oil and gas wells, as the result of discovery on or after March 1, 1913, is allowed only to the party or parties in possession at the time of the discovery, and not to subsequent purchasers

He also holds that the value which may be set upon the case of the discovery of mines, oil and gas wells, pursuant to the second proviso of Section 234 (a) (9), Revenue Act of 1918, to be depleted in accordance with such reasonable rules and regulations as the Commissioner of Internal Revenue and the Secretary of the Treasury may prescribe according to the peculiar conditions in each case, is, in the case of a lease, to be equitably apportioned between the lessor and the lessee.

Acceptance of W. M. R. Awards Prohibits Later Adjustment

No adjustment of errors in War Minerals Relief claims can be made after the award has been accepted. A decision to that effect has been handed down by the Controller of the Treasury. In the claim of Samuel H. Dolbear, an award of $10,955.15 was made and accepted, full payment having been made Jan. 16, 1920. Later it developed that an item of $2,845.37 should have been included in the award. The Secretary of the Interior issued a settlement certificate in favor of Mr. Dolbear for that amount on June 5, 1920, but the auditor refused to honor the certificate. The matter was carried to the Controller of the Treasury, who held that "if the Secretary of the Interior may reopen settlements made by himself or by his predecessors, it will be necessary to continue the appropriation on the books of the Treasury Department indefinitely." The controller holds that the additional amount due Mr. Dolbear should be passed upon by Congress as a regular claim against the Government.

Purchases of silver under the Pittman Act at the close of business, Nov. 13, totaled 23,075,231 oz.

NEWS BY MINING DISTRICTS

MEXICO

State of Coahuila

Increase in October Shipments From Guadaloupe District

Torreon—Shipments of ore from the San Juan de Guadalupe district to the Torreon smelter increased considerably during October. The San Acasio mine is being operated by T. E. Guzman, and is producing some high-grade silver ore. John Gibson has just shipped in a car of silver-lead ore from the Santa Cecilia mine adjoining it, and Luis Andiffered, a well-known French mining man of Mexico City, is preparing to operate the Recompensa group in the same district.

Dinamita—A practically new mining district is being opened up near the station of Dinamita, about 30 miles west of Torreon. Two groups of mines have been filed on in this vicinity during the last week, one known as the Cornisa and the other the Dinamita group. Some good values in silver, lead, iron, and manganese have been found, and considerable excitement prevails in the camp.

Reyes—Ezequiel Gallegos, representing some German miners, has applied for titles to several groups of mines in the Reyes district, which is becoming quite active. Several shipments of ore were received by the Torreon smelter last week from that camp.

The coal strike in the northern part of this state threatens a coal shortage at the smelters and mines of this district, unless the miners return to work soon. The strike leaders and mine owners are in conference with government officials in Mexico City at the present time.

Jalisco

Canada Mine May Sink Shaft Deeper

The development of the Canada mine is proceeding favorably on the 200-ft. level, and it is now necessary to sink the shaft another 200 ft. to ascertain if the values continue in depth. Broken ore in shrinkage stopes has increased from 52,174.5 tons June 13 to 59,245 tons Sept. 5.

Amparo Mining Co. reports that during the period June 14 to Sept. 5 the mill ran 84 days out of a possible 84 days, treating 34,357 tons, or 409 metric tons per day, with an average gross value of $12.51 per ton, U. S. currency. During this period $58,635.37 was expended for construction, development, and prospecting.

In Globe a suit for foreclosure of a lien and for $400,000 has been filed against the Inspiration-Miami Copper Co. by Joseph Kleinfelder and associates. It is claimed that certain contracts have not been kept.

CANADA

Ontario

Cornish Miners Find Employment at Dome Mines

Porcupine—Labor is now becoming more plentiful, many of the unemployed seeking work in the mines. The Dome mines has increased its force by the arrival of 109 Cornish miners brought out under a four-months contract, which may be renewed.

The McIntyre has developed a large orebody below the 1,000-ft. level. The deposit appears to be a continuation of the Hollinger vein No. 84. Should the Hollinger vein persist to a depth equal to that attained on the McIntyre it will mean a very large addition to the Hollinger ore reserves.

The Little Pet, on which nearly $100,000 had been spent in development, and the Porphyry Hill, both within half a mile of the Dome Mines, have been re-staked.

Ore in sight on the Porcupine Vipond-North Thompson, including that opened up by development down to the 600-ft. level, is estimated at 130,000 tons, valued at over $1,250,000. It is planned to sink to the 900- or 1,000-ft. level, open up main haulage levels, and remodel and extend the present 100-ton mill, increasing its capacity to 150 tons daily.

Kirkland Lake—At the Kirkland Lake, a drift started on the 400-ft. level has been halted on account of labor shortage. The 900-ft. level, the lowest in the camp, is being opened up. The mill is treating 125 tons per day.

A wide vein has been encountered in a crosscut 86 ft. from the shaft at the 300-ft. level of the Bidgood.

Calabogie—The warehouse and packing room of the Black Donald graphite mine, filled with refined graphite ready for shipment, has been destroyed by fire, with a loss of about $30,000, partly covered by insurance.

Cobalt—The Nipissing during October mined ore of an estimated value of $184,578 and shipped bullion and residues from Nipissing and customs ores of an estimated net value of $316,475.

The Bailey mine appeared on the list of shippers for the first time during the week ended Nov. 5, when it sent out a car of 87,116 lb. of ore.

The Kerr Lake crusher alongside its dump of low grade ore is nearly completed. The ore will be treated at the Dominion reduction mill. The veins discovered in digging for the foundation are being tested underground and will be developed on the 90- and 150-ft. levels.

A winze on the Ruby now down 30 ft. has encountered good ore, including some high grade stated to carry 1,000 oz. to the ton. The wall rock shows leaf silver.

The McKinley-Darragh is closing down its Savage property until more labor is available. A fair tonnage of low grade remains to be taken out.

Ontario Kirkland Gold Mines will build a new mill at Tough Oakes.

High-grade ore has been encountered at the Lumsden in a raise from the 225-ft. level. The vein is about 8 in. wide and the ore is stated to carry about 2,000 oz. to the ton.

Gowganda—The Miller Lake Silver Lodes has been taken on option by Montreal interests. A mining plant has been installed and drifting is being undertaken on the 100-ft. level.

West Shining Tree—Hamilton B. Wills & Co., Ltd., on behalf of themselves and other stockholders, have applied for an injunction to prevent the Wasapika Gold Mines, Ltd., from issuing stock to the Wasapika Consolidated Mines, Ltd., in the manner proposed, on the ground that it is not in accordance with precedent, and would tend to deprive innocent purchasers of the stock of their rights.

Elk Lake—The National Mining Corporation, Ltd., of England, with a capital of £2,500,000, has secured an interest in the White Reserve mine in the Maple Mountain district. A comprehensive diamond-drilling program will be carried out under the direction of J. B. Tyrrell, of Toronto.

CALIFORNIA

Old Mines in Calaveras County Reopen—Gasolene-Driven Stamps at Grass Valley Successful

San Andreas—The old Demarest quartz mine, a few miles southeast of San Andreas, may be reopened and further developed. This property was worked several years ago and at that time showed great promise, but, like all true fissure veins on the Mother Lode, the necessity for attaining greater depth became apparent and there was a difficulty in securing the necessary funds for that purpose.

Angels Camp—Work in the Finnegan mine, south of Angels Camp, is going on actively and cross-cutting to tap the eastern vein which has been in progress for several weeks has been completed successfully. The Finnegan adjoins the celebrated Morgan mine and it is claimed to have the north extension thereof.

For the first time in nine years the shrill tones of the whistle at the Rainer gravel mine on Bald Hill, about a mile north of Angels, echoed through the hills. It was the announcement that another one of the long silent gold mines of this locality will resume operations. Water skips are now running and will continue to do so day and night until the underground workings are unwatered. The Rainer mine is

situated on what is generally known as the Valecita channel and which, before reaching the Rainer mine, was fed into by many rich tributary streams. The property is owned by the Rainer Mining Co., Inc. J. Montreeville is general superintendent.

Grass Valley—The test run of the gasoline-driven stamp mill at the Boundary mine was successful. The ore already mined will require two or three weeks to crush and in the meantime the water will be pumped out of the shaft and drifts will be put in order for work resumption. M. J. Brock is manager and principal owner.

The mill at the Alcade mine has been overhauled under the supervision of Lloyd Root. There are now ten stamps at this property and there is a considerable quantity of ore in the bins and on the dumps that will pay to run through the mill.

The labor situation in the Grass Valley district is clearing, although there is a surplus of men seeking places and few experienced miners.

Sacramento—The report of the mineral production of California for 1919 compiled by the state statistician showed that counties that formerly ranked high have in the last year sought lower places. Yuba now ranks first in production, Nevada County second, and Amador third, while Plumas, which was near the tail end for many years, now holds fourth place, due to the development of the copper belt. Sacramento, although considered to be primarily an agricultural county, ranks sixth in mineral production.

The total production of gold, silver and copper has declined from $31,187,807 in 1918 to $22,201,898 in 1919. Gold made a small gain while the production of copper decreased from 47,674,660 lb. in 1918 to 21,732,507 lb. High cost of material did much to keep down mineral production.

San Francisco—No suspension of activity at the property of the Engels company will be caused by the low price of copper, reports E. E. Paxton, president of the company. Mr. Paxton stated that development work upon a greater scale was being planned along with copper production so that when the prices return to normal the mine will be in a position to deliver ore upon a larger scale. Four hundred and fifty miners are employed at the mine.

The Walker mine will lay off most of the force of 170 men and only development work will be carried on during the winter. The reasons given for cessation of production are the low copper prices and high labor, power and transportation costs.

Downieville—Work at the City of Siz quartz property at the head of Slug Canyon ceased for the season on Nov. 1, due to the fact that there are no adequate winter housing facilities. During the summer a raise from the upper tunnel to the surface was completed. In the lower tunnel several crosscuts were run and raises put up, with the result that both foot and hanging wall have been definitely located. Crosscuts driven both east and west at one point in the lower tunnel show the walls at the particular place to be 70 ft. apart.

Sutter Creek—With thirty stamps dropping at the Central Eureka and high-grade ore being found on the 3,900 level conditions at the mine are favorable.

Quincy—The Walker Copper Co. announced on Nov. 2 that high cost of power, high freight rates, and high labor costs, with declining prices for copper, caused it to lay off most of its miners and stop production for the winter. Only sufficient labor will be retained to carry on development and construction work.

Idria—The New Idria Quicksilver Mining Co. announced on Nov. 4 the temporary closing of its large plant as the result of the stagnant metal market. This action leaves but three small quicksilver producers operating in the state. This company's plant has been rebuilt since it burned down in June last.

Colfax—The Crusader mine, a famous property of El Dorado County, now under lease to the Plymouth Consolidated Gold Mining Co., is to developed. The property is owned by Seymour Hill of this county. W. H. Buys is the superintendent in charge.

LOOKING DOWN SAN MIGUEL RIVER, COLORADO, FROM FALL CREEK MINE

COLORADO

Durango—The discovery of a new orebody at the Ten Broeck has changed the plans of the company, which will continue operations through the winter. The vein is 5 ft. wide and assays well in gold and silver. It was discovered while drifting in the 3,000-ft. crosscut. If it continues to the surface it will give about 1,600 ft. of stoping ground.

The Esmeralda, on South Fork Lightner, has closed down for the winter. The property was being placed in shape for the erection of a thirty-five-ton mill, when an unexpected heavy snowfall prevented further operations.

The Jumbo Mining Co. has discontinued operations at the Jumbo temporarily, due to a pending deal for the sale of a controlling interest in the mine. The principal silver ore of the Jumbo is in a lime stratum 5 ft. thick.

The Co-operative Mining & Milling Co. has opened a 4-ft. vein of good-grade ore. Work on the road has been discontinued, but it is planned to operate the mine all winter. Lessees on the Idaho have shipped a carload of gold and silver ore to the Durango smelter, which is expected to run about $50 per ton. Lessees on the Mayday are laying track in No. 2 tunnel. Work is progressing at the Cumberland, under the supervision of E. B. Miller. The vein here, in the lower tunnel, is 5 ft. wide and carries about 11 oz. per ton in silver, with a small amount of gold. In the upper workings the vein has an average value of about $60 per ton in gold and silver.

Cashin—Michigan-Colorado Copper Mining Co. stockholders have asked for a receiver in a petition filed Oct. 29 in Detroit, Mich. Petitioners allege the company to be insolvent, and that they purchased stock as the result of misrepresentations.

Freeland—The Gum Tree property has been leased to W. B. Stewart, who will reopen and develop it.

Telluride—Shipments of concentrates from Telluride during the month of October were as follows: Tomboy, 70 cars; Smuggler-Union, 25 cars; Liberty Bell, 14 cars; total, 109 cars. Shipments have been lower than usual recently owing to the fact that the capacity of the Smuggler-Union has been reduced about 30 per cent since the flotation plant was destroyed by fire.

Pandora—The foundations for the new flotation plant of the Smuggler-Union Mining Co. are being laid and the structural steel is arriving. The new building will be about 200 x 300

ft., and will be fireproof. The new plant will increase the company's treatment capacity to about 700 tons per day. The company is in urgent need of good carpenters, miners, and laborers.

Idaho Springs—Lessee Charles Johnson has opened a pocket of high grade silver ore in the Silver Age property, the ore assaying about 4 per cent lead and over 100 oz. silver.

The Shafter mine, one of the old producers of high-grade gold ore in this district, will be reopened and developed under the direction of Lee Gilson.

Cripple Creek—The new orebody in the property of the Modoc Consolidated Mines Co. has been opened for a distance of 120 ft. and over a width of 25 to 30 ft. The ore is filled with seams of sylvanite, and is averaging about $30 per ton at the mill. About 75 per cent of the material broken and hoisted to the surface is ore. October production was about 2,500 tons, with a gross bullion value of about $75,000. A winze sunk from the 1,300-ft. level indicates the continuity of the ore below this level. Crosscuts are being driven toward the oreshoot from the 1,200-ft. and 1,400-ft. levels. Electric hoisting equipment is being installed at a cost of about $30,000. With this equipment the property's tonnage will be substantially increased. A. H. Frankenberg is general manager.

Breckenridge—The Wellington mines will either curtail operations or close down completely during November on account of an increase in railroad freight rates amounting to $3.50 to $3.75 per ton. The grade of ore produced by the mine cannot stand this increased transportation charge and it is not likely that the company will do more than keep the property unwatered and continue mine development. The Wellington is one of the large producers of zinc ore in Colorado, and the largest employer of labor in Breckenridge.

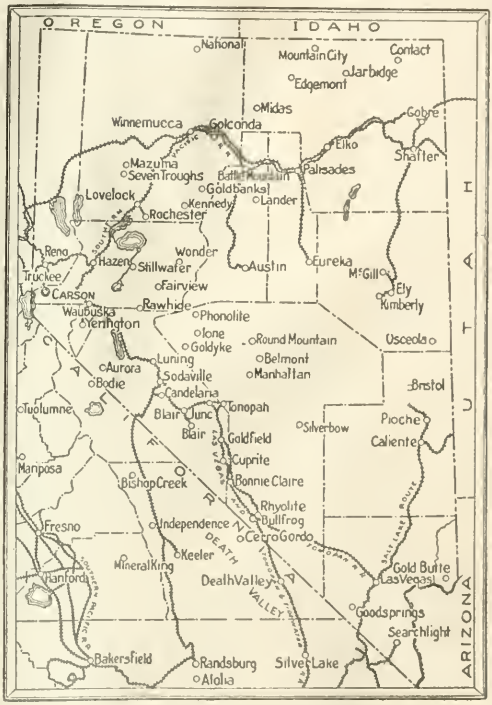
NEVADA

Tonopah—Bullion shipments for the second half of October are as follows: Tonopah Belmont, $95,700; West End, $62,370; Tonopah Extension, $53,000. Shipments from the Tonopah Mining and the MacNamara companies have not been reported as yet.

No new discoveries or important developments have been made in this district during the past week. Regular development work was performed in the Tonopah Belmont on several veins from the 550, 700, 800, 900, 1,000, and 1,100 levels. Mine tonnage is about 400 tons per day, the balance of the mill tonnage being custom ore. In the Tonopah Extension total development work for the past week was 182 ft., most of which was performed on the 1,540, 1,601 Intermediate, 1,680, and 1,760 levels. Progress in sinking the Victor and McCane shafts was only fair. In the West End development on the West End and Ohio veins was satisfactory. Tonnage for the past week was 1,500 tons. West End operations in Tonopah "76" territory from the Ohio shaft 800 level are progressing satisfactorily in favorable formation. The Tonopah Mining Co. report no changes, regular development being performed in the Mizpah and Silver Top sections of the mine and tonnage to mill was normal. The California Tonopah is making regular shipments which more than pay operating expenses. This company is sinking a winze from the 700 level, which is the lowest shaft level, to the 950. Conditions are reported favorable and the there being no milling plant on the ground.

Blair Junction—The Western Chemicals Inc., owning a potash-alum and sulphur property near Blair Junction, have completed their plant and expect to start operations soon.

Virginia City—One of the biggest ore productions for a single week since the old bonanza days was indicated by the official report of the Consolidated Virginia mine for the week ended Oct. 21. Most of the ore is coming from



MINING CAMPS OF NEVADA

station will be completed and crosscutting begun in about two weeks.

Divide—Although the report of J. H. Farrell on the Tonopah Divide mine showing present reserves of assured and probable ore as 53,158 tons, with a gross value of $21.78 per ton, and a total gross value of $1,158,733, may be disappointing to stockholders, it nevertheless gives them something definite to base their hopes on; at least so far as present available tonnage is concerned. This report checks the one made by E. A. Julian quite closely.

Belle-Helen—There is a revival of interest in this district, located about 50 miles east of Tonopah. The main property has produced about $125,000 gross from a fissure vein in rhyolite, and it is claimed that there is considerable ore of milling grade on the dump and in the mine. All ore produced to date has been shipped to Tonopah or to smelters, the north drift from the winze below the 2,150-ft. level, which is now out 70 ft., having advanced 24 ft. during the week. From this work 67 tons was extracted, which is said to have averaged several hundred dollars per ton.

Pioche—The Virginia Louise Mining Co. will increase its output immediately. Fifty tons of fluxing ore will be sent to the American Smelting & Refining Co., Salt Lake City, which in addition to the contract for 75 tons per day entered into with the U. S. Smelting Co., will materially increase the company's revenue.

Ore shipments from the Pioche district for the week ended Nov. 4 were on a reduced scale, but with assurances of fair future treatment from the officers of the Salt Lake route it is hoped that the shipments will soon be increased. The tonnage amounted to

2,080 tons, distributed as follows: Prince Consolidated, 1,250 tons; Virginia Louise, 510 tons; Bristol Silver, 100 tons; Consolidated Nevada Utah, 175 tons; Ida-May mine, 45.

Ely District.—A contract for the monthly shipment of 200 tons of high-grade manganese ore was recently secured by Joseph Vietti, the ore to be shipped to the Steel Corporation's mills at Pittsburgh, Pa. The Vietti mines are situated near the Coppermines Ranch, in Steptoe valley, and the ore will be hauled by motor trucks to the railroad at East Ely. Mining operations are still being carried on by the Nevada Consolidated Mining Co., but on a greatly reduced scale, only three steam shovels being operated in the big pits.

MICHIGAN

The Copper District

Calumet & Hecla Haulage Level Cemented—Mohawk Company Using Stope Scrapers and Back Filling

The long haulage level which the Calumet & Hecla Mining Co. is driving between the Red Jacket shaft and No. 12 South Hecla shaft has now reached a point 1,000 ft. south of Hecla No. 7 shaft, which leaves about 2,000 ft. of drifting to be done before the south terminal is reached. This haulage level is nine feet high by twelve feet wide and is entirely coated on the sides and back with gunite. This cement coating protects the drift from the damp and smoky atmosphere.

The Arcadian Consolidated Copper Co. is about to cut the seventh level plat in its New Baltic shaft. This leaves 200 ft. of shaft sinking yet to be done before the ninth level is reached from where drifting is to be started toward the old Arcadian shaft. The decision to do this work at the present time has not yet been reached.

The Mohawk Mining Co. in the 25th level of their No. 4 shaft are entering the zone where the Kearsarge amygdaloid lode has proved to be much wider than normal. This phenomenon has been observed on the 22d, 23d, and 24th levels, having a lateral extension of about 400 ft. and is about 40 ft. wide, maintaining good stoping ground for the entire width. In mining the lode for such a width the backfilling method is used. This company is using the recently developed stope scrapers which have proved of much value. The Mohawk Mining Co.'s stamp mill is treating all the ore from the Wolverine mine as well as its own. This arrangement will continue during the present period of decreased production.

Menominee Range

Iron Mountain—Operations have been suspended at the Indiana mine. Work was started there only about two months ago, but the cancellation of several of the ore contracts caused a shutdown.

Crystal Falls—The stockpiles at the McKinney Steel Co.'s mines—the Dunn, Tobin and Odgers—have all been moved and shipments are now being made from the pockets. New equipment will be added at all three of these mines during the winter season, most of it being electrical. The Amasa-Porter and Werner properties will have to carry over considerable ore, as will the Bristol. However, sufficient ore has been shipped to permit stocking room during the winter. The M. A. Hanna Co. has moved all of the ore which was in storage at the Carpenter and Monongahela mines. It is reported that the Judson mine is to pass to the Balkan Mining Co., a subsidiary of Pickands, Mather & Co. The M. A. Hanna Co. is at present operating the mine for the fee owners, but it is stated that the owners desire to place the property outright.

Iron River—Preparations are being made to resume operations at the Fogarty and Baltic mines of the Verona Mining Co. When these mines open up again it is planned to suspend work temporarily at the Caspian in order to permit the shaft being concreted from surface to the ledge. The Fogarty and Baltic have been idle for two years. A complete new electrical equipment has been installed at the Fogarty. The work of concreting the Tully shaft is going ahead steadily. New electrical equipment will be added here. It is planned to reopen the Tully in the spring. Most of the Iron River mines are operating to capacity right now, but several of them will have to carry over considerable ore.

Marquette Range

Diorite—The American-Boston Mining Co. is to close down the American mine at an early date. There is too much water coming in for the pumps to handle and the owners claim that the mine is not making money for the stockholders.

Palmer—The Richmond, Maitland and Empire mines have almost completed shipments and will close down this month. The Isabella is the only property in the Palmer district which will work throughout the winter. There is some talk that the American Steel & Tube Co. will take over this mine from the Cascade Mining Co.

MINNESOTA

Cuyuna Range

Rescue Station Cost Largely Subscribed —Rowe Mine Closed Down

The annual report of August Swanson, Inspector of Mines for Crow Wing County, just published, shows a decrease in fatal mine accidents for the year ending June 30 to six, as against eleven for the preceding year. Sixteen mines were operated. Twenty-eight were inactive, and 1,746 men were employed.

The average daily wage for underground miners during the period was $7.55 for contract work and $5.56 for company account. In the open pits wages varied from $11.56 per day for steam-shovel engineers to $5.17 for common labor; and on surface work from $8 per day for electricians to $4.49 for changehousemen.

A rescue station for the Cuyuna Range is to be built by subscriptions from the mining companies at an estimated cost of $6,000, of which amount $4,500 has been subscribed. The plans call for a building 15 x 30 ft., with two rooms, one for instruction and training in first aid, and the other for storing rescue apparatus, with a man always in charge.

Crosby—Rescue Car 10 of the U. S. Bureau of Mines is scheduled to be stationed on the Cuyuna Range from Nov. 15 to Jan. 8 for purposes of instruction in first aid and mine rescue work. The Portsmouth and the Mahnomen, open pits, have completed shipments for the season.

Riverton—The Rowe mine, operated by Pickands, Mather & Co. for the Pittsburgh Steel Ore Co., has closed down, and the present holders may relinquish their lease on it. Ore blocked out and available to present working levels has been practically exhausted. The operators of the Rowe mine were pioneers in the stripping of overburden from iron mines by the hydraulic method. One and half million yards of overburden was removed at this property at a total cost of 6.7c. per yd.

John A. Savage & Co. plan a screening, crushing, and drying plant at its Sagamore manganiferous iron mine. The drying plant will be two units handling 4,000 tons per day. A portion of the machinery has been contracted for. A Worthington Glendora-type deep-well pump of 100-gal. capacity has been installed at the Sagamore drainage shaft.

IDAHO

Cœur d'Alene District

Tungsten Minerals Discovered in Gold-Bearing Vein

North Fork—High-grade tungsten ore of unusual value has been struck on the property of the Kennon Mining Co. in Pony gulch. The ore was assayed to determine its gold content and it was discovered that 80 per cent of it was tungsten. The tungsten is a vein 8 in. wide in a ledge that is 5 ft. wide; the ledge carries $5 to $6 in gold.

The Ajax mine recently struck a full face of good milling ore in the east drift. The company some time ago sunk a shaft 200 ft. from the Moonlight vein and sunk a winze 120 ft. on the vein. From the bottom of the winze it drifted 150 ft. Most of this distance the tunnel followed a 1-ft. vein of good milling ore. The work was turned to an east drift on the same vein. The ore pinched out but soon came in again better than ever, giving the full face of ore reported. Two shifts are employed.

Wallace—Whatever may be the terms of the settlement between the Hecla Mining Co. and the Federal Min-

ing & Smelting Co., respecting their rights to the apex of the Hecla "east vein," they can have no bearing on the ownership of the main vein of the Hecla. This great orebody is now being explored at a depth of 2,000 ft. from the collar of the shaft and approximately 3,500 ft. from the surface. The drift has been advanced six or seven hundred feet in the ore, showing five feet of solid shipping lead-silver ore without a trace of zinc and an equal amount of good milling ore. This is pronounced the best showing that has been exposed in the mine. On the 1,600 level this oreshoot was 1,800 ft. long and averaged 6 to 10 ft. wide. The opening of 2,000 level adds 400 ft. of vertical depth on the ore.

Mullan—The Federal Mining & Smelting Co. has awarded a contract to sink the main shaft of the Morning mine 200 ft. deeper, making its total depth 1,450 ft. below the main working tunnel. There has been a pronounced improvement in the grade of ore with each succeeding level, and the amount of lead as compared with zinc has steadily increased. The orebody continues very large.

ILLINOIS

Elizabethtown—On Saturday, Nov. 6, the magazine on the 300 ft. level of Fairview Fluorspar & Lead Co.'s mine was found burning. Several hundred pounds of dynamite was stored in this magazine. Rescue men put on gas masks and went into the mine, bringing all overcome by the smoke and fumes to the surface. One man was taken to the hospital, others will recover within a few days. This is one of the mines at which the strike is still on. Several of the striking miners have been taken back and put to work, they turning in their union cards at the office before going to work. It is not known how the magazine caught fire, it being in a damp, cool place, and being, also, a stone-wall room. There was no explosion. The mine is running full force regardless of the union strikers.

MONTANA

Butte—Davis-Daly Copper Co. drifting operations on the 2,700-ft. level of the Colorado mine continue. The improved showing on this level is suggesting sinking the Colorado shaft an additional 200 ft.

Plans for the active participation of the Anaconda Copper Mining Co. in the fertilizer industry are going forward steadily. Experiments at the Washoe works in the manufacture of fertilizer are proving instructive for its economical production. Anaconda continues to do a fair amount of silver ore development together with its repair work and general copper ore development.

President C. F. Kelley of the Anaconda company has publicly denounced as untrue the statement circulated by labor agitators to the effect that the company intends to bring about a reduction of wages.

Tuolumne Copper Co. shipments from the Main Range mine continue about 100 tons per day. Development work is chiefly drifting on the 1,200-ft. level.

Development work has been cut down at the Black Rock mine of Butte & Superior, and the principal work underground aside from production is the raising out from the 2,300-ft. level to connect with the No. 3, the main shaft.

Development work by the North Butte is being slowed down. The Edith May vein on the 3,600-ft. level is being driven for as fast as it is possible, heat conditions interfering somewhat.

Elkhorn—Boston & Montana expects to cut the Park vein on the 300-ft. level within the next two weeks. Drifting on the Blue Jay is said to be showing further milling ore. Union Pacific system is negotiating for the Montana-Southern Railway, the ore-carrying line of the Boston & Montana.

Grass Valley—Stemwinder Mining Co. plans a boarding house, a bunkhouse and a leaching plant at its property near Helena. An assay office already has been installed. Ore runs high in silver, and two shafts have been sunk, one to 110 ft. and the other to 85 ft.

Marysville—The Philadelphia Mining Co. has resumed operations at the Bell Boy property, with lead-silver ore uncovered in the Nile claim. Drifting is under way.

Neihart—Reports again are in circulation that the Silver Dike company plans a 500-ton concentrator to treat the Silver Dike ores, and that the plant will be either on Carpenter or Belt Creek.

Saltese—An intrusive dike has been entered by the Long Montana-Idaho tunnel being driven to reach a point under what is known as the Monitor orebody, and the indications are regarded as good for an ore showing. The Wilson Mining Co. will resume operations on a group of fourteen claims, through which strike two strong parallel veins with evidence of a silver-lead content.

Philipsburg—The owners of manganese properties are developing silver properties. At the Sweet Home there was recently opened a body of ore which has assayed 900 oz. to the ton.

JOPLIN-MIAMI DISTRICT

Oklahoma—Kansas—Missouri

Aurora, Mo.—Fire of unknown origin destroyed the concentrator of the Red Wasp Mining Co., two miles north of here, on Nov. 11. The mill had been idle for some months, but was recently purchased by Larry Brunk, who intended to start it up in the spring. He had contracted for prospect drilling on the lease, which formerly was a good producer. He carried $5,300 insurance on the mill, and had recently refused an offer of $16,000 for it. It was built in 1916 and was fully equipped with modern machinery with the exception of the electric motors, which were removed some time ago.

Flat River—The machine shop of the Federal Lead Co. at their No. 1 shaft was destroyed by fire recently. In it was one of their latest improved underground power shovels. While the accident will temporarily cripple them, their other machine shops, the Nos. 3 and 4 mills will enable most of the work to be carried on as usual.

UTAH

Salt Lake City—Increased freight rates coupled with the lowered price of zinc, mark the retirement, for the time being at least, from the Utah field of the Grasselli Chemical Co., for the past twenty years continuously represented by buyers in Utah. The company will devote its energies to the Joplin district. In general, much anxiety is felt here regarding the increase in freight rates, especially within the state, as allowed by the Interstate Commerce Commission and opposed by the Utah Public Utilities Commission. The output of Utah mines will be further cut if the proposed increases are allowed to stand. H. W. Prickett, Walter Fitch, president of the Chief Consolidated Mining Co.; Jackson McChrystal of the Gemini, Ridge & Valley, and Godiva mines, representatives of the Grand Central Mining Co., of Tintic, and A. G. MacKenzie all exhibited statistics and letters demonstrating great present profits by the railroads and the already disastrous effects to mines and smelters as a direct result of the increase in freight rates of June 25, 1918. Mr MacKenzie pointed out what might be expected if the proposed increases asked were allowed to stand. The hearing on in Salt Lake City before Examiner Disque was concluded Nov. 5, and Dec. 10 has been set as the date for the filing of briefs, after which the case will be referred to the commission at Washington, with such findings and recommendations as the examiner may see fit to make.

Bingham—The directors of the Bingham Mines company—owning the Dalton & Lark and Yosemite mines at Bingham and Victoria at Tintic, and controlling the Eagle & Blue Bell, at Tintic—propose with the consent of the stockholders, to purchase 50,000 shares at $10 per share, to be held as treasury stock.

Eureka—The Tintic Standard during October shipped 150 cars of an average tonnage of 55 tons, the ore coming from three different stopes. More ore could have been shipped with more railroad cars available.

Park City—Park City shipments amounted to 1,843 tons, as compared with 1,634 tons the week preceding. The Silver King Coalition plans a company store providing supplies to its employees at cost. Labor conditions at the camp are improving, and the company has opened a new ore zone of promise. The Judge Mining & Smelting Co. will add coal to its store's commodities expecting this to reduce the price of fuel to its employees by about $4 a ton.

THE MARKET REPORT

Daily Prices of Metals

Nov	Copper, N Y net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N Y	Lead St. L	Zinc St. L
11	14.50@14.60	36.25	37.00@37.50	6.50@6.60	6.50@6.60	6.45
12	14.45@14.60	36.00	37.00@37.25	6.50	6.50	6.35
13	14.45@14.60	36.00	36.75@37.25	6.50	6.50	6.35
15	14.40@14.60	35.00	36.00@36.25	6.25@6.50	6.25@6.50	6.30
16	14.35@14.60	35.50	36.50@37.00	6.25	6.25	6.20
17	14.35@14.60	36.75	37.25@37.75	6.00@6.35	6.00@6.35	6.15@6.20

*These prices correspond to the following quotations for copper, "delivered": 14.65 @14.75, 14.60@14.75, 14.60@14.75, 14.55@14.75, 14.50@14.75, and 14.50@14.65c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Nov.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
11	87⅞	87	99	244	249	34	33⅞	36	37½
12	87¼	86¾	99	244¾	249¾	34½	33½	36	37⅜
13	....	....	....	....	....	....	....	....	....
15	85¾	84½	96	236½	242½	34½	32½	34¾	36¼
16	84½	83⅝	95½	239	242½	33½	31½	34	36⅛
17	84	83¾	95	242¾	246	32	31⅜	35	36⅝

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Nov.	Silver Sterling Exchange	Silver New York Domestic Origin	Silver New York, Foreign Origin	Silver London	Nov	Silver Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
11	336½	99½	80⅞	54⅛	15	336	99½	76½	51⅜
12	336	99½	80⅜	53⅞	16	339	99½	76⅝	51
13	336	99½	79⅜	53½	17	345	99½	78¾	51⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Nov. 17, 1920

The downward trend of metal prices has continued during the last week. Many producers are unwilling to sell at current levels, and the market is made by those interests willing to cut prices to make sales. Demand is very weak, and only small lots are being sold. Manufacturers are unwilling to carry large stocks on their year-end inventories, and there is little hope of improvement before the holidays.

Copper

Most of the large producers are willing to sell copper for any delivery at 14.75c. delivered, but buying is of small volume. Some sellers are glad to get rid of spot metal at 14.50c. delivered. What little export demand existed has fallen away to a large extent with the recent decline in exchange rates.

Wages and salaries have been reduced 15 per cent and production has been curtailed by the Calumet & Hecla company. The movement is likely to spread to other producers, with copper at present prices, and further programs of curtailment are being definitely planned.

Lead

Monday afternoon, Nov. 15, the A. S. & R. reduced the price of lead from 7c. to 6.50c. for both New York and St. Louis delivery. This was in line with the general price movement here, and no doubt was also influenced by the continued fall in London. The A. S. & R. official price in St. Louis, it will be noted, remains on a parity with that in New York.

The price of lead in London was expected to fall, as it was considered too high, but it is rumored that the decline was hastened by American selling of futures in that market. The London price might be steadied by a combination of the Australian and Spanish producers, but then there would be the possibility of Mexican lead going to London. Production in Mexico has been much curtailed recently on acount of the strike of the coal miners, but this is expected to be settled in a few days; mining will then be resumed.

Chemical lead continues to command a premium, particularly for delivery this year, and can hardly be obtained under 7c. in either St. Louis or New York for November metal.

Dealers are showing an interest in lead at current prices, and the speculative element may soon come into the market.

Zinc

The gradual decline continues. To make predictions in these times is hazardous, but it is considered likely that this metal is near the bottom. Metal for forward delivery commands a premium of about 10 points.

The price of zinc is so far below the cost of production that output is being markedly reduced. Several weeks ago most of the mines in the Joplin district closed down for two weeks, and operations are still much curtailed. The Butte & Superior Co., which had been producing about 7,500,000 lb. of zinc a month, has entirely suspended, Anaconda is reported to have cut production from 10,000,000 to 5,000,000 lb. per month, and the Interstate-Callahan company is closed down. As this country probably now produces close to three-quarters of the world's zinc, the domestic curtailment should have a marked effect in steadying the market.

Tin

Traders continue anxious to buy for forward delivery, but there is no large consumer demand, and the market is quiet. The stocks of tin are now fairly well liquidated and in stronger hands, and the feeling is that the price is likely to rise. Whether temporary or not, there was a pronounced strengthening today, inspired by an advance in London and the higher rates of sterling for the last two or three days.

A few sales of electrolytic have been made, but the market is very quiet at approximately the same prices as for Straits.

Straits tin for future delivery: Nov. 11th, 38.50@39c.; 12th, 38.25@38.50c.; 13th, 37.75@38.25c.; 15th, 36.75@37.25c.; 16th, 37.50@38c.; 17th, 38.50@39c.

Arrivals of tin in long tons: Nov. 9th, Australia, 50; 10th, Straits, 40; China, 15; 13th, Straits, 125; China, 25.

Silver

Since our last report, the London price has fallen daily until the 17th, when it reacted to 51⅜d. The New York quotation also dropped in sympathy with London until the 16th, when the improvement in sterling exchange brought about an advance in the New York market, despite the lower price in London. Sterling exchange advanced again sharply on the 17th, and these violent fluctuations have a marked effect on silver prices. The fall in silver is due to the weakness of the Eastern exchanges and the dullness of the export trade.

Mexican Dollars — Nov. 11th, 61⅝; 12th, 61½; 13th, 60½; 15th, 58½; 16th, 58½; 17th, 60⅜.

Gold

Gold in London: Nov. 11th, 121s. 4d.; 12th, 121s. 11d.; 15th, 121s. 6d.; 16th, 120s. 9d.; 17th, 118s. 9d.

General Stock of Money in the United States Nov. 1: Gold coin (including bullion in Treasury), $2,739,043,566; gold certificates, none; standard silver dollars, $269,857,494; silver certificates, none; subsidiary silver, $264,697,830; Treasury notes of 1890, none; United States notes, $346,681,016; Federal Reserve notes, $3,663,517,685; Federal Reserve banknotes, $238,601,900; National banknotes, $732,549,629; total, $8,254,-949,120.

Foreign Exchange

A weak tendency in European exchanges generally, continued through last week, but for the last three days a rebound has been in evidence, though how long it will persist is problematical. On Tuesday, Nov. 16, francs were 5.91c.; lire, 3.56c.; and marks, 1.39c. New York funds in Montreal, 12¼ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33.1c.; 98@99 per cent, 32.90c. Outside sales reported at 31c. for both grades.

Antimony — Chinese and Japanese brands, 6¼@6¾c., market very quiet; W. C. C. brand, 8¼@8¾c. per lb. Cookson's "C" grade, 12¼@13c. Chinese needle antimony, lump, nominal at 5¾@6¼c. per lb. Standard powdered needle antimony[1] (200 mesh), 9c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.00 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100 lb. lots and over, f.o b. Niagara Falls.

[1]Molybdenum Metal in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$85 per oz. Dull.

Platinum—Firm at $85@$90 per oz.

Quicksilver—Market quiet; $58@$60 per 75-lb. flask. San Francisco wires $55@$62. Easy.

[1]Rhodium—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]Selenium—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]Thallium Metal—Ingot, 99 per cent pure, $20 per lb.

[1]Tungsten Metal—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 65@70c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

[1]Manganese Ore—50c. per unit, seaport; chemical ore (MnO_2) $60@$70 per gross ton, lump; $80@$90 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 65@70c. per lb. of contained sulphide, New York.

[1]Tantalum Ore—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]Titanium Ores—Ilmenite, 52 per cent TiO_2, 1¼@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.25@$4.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$2 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]Zircon—Washed, iron free, 5c. per lb.

[1]Zirkite—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 13—Zinc blende, per ton, high, $47.45; basis 60 per cent zinc, premium, $39; Prime Western, settling, $45@$37.50, buying, $37.50; fine sand slimes, $35@$32.50; calamine, basis 40 per cent zinc, $35. Average settling prices. Blende, $45.16; calamine, $38.96; all zinc ores, $45.05.

Lead, high, $103; basis 80 per cent lead, settling, $110@$65; buying, $65; average settling price, all grades of lead, $83.83 per ton.

Shipments for the week: Blende, 10,698; calamine, 194; lead, 1,680 tons. Value, all ores the week, $627,380.

Seventeen mines are reported as not having resumed following the voluntary cessation of operations by 85 per cent of the producing mines. These are reported as closed indefinitely. It is estimated the mines in operation will produce 7,500 to 8,000 tons per week. Stock in bins is estimated at 45,000 tons, 30,-000 unsold, 15,000 sold, and 2,800 tons sold ahead of production. One company is holding 16,000 tons of the unsold ore, the balance being widely distributed.

Reports have been received here that smelters at Van Buren, Blackwell, and Bartlesville had closed down or would be closed soon.

Platteville, Wis., Nov. 13—Blende, basis 60 per cent zinc, $43.50 per ton for high grade. Lead ore, no sales. Shipments for the week: Blende, 596; calamine, 30 tons. Shipments for the year: Blende, 58,521; calamine, 2,534; lead, 4,428; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 2,014 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@ $3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@ $75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@7c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin)—Crude, $9@ $12; washed, $12@$15; powdered, $18@ $22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@ $30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@ $23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b Illinois mines, and $27.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$18 per ton carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned—$36.50 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in,, $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike. Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 14@14½c. per lb.; sulphide, powdered, 18@19c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 18@19c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $175, freight allowed; $170, f.o.b. seaboard bases; English, $165@ $170, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $70, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $160.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 75@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 24½c. per lb.; wire, 19c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 10½c.; cut lead sheets, 10¾c. in quantity, mill lots.

Nickel Silver — Unchanged at 35¾c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 22¼c.; sheathing, 22¾c.; rods, ⅝ to 3 in., 19¼c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Nov. 16, 1920

Demand for steel products in the open market continues extremely light, with not enough inquiry, running into tonnage, to develop the lower prices some of the independent producers would probably be glad to quote for the purpose of securing more business. Demand against contracts has decreased little in the last week, the period of cancellations and postponements being nearly ended.

Predictions that the iron and steel industry will witness a buying movement next April or thereabouts, with a stiffening in prices following the decline now in progress, are made with less confidence than recently, it being observed that the readjustment promised for other industries must be extensive and require time for consummation. Occasionally, predictions are made that the decline in steel prices will not stop with a decrease in independent prices to the level now maintained by the Steel Corporation.

Pig Iron—Foundry iron has been offered by furnaces at $40, Valley, or $1 decline from last week's quotation. Bessemer remains at $42 and basic at $38.50, Valley, both being quite inactive. Freight to Pittsburgh is $1.96. Two additional merchant furnaces in the valleys are blowing out.

Semi-Finished Steel—The market remains stagnant, with no inquiry to test values. Sheet bars could probably be obtained without difficulty at $60, against the nominal quotation of $65 last week, and billets remain quotable at $55 and rods at $70.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls hardwood, 6c. per lb., in 250-lb. bbls

Connellsville — Furnace, $10@$12; foundry, $8@$10.

The Position of Silver

Domestic Producer Favored by a Fixed Price—Exports Going Mainly to China and Not to India—Asiatic Conditions None Too Bright—India Now on a New Rupee Rate

THE Treasury, under authority of the Pittman Act, has purchased over 23,000,000 oz. of domestic silver at $1 per oz. since the repurchases were first authorized—May 13, 1920. At this rate of buying it will take about four and one-half years to complete the purchase of the entire 207,000,000 oz. In the meantime the American silver producer is placed in a favorable position, for whereas the general economic tendency in commodity prices is downward, the silver producer will realize a fixed price for his product for some time to come.

The average price of foreign silver since its drop below $1 and up to Nov. 15 amounts to about 90c. It would thus seem that the American silver producer on his sale of 23,000,000 oz. of silver to the Government has realized about 10c. above the market, equivalent to about $2,300,000 above the outside market prices. As the price of mining supplies drops, the cost of silver mining should decrease. This is an important consideration for the silver miner, as, even with the price of silver at $1, frequent complaint is heard about the high cost of production.

The average monthly price of foreign silver has declined in steps since the first of the year, and, judging from the declines that occurred in other commodities, the reputation of silver as an economic barometer is strikingly sustained. The drop in silver took place several months before the general commodity price decline, but was greatly retarded by the stabilizing effect of the Pittman Act, with its resultant withdrawal of American silver from the market.

1920 AVERAGE PRICES OF FOREIGN SILVER AT NEW YORK

In Cents per Troy Ounce, 999 Fine

Jan.	132 827	June	90 957
Feb.	131 295	July	91 971
Mar	125 551	Aug	96.168
Apr.	119 779	Sept	93.675
May	102.585	Oct.	83.486

During the first nine months of this year there was imported into the United States almost $73,500,000 in silver, and at the same time about $98,700,000 in silver was exported, as compared with imports amounting to $64,000,000 and exports of $177,100,000 for a similar period in 1919, which is a decided drop in exports. It is of interest to observe from the following table the different destinations of the exported sillver in 1920 as compared with that sent abroad in 1919. During the first nine months of last year India received the greatest amount of silver from the United States, $109,000,000, and China, including Hongkong, less than one-third as much as India, $34,000,000. In 1920, over a similar period, China, and Hongkong, took about $76,000,000 in silver, whereas India imported only $223,000 from the United States. This fact forcibly illustrates the great influence Chinese buying has had lately in sustaining the market. At present Chinese support is about all that is preventing a further sharp decline.

MOVEMENTS OF SILVER TO AND FROM THE UNITED STATES, NINE MONTHS ENDING SEPTEMBER, 1920 AND 1919

EXPORTS

To	1920	1919
China	$55,977,000	$29,528,000
Hongkong	20,015,000	4,784,000
Canada	6,119,000	2,808,000
England	4,520,000	13,055,000
India	223,000	108,877,000
Mexico	2,840,000	988,000
France	33,000	6,588,000
Others	8,955,000	10,476,000
Totals	$98,682,000	$177,104,000

IMPORTS

From	1920	1919
Mexico	$44,795,000	$ 45,173,000
Peru	9,786,000	6,610,000
Central American States	6,023,000	2,683,000
Canada	3,068,000	5,560,000
Chile	2,607,000	1,459,000
B. E. Indies	2,290,000	971,000
Others	4,893,000	1,530,000
Totals	$73,462,000	$63,986,000

Asiatic conditions are none too rosy. The report of an impending famine in China will not be conducive to trade movements. As Samuel Montagu & Co. aptly point out, "China unfortunately is not in the position of India, where, should drought and distress prevail, the government is able to organize relief on a large scale and possesses the financial resources necessary for methods involving considerable expenditures." China's export trade is almost at a standstill, and exporters are having exchange difficulties concurrent with the decline in silver. The large silver imports of China are ascribed not only to a replacement of the silver shipments made during the war to India but to the ill repute into which paper money has fallen in the interior of Asia, where Russian currency normally figured. Samuel Montagu & Co. estimate that 50,000,000 to 60,000,000 oz. of silver may be absorbed annually by China for use in the interior of Asia.

India has changed the value of the rupee from Rs. 15 to the £1 to a rate of Rs. 10 to the £1. This step was considered earlier in the year, being the result of the recommendations of the India Exchange and Currency Commission appointed to study the reorganization of India's currency. The great rise in silver last winter forced the face value of the rupee above its bullion value and made the coinage of rupees highly unprofitable to the government. At the time the commission's report was made, silver commanded a high price, over $1.30 per oz., and the step to reorganize the currency was taken not only to bring back the token character of the coin but to prevent as far as possible a recurrence of conditions under which the intrinsic value of the rupee exceeded its face value. Two alternatives were open—to reduce the fineness of the coin or to reduce the rupee rate, that is the number of rupees which could be exchanged for a given weight of gold—the sovereign. The commission recommended the latter course, and the reorganization was put into effect, after proper notice had been given, on Oct. 1. In so doing India took a remarkable step in monetary finance and one which has provoked both favorable and unfavorable comment. The following table compares the old and new rates:

	Old Rate Rs. 15 to £1	New Rate Rs. 10 to £1
Par value of rupee in English currency	1s. 4d.	2s
Par value of rupee in U. S. currency	32 44c.	48 66c
Face value rupee @ 80c. silver	27 50	27 50
Face value rupee @ 100c. silver	34 37	34.37

Besides the Asiatic consumption of silver, there has been introduced another consuming quarter. Mexico is reported to be continuing to purchase silver for coinage purposes, but in relatively small amounts, at an average price 4¾c. above the New York foreign quotation for silver, and used about 1,450,000 oz. in July for the purpose. As the power of Mexico to absorb silver is controlled largely by the number and wealth of the population, it is interesting to note that the amount of money in circulation in Mexico, according to S. R. Wagel, is 28,655,000 pesos, or at the rate of 1.91 pesos—95½c.—per capita. In the United States the money circulation on Nov. 1 amounted to $6,393,140,000, or $59.48, on a per-capita basis. Mexico is on a sound metallic basis, with little paper money, whereas the United States has in circulation large amounts of paper.

Although Mexico is coining silver and the United States is operating its mints to capacity in the coinage of subsidiary silver, it is not very encouraging to note the tendency in many countries to get away from the use of silver coins. Germany is reputed to be using everything from porcelain to zinc. Aluminum and iron coins are stated to be common there. Other nations whose currency has greatly depreciated cannot of course keep silver in circulation. Bad money drives out good money, and so some other expedient has to be instituted. Hence Germany's abandonment of silver.

MINING STOCKS

Week Ended November 13, 1920

Stock	Exch.	High	Low	Last	Last Div	
COPPER						
Adventure	Boston	*70	*60	*70		
Ahmeek	Boston	57	52	52	Sept. '20, Q	50
Alaska-B.C.	N. Y. Curb			1/8		
Allouez	Boston	23	20	20	Mar. '19,	1 00
Anaconda	N. Y.	50½	45½	45½	Aug. '20, Q	1 00
Ariz. Com'l	Boston	8½	8	8½	Oct. '18,	50
Big Ledge	N. Y. Curb	1/16	1/16	1/16		
Bingham Mines	Boston	9⅝	9	9½	Sept. '19, Q	.25
Calumet & Ariz.	Boston	53½	51	51½	Sept. '20, Q	1 00
Calumet & Hecla	Boston	255	245	248	June '20, Q	5 00
Canada Copper	N. Y. Curb	*22	*20	*20		
Centennial	Boston	9	9	9	Dec. '18, SA	1 00
Cerro de Pasco	N. Y.	38½	34½	34½	Sept '20, Q	1 00
Chief Consol.	Boston Curb	3⅜	3⅛	3⅛	Nov. '20, Q	10
Chile Copper	N. Y.	14⅜	12⅜	12⅝		
Chino	N. Y.	25⅜	21	21	Sept. '20, Q	37½
Columbus Rexall	Salt Lake	*34	*33	*33½		
Con. Ariz.	N. Y. Curb	1/16	1/16	1/16	Dec. '18, Q	.05
Con. Copper M	N. Y. Curb			*6⅛		
Copper Range	Boston	33⅜	30	30½	Sept. '20, Q	50
Crystal Copper	Boston Curb	*61	*50	*59		
Davis-Daly	Boston	7 1/16	6⅞	6⅞	Mar. '20, Q	25
East Butte	Boston	9⅛	9	9	Dec. '19, A	50
First Nat'l	Boston Curb	*100	*80	*85	Feb '19, SA	15
Frankl'n	Boston	2⅜	2⅛	2⅛		
Gadsden Copper	N. Y. Curb			*70		
Granby Consol	N. Y.	26	20½	20½	May '19, Q	1 25
Greene Cananea	N. Y.	25⅜	23⅜	23⅜	Aug. '20, Q	.50
Hancock	Boston	3⅜	3⅜	3⅜		
Houghton	Boston Curb			*45		
Howe Sound	N. Y. Curb	3	2⅞		Oct. '20, Q	05
Inspiration Con	N. Y.	42	38	38⅜	Oct. '20, Q	1 00
Iron Cap	Boston Curb	8	8	8	Sept. '20, K	.25
Isle Royale	Boston	24	21	21	Sept. '19, SA	.50
Kennecott	N. Y.	22⅝	20⅜	20⅝	Sept. '20, Q	50
Keweenaw	Boston			1⅜		
Lake Copper	Boston	2⅜	2⅛	2⅜		
La Salle	Boston	2⅜	2	2⅛		
Magma Chief	N. Y. Curb			*21		
Magma Copper	N. Y. Curb	26	24	24	Jan. '19, Q	.50
Majestic	Boston Curb	*14	*12	*12		
Mason Valley	Boston	1⅜	1⅛	1⅛		
Mass Consol	Boston	3⅜	1	3⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	4⅜	4	4		
Miami	N. Y.	19⅜	17⅛	17⅜	Nov. '20, Q	.50
Michigan	Boston	3	3	3		
Mohawk	Boston	57⅜	51⅞	51⅞	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb	5⅝	5⅛	5⅛		
Nevada Con	N. Y.	11¼	10⅜	10⅜	Sept. '20, Q	.25
New Arcadian	Boston			2⅜		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17⅜	16½	16⅝	Aug. '20,	.25
Nixon Nev	N. Y. Curb	*5	*5	*5		
North Butte	Boston	15	10⅜	11⅛	Oct. '18, Q	.25
North Lake	Boston			*25		
Ohio Copper	N. Y. Curb			1/16		
Oilway	Boston	2⅛	2	2⅛		
Old Dominion	Boston	22⅜	21	21½	Dec. '18, Q	1.00
Osceola	Boston	31	27⅜	27½	June '20, Q	50
Phelps Dodge	Open Mar.	†175	†150		Oct. '20, Q	2.50
Quincy	Boston	42½	41½	42	Sept. '20, Q	1.00
Ray Con	N. Y.	13⅜	12½	12⅝	June '20, Q	.25
Ray Hercules	Boston Curb	*61	*61	*61		
St. Mary's M. L.	Boston	36	32	32	June '20, K	2.00
Seneca Copper	Boston	23	18⅜	18⅛		
Shannon	Boston	1⅛	1	1	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	7⅜	5	6⅛	Jan. '20 Q	.25
South Lake	Boston			2		
South Utah	Boston	*8	*8	*8		
Superior Copper	Boston	4⅜	4	4	Apr. '17,	1.00
Superior & Boston	Boston	2⅜	2⅛	2⅛		
Tenn. C. & C.	N. Y.	9⅝	8⅛	8⅞	May '18, I	1.00
Tuolumne	Boston	*50	*45	*45	May '13,	.10
United Verde Ex.	Boston Curb	*29	*27⅛	*27⅜	Nov '20, Q	.50
Utah Consol	Boston	5	4⅜	4⅜	Sept '18,	.25
Utah Copper	N. Y.	59	53	53⅛	Sept '20, Q	1.50
Utah M. & T.	Boston	1⅜	1	1 1/16	Dec. '17,	.30
Victoria	Boston			1⅞		
Winona	Boston	*50	*50	*50		
Wolverine	Boston	11	10⅜	10⅜	Jan. '20, Q	50
LEAD						
Hecla Mining	N. Y. Curb	4⅜	4⅛	4¼	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14⅛	14	14	Sept '20, QX	50
Stewart	Boston Curb			*13	Dec. '15,	05
Utah Apex	Boston	3	2⅛	2⅛	Nov. '20, Q	25
ZINC						
Am. Z. L. & S.	N. Y.	12	6⅛	8⅛	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	40	32	32	Nov. '20, Q	1.50
Butte C. & Z.	N. Y.	6⅛	5⅛	5⅛	June '18, I	.50
Butte & Superior	N. Y.	16⅛	10⅛	11⅜	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	7⅛	6⅛	6⅜	June '20, Q	.50
New Jersey Z.	N. Y. Curb	160	157	157	Nov '20, Q	4 00
Success	N. Y. Curb	4	2	2	July '16,	03
Yellow Pine	Los Angeles	*85	*85	*85	June 20, Q	03

Stock	Exch	High	Low	Last	Last Div	
GOLD						
Alaska Gold	N. Y.	1⅛		1⅛		
Alaska Juneau	N. Y.	1⅛		1⅛		
Carson Hill	N. Y. Curb			22⅛		
Cresson Consol. G	N. Y. Curb	1/16		1/16	June '20, Q	.10
Dome Ex.	Toronto	*50	*44	*46		
Dome Mines	N. Y.	12⅛	11⅛	11⅛	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb.	*0	*8	*9	Dec. '19,	.05
Hedley	Boston			4⅛	June '19,	10
Hollinger Con.	Toronto	5.40	5.50	5.50	Nov. '20, X	05
Homestake	N. Y.	48½	48	48½	Sept. '19,	.50
Kirkland Lake	Toronto	*	*	*43½		
Lake Shore	Toronto	1.07	†1.02	1.08	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	1.94	1.91	1.91	Sept '20, K	05
Porcupine Crown	Toronto	*23½	*22	*23	July '17,	03
Portland	Colo. Sprgs.	‡		*60	Oct. '20, Q	01¼
Reorgan. Booth	N. Y. Curb.	*4⅛	*3	*3	May '19,	.05
Silver Pick	N. Y. Curb.	*6	*5⅛	*6		
Teck Hughes	Toronto	*7	*6½	*6½		
Tom Reed	Los Angeles	1.43	1.36	1.38	Dec. '19,	.02
United Eastern	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '20, Q	15
Vindicator Consol	Colo. Sprgs.	‡		*18	Jan. '20, Q	01
West Dome Consol	Toronto	*5⅜	*5⅛	*5⅜		
White Caps Min.	N. Y. Curb.	*8	*6	*6⅜		
Yukon Gold	Boston Curb			1⅛	June '18,	02½
SILVER						
Arizona Silver	Boston Curb	*21	*18	*20	Apr '20, M	03
Beaver Con.	Toronto	*38½	*35	*35½	May '20, K	03
Coniagas	Toronto	2 25	2 25	2.25	Nov '20, Q	12½
Crown Reserve	Toronto			*22	Jan. '17,	05
Kerr Lake	Boston	3⅛	3⅛	3⅜	Oct. '20, K	12
La Rose	Toronto			*30	Apr '18,	02
McKinley-Dar.	Toronto	*50	*47	*48	Oct. '20, Q	03
Mining Corp.	Toronto	1.68	1.60	1.65	Sept '20, Q	12½
Nipissing	N. Y. Curb.	8⅛	8⅛	8⅛	Oct. '20, QX	50
Ontario Silver	N. Y.	4⅛	4⅛	4⅛	Jan '19, Q	50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12,	10
Peterson Lake	Toronto	*11⅛	*11⅛	*11⅛	Jan. '17,	01¼
Temiskaming	Toronto	*32	*30	*30½	Jan. '20, K	04
Trethewey	Toronto	*26½	*24½	*24½	Jan. '19,	05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*1⅛	*1	*1		
Barnes-King	Butte	‡		1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb.	*8	*5⅛	*7		
El Salvador	N. Y. Curb.	11/16	11/16	11/16		
Jim Butler	N. Y. Curb	*18	*17	*17	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*6	*6	*6	June '16,	.05
Louisiana Con.	N. Y. Curb.	3/16	3/16	3/16		
MacNamara M	N. Y. Curb.	⅛	1/16	⅛	May '10,	.02
N.Y. Hond. Rosar	Open Mar	11	*9½		Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1⅛	1⅛	1⅛	Oct '20, Q	05
Tonopah-Divide	N. Y. Curb.	1 1/16	1	1 1/16		
Tonopah Ex.	N. Y. Curb	1⅛	1 1/16	1⅛	Oct '20, Q	05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1 1/16	Oct '20, SA	05
West End Con.	N. Y. Curb.	1⅛	1⅛	1⅛	Dec. '19 SA	05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*18	*17	*17	July '20, M	01
Consol. M. & S.	Montreal	23	19⅜	21	Oct. '20, Q	o21
Daly Mining	Salt Lake			2.40	July '20, Q	10
Daly-West	Salt Lake	4⅜	4⅛	4⅛	Oct '20, Q	25
Eagle & Blue Bell	Boston Curb	2⅜	2⅛	2⅛	Apr. '20, Q	10
Electric Point	Spokane	*14½	*14	*14	May '20, SA	03
Fed. M. & S.	N. Y.	9⅜	8	8	Jan. '09,	1.50
Fed. M. & S. pf.	N. Y.	31	28	30	Sept. '20, Q	1.75
Florence Silver	Spokane	*25	*25	*25	Apr. '15,	.01¼
Grand Central	Salt Lake			*37½	June '20, K	03
Iron Blossom	N. Y. Curb.	1⅜	1	1⅛	Apr. '20, Q	02½
Judge M. & S.	Salt Lake			3.82½	Sept. '20, Q	12½
Marsh Mines	N. Y. Curb	*11⅛	*9	*11		
Prince Consol.	N. Y. Curb	1/16	1/16	1/16	Nov. '17,	02½
Rambler-Cariboo	Spokane	*8	*6	*8	Feb '19,	01
Rex Con.	N. Y. Curb	*6	*5	*5		
South Hecla	Salt Lake	*74	*73	*73	Sept '19, K	15
Stand. S. L.	N. Y. Curb	1/16	1/16	1/16	Oct. '17,	05
Tamarack-Custer	Spokane	2 20	2 00	2.00	Dec. '19, K	03
Tintic Standard	Salt Lake	3 50	3.25	3.32½	June '20, Q	10
Wilbert Mining	N. Y. Curb	*4	*4	*4	Nov '17,	01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	17	15⅛	15⅛	Mar. '19,	.50
Internat'l Nick.pf	N. Y.	83	83	83	Nov. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	2⅛	2⅛	2⅛	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	*9	*5	*9		
VANADIUM						
Vanadium Corp.	N. Y.	50	45	47	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp	Montreal	92⅜	84	88	Oct. 20, Q	1.50
Asbestos Corp pf	Montreal	98	94	98	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	57	51⅛	53	Sept '20, Q	1 00
Am. S. & R.pf.	N. Y.	91	88⅛	88⅛	Sept. '20, Q	1.75
Am. Sm. pf. A	N. Y.	78	76⅛	7⅜	Oct. '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	52⅛	48	48	Oct '20, Q	1.50
U.S.S.R.& M. pf	Boston	44	43½	43½	Oct. '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, Semi-annually BM, bimonthly K, Irregular I, Initial X, includes extra

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Volume 110 New York, November 27, 1920 *Number* 22

The Mining Congress at Denver

THE Twenty-third Annual Convention of the American Mining Congress had fine and bracing weather and other favorable settings for its meeting in Denver. It was said that the attendance was quite satisfactory as to numbers, and unusually pleasing as to the representative character of those present; for although the Congress is an open forum, it is most successful when it attracts naturally those who represent the real elements of the industry. At the opening session a telegram was read by Mr. Bulkeley Wells from the President of the United States, congratulating the Congress on the work it had accomplished in the past and commenting on the expected good which would result from its further deliberations. Again, Mr. Clay Tallman, Land Commissioner and Special Representative of the Secretary of the Interior, paid a voluntary compliment in his speech to the representative of the Congress in Washington, Mr. Callbreath, declaring that, after careful study, the officials in Washington had come to look upon him as an institution, and that they had always found he stood for the good of the mining industry as a whole, and not for some special interest in it. Such tributes must be gratifying and encouraging to the officers of the Congress, which is to mining what the Chamber of Commerce is to trade.

The looseness in selecting the state delegates to the Resolutions Committee, which we pointed out editorially last year in connection with the St. Louis meeting, was remedied at the Denver session by giving the state delegations plenty of time to meet and elect their representatives; and the adoption of the resolutions was further safeguarded by each resolution being passed upon by a committee of the directors of the Congress before being referred to the Resolutions Committee.

Possibly, the greatest interest in the convention centered around the gold-mining situation and the McFadden Bill as a remedy; and approval of this remedy was more unanimous and confident than when the plan was proposed a year before at St. Louis. The flotation conference was also an occasion of special interest.

We again recommend these annual meetings to mining engineers as well as to the mine operators of the country. The free discussions of questions of vital interest to the welfare of the mining industry are bound to be productive of much good; and the officials have the wholesome ideal of carving out a record in things accomplished, as well as illuminating the problems by debate.

Church and State

THE main deliberations of the Mining Congress in Denver were held in the First Baptist Church, across the street from the Albany Hotel. Sitting in a pew and listening to a speaker behind a pulpit, with the pipes of the great organ above his head, called back so strongly the association of ideas with countless Sabbaths, that many fumbled around nervously for hymn books, when the organist rendered his contribution to the proceedings, and felt in their pockets for change against the eventual collection. The gentle snoring of a man on the eighteenth row of pews on the right (who had doubtless been put to sleep by the same powerful association of ideas) heightened the impression. Even the speakers, behind the pulpit, naturally fell into those rhetorical and rhythmic swings and cadences of voice which preachers employ; and the temptation to thump the pulpit was frequently noted. Speakers were observed to develop a tendency to divide their speeches from firstly to sixthly and lastly; and when the first meeting of the convention was over the audience rose and lingered a moment, standing waiting for the benediction.

Surely, this year we may look to see something especially righteous shine out of the mature deliberations of the Congress.

Employer and Employee

INDUSTRY, including the mining industry, is depressed; times are becoming hard; profits are vanishing; wages are high; living costs are still high; the employer faces a shut-down and the employee a lay-off. What should be done?

We are not fond of the antithetic terms Capital and Labor: they are academic and obscure the issue; they are in any event abstract words applied more or less clumsily to concrete human groups whom the terms employers and employees fit simply and accurately. It is the principle of leader and follower which is exemplified in this relation, a principle beloved of mankind in all ages and inevitable to it.

The wise leader will give much thought to the comfort and prosperity of his followers: and they to his. As an employer, he will wish for them the best working conditions and the highest feasible wages; and they will wish for him and for the capital (either his own or borrowed) which he puts into the enterprise, on which they all subsist, as high a profit as is feasible and proper. Each must, therefore, put his mind on the job to be done. Efficiency of management (on the part of the employer) and efficiency of labor (on the part of the employee) is what both parties have the right to expect, for without either the one or the other both must suffer.

The problem of mine managers is, therefore, the maximum increase of efficiency and the minimum decrease of wage. This efficiency should be studied in all departments, and can hardly be properly attained without sympathetic co-operation throughout; and this extends to mine and mill workers, the production department, or, as sometimes quaintly termed, the labor

department. (Does not every man on the job, from the manager down, labor? If not, he should be fired.)

Sympathetic co-operation is not possible without intelligent appreciation; therefore it is good policy, here as everywhere else, to turn on the light. Experience has proved that in many places workmen will decide reasonably and helpfully when shown a company's real condition, whereas their moods and demands will be heartbreaking to a manager if they are left for enlightenment to the cock-and-bull tales of the ignorant professional agitator. Let each manager remember his true position as a leader, and that each leader must tie his followers to him by personal loyalty and confidence, if he and they would succeed.

Examples of the increased efficiency which has been made possible by this policy are cropping up in numerous places, and many business enterprises are feeling out inquiringly along these lines. The main thing is to give every man an interest in his work, so that he can feel that it is *his* work, and that he is working for himself as well as for others. That principle must underlie all plans.

All this is working toward a new type of co-operation in industry—the natural human type which we have just sketched. We do not think any intelligent man will disapprove of the principle of labor unions, or deny what they have done for the betterment of the condition of the workingman. Nevertheless, the abuse of power by widespread organizations is always to be guarded against; and the making of rules to insure equality of earnings is against efficiency and an average high scale of wages. Moreover, the system carried to excess creates a lack of interest or even a hostility between employer and employee—an unnatural condition. Therefore, without abandoning our favor of unions, we are in favor of the open-shop policy for all enterprises, without which the closer union of employer and employee, so essential for mutual prosperity, cannot be accomplished; for this union should be a more intimate one than any other. Mining enterprises have perhaps progressed further in this direction than most enterprises; and, we believe, are almost without exception on the open-shop plan. These mines will henceforth find their chief problem in bringing about increasingly closer co-operation and teamwork within their own organizations.

Another Call for Hoover

WE NOTE an advertisement of the Harriman National Bank in one of our New York papers, entitled "Hoover," and in which is expressed the desire, with appropriate arguments, to have Hoover act as head of a great corporation supposedly to organize under the Edge Act and to foster our international trade. Much has been said lately about the unprecedented opportunity before the country in its export trade. The American Manufacturers' Export Association recently held an important meeting to discuss the salient features of this opportunity, as constructive legislation now upon the statute books—the Edge Law—permits properly incorporated banks to finance foreign trade, and the commercial and general press has given much publicity to the possibility of entering a field of trade hitherto practically closed to the country and still largely in the hands of British financial interests.

Copper producers, cotton growers, and hundreds of other interested parties are tremendously concerned in the steps our country is taking to stimulate its exports. An Edge Law corporation which would perform this function undoubtedly needs executive ability of the highest standing and the keenest business knowledge, to say nothing of a sound knowledge of international affairs. No wonder the call for Hoover. "Would the South, its warehouses bulging with cotton, object to Hoover? Would the farmer of the West, with his record crops? Would the manufacturer of the East, with his raw materials waiting to be turned into goods? Would the financial expert?" So runs the plea, and concludes, "Who would object to Hoover, and who can offer a better name to bring together the consumers of Europe and the producers of America?"

We had not thought of Hoover in this light, but are forcibly struck with the singular appropriateness of his war record to the task of building up our foreign trade through foreign good will. The executive head of an Edge Law corporation with an international reputation possesses an invaluable asset. We have a suspicion that there are other jobs in store for Hoover which would to an even greater extent call upon his ability, and although, as Secretary of the Interior or Treasury, he would preside over some vital department of our Government, and indirectly be concerned in foreign affairs, his counsel in the deliberations of President-elect Harding's Cabinet should exert a pronounced influence in shaping the foreign policy of the nation. Without a definite foreign policy and firm, whole-hearted governmental approval and moral support, an Edge corporation cannot fulfill its mission to the utmost, for the ultimate foundation of success in foreign trade lies in our Government.

Lawlessness, of Domestic or Foreign Origin

IN A RECENT NUMBER a correspondent writing from Butte called attention to the lawless and revolutionary foreigners in that mining center, who threaten, by their preponderance at the polls, to take the reins of government away from the native born, and administer the affairs of the community according to their own wild and selfish ideas. As a remedy against the threat of being engulfed by foreigners who do not understand our ideals, and are unfit for our institutions, he suggests the withholding of the franchise from the foreign born, except where some foreigner by exceptional merit is granted that distinction.

Butte has long been a center of social discontent, and, indeed, one of the rotten spots in the United States, in the mining world not unlike what Paterson, N. J., has been in the industrial world. The bandits of radicalism were pitchforked out of Colorado, and later out of Nevada; but Butte has always been their strong fortress.

The case is serious enough to warrant fearless treatment. What is to be done? Shall we deny the franchise to the foreign born? There is no question that the foreign born, lumping them as a class, are a heavy liability for us to carry. In the large cities, as the centers of industrial activity, they congregate, and their numbers and lack of sense of responsibility make them easily marshalled by political machines; and thus they dominate and often help to make rotten the politics of cities like New York and Philadelphia. The foreign born, we are told, predominate in our police courts, and in our prisons. Assimilation in the melting pot of so much refractory material is at times a difficult process.

On the other hand, we recently heard a coal producer—a high-class type, himself of foreign birth—describe his difficulties in operating in West Virginia, on account of the lawless mountaineers of that region. Making and selling poisonous moonshine whisky, robbery, shooting, and killing are commonplace occupations which have been handed down among these people from generation to generation. Concerning this situation, a moral cowardice characterizes the whole state, and there are no authorities that have the courage to deal with them as hardened and habitual criminals should be dealt with. This portion of West Virginia, we are convinced, is far more rotten than Butte. These West Virginian mountaineers are of old-time American stock—originally of English extraction. We have heard that they are the descendants of English refugees from justice who fled to the wilds of America and made their lairs in the mountains of the state.

Thus, we see that there are undesirable foreigners and also that there are undesirable Americans. On the other hand, our country could not well have spared the help it has received from those foreign-born citizens who love our institutions and our ideals and who have advanced our welfare—and every reader can enumerate many among his friends. It is not important whether a man is foreign born or native born, whether he is a native son in California, or a tenth-generation American in New England—the question is whether he is worthy or unworthy.

What shall be done, therefore, with conspicuous congregations of the unworthy like those at Butte and in the West Virginia mountains? Shall we take away their franchise? That would be simply to outlaw these half-wild children whom we wish to reclaim. Rather, perhaps, they should be given further civic responsibilities; but held vigorously to their faithful discharge of them. What they lack mainly, even if not exclusively, is enlightenment. Frequently, what is most needed is a higher morale and higher planes of thought and conduct for those classes of citizens who consider themselves superior. For example, considering the prompt and painless handling of the police strike in Boston by Calvin Coolidge, is it not likely that had he been Governor of West Virginia he would have given these mountaineers new conceptions of law and order? How long would the hill billies terrorize the surrounding country in the presence of a state constabulary like that of Pennsylvania, or like that model of all police organizations, the Royal Northwest Mounted Police of Canada, and with honest and fearless courts of justice to complete their work?

The Morale of Operating Crews

"SAY, Bill, don't you know that one of your five pumps is taking twice as much power as the others?" said the electrician to the pump boss. "Well, it's working," said Bill. "You'd better leave it alone."

Two phases of human nature are epitomized in this incident. One, that of inquiry or the desire to get at the fundamentals; the other, a complaisant acceptance of a bad condition although specific information is at hand to throw doubt upon the desirability of maintaining that condition. How often do we realize that matters of importance require our attention, yet fail to act on available knowledge? A hot journal usually commands prompt attention, a heavy leak in a pump column or a leaking gland on a pump would start Bill into action. But the unseen flow of energy through a conduit or a pipe and its utilization in a motor or otherwise are in a way mysterious to Bill, and he does not have to pay the added expense due to its inefficient application. If the comparative operating costs of the five pumps were placed before him he might take notice, but just as likely as not he would be only casually interested.

Too often the attitude of bosses, foremen, and workers is the one of "getting by" with minimum physical and mental exertion. This attitude applies to all forms of waste that occur in a mining operation. Close supervision and inspection are important ways of preventing excessive wastes both in materials and in energy, but of as great importance is the stimulation of morale in the organization. If Bill's attitude had been one of active co-operation with the electrician one kind of waste would have been speedily stopped.

We believe that it would be a good plan to persistently spread the data obtained by inspection before individuals directly responsible. A follow-up plan would be a necessary feature. Supplementary cost data would serve to make the effect of wastes in enegy flows, such as electricity, compressed air, and steam, more real than could otherwise be possible. We must visualize for Bill and his confreres. They should be made to look upon individual operations in some such way as the manager does. Cost sheets and cost analyses are placed before the manager, but how often is a pump foreman given the cost data of his particular division? The bulletin board can be used to advantage, and if Bill were required to visualize the money outgo on his particular job he might be induced to feel somewhat as he does when he figures out his personal expense budget or when he looks at his grocery bill and counts out the money with which to settle it.

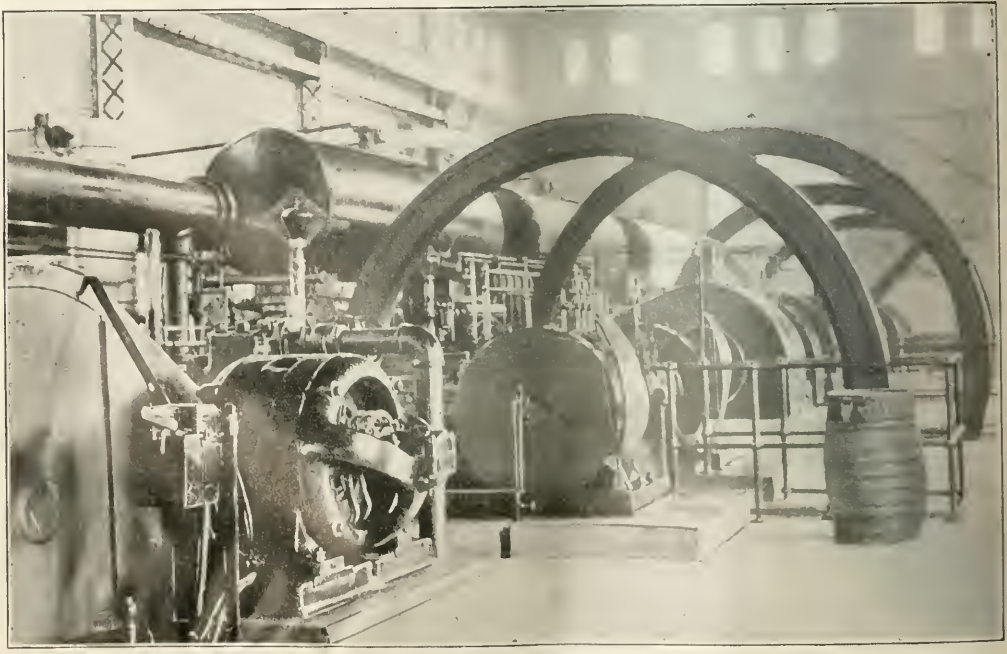
At the bottom of morale is a live interest in the job. Every employee should have such an interest, although much has been done to break that down. Continuity of employment is dependent on the success of an enterprise. Excessive waste and indifference can wreck an enterprise that under more favorable conditions might furnish continuous and remunerative employment for a long time. A management fair in its dealings with its employes and exacting in the sense that it keeps closely in touch with details will develop morale even under unfavorable conditions, but a careless and indifferent management cannot develop it even under the most favorable. Thus, as we see the lesson in the incident quoted, there should be close control, visualization of cost and operating data for the details of operation, and a certain amount of bulletin boarding to keep all concerned in touch with the facts.

Sound Money

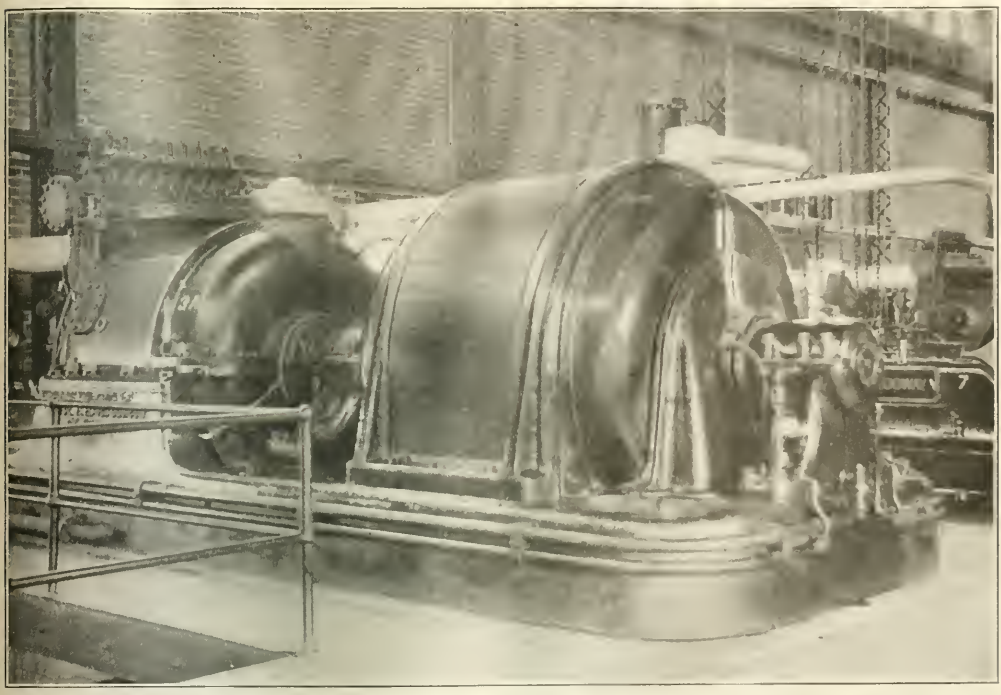
MEXICO is sound at least in one important particular. It claims to be the only country in the world where the sole circulating currency is gold and silver. There may be those that claim that 40 per cent money is as good as 100 per cent money, among many who believe the contrary, but there are none who will not agree that gold and silver coin is money of the quality that cannot be improved. It is the real material which banknotes "promise to pay." When in doubt on the monetary question, fall back on the real money concerning the value of which there is no difference of opinion.

Smelter Power Plant of the Arizona Copper Co.

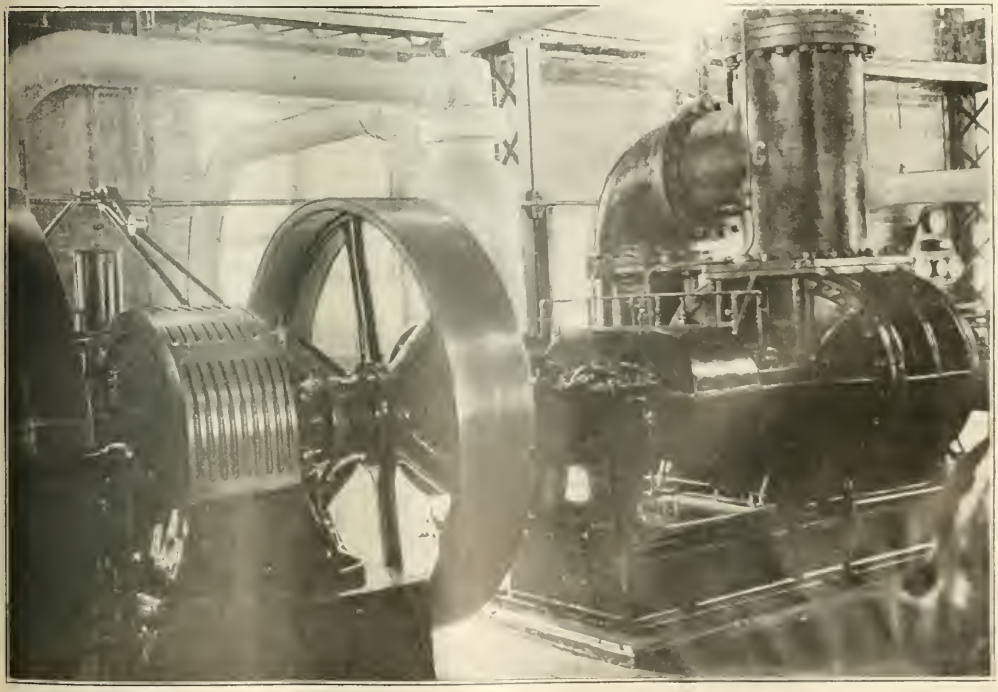
SPRAYS FOR COOLING CONDENSER WATER



BLOWING ENGINES



2,000 KW. G. E. TURBINE-DRIVEN GENERATORS



ROTARY PUMPS

Mining Congress Holds Annual Convention At Denver

W. J. Loring Elected President—Flotation Conference Marked by Debate Between Operators' Representatives and Minerals Separation Officials—Sessions on Taxation, Standardization, Tariff and Gold Keep Delegates Busy—McFadden Bill Indorsed

STAFF CORRESPONDENCE

"IT IS ALTOGETHER appropriate that a convention of the American Mining Congress is again held in Denver," said Bulkeley Wells in his presidential address at the organization's Twenty-third Annual Convention that met in the Western city during the week of Nov. 15. "Here, twenty-three years ago, the organization was created. From 1896 to 1907 its working force consisted of the secretary and one stenographer. In so recent a year as 1910 the income amounted to but $5,000, while in the last year its

JOHN T. BURNS
Assistant Secretary of American Mining Congress and in Charge of Convention Arrangements

receipts have reached the substantial sum of $150,000." Thus the Congress upon this occasion returned to the place of its birth, full grown.

This convention faced many of the problems that were subjects of consideration by the last one held in St. Louis a year ago. The questions of relief for gold producers and for war mineral claimants, of mine taxation and of standardizing mining equipment, as well as of development of an oil-shale industry in this country, were again on the program. In the year elapsed, the plight of the gold-mining companies had steadily worsened, the producers of war minerals remained, for the most part, as dissatisfied as ever, and mine taxation was still a subject of debate. No better place than Denver could have been chosen in which to discuss these matters, for in Colorado the gold mines of Cripple Creek are in dire straits, and an effort is under way to make the mining industry within the state pay a larger share of taxes than ever. Denver is also the natural place for a conference on oil-shale development. But, whatever the object of the delegates in coming, the convention opened promptly on the afternoon of Nov. 15, with a large attendance, this despite the fact that the convention hall was the Baptist church. Indeed, one speaker remarked that, without doubt, many of the mining men present were in church for the first time in their lives, which accusation no one saw fit to deny. The headquarters of the convention were at the Albany Hotel.

CONVENTION CALLED TO ORDER BY T. B. STEARNS

The convention was called to order by Thomas B. Stearns, chairman of the Committee on Arrangements. The delegates were welcomed to Denver by Mayor Bailey and by George E. Collins, governor of the Colorado Chapter. President Bulkeley Wells then took the chair and introduced E. P. Mathewson, who responded in behalf of the Mining Congress. "Wherever and whenever the American Mining Congress convenes, there will be found E. P. Mathewson," said Mr. Wells.

The spirit of the occasion, together with the solemn surroundings, perhaps aided by the music of the church organ, so affected Mr. Mathewson that he then and there announced his conversion. His father had been a prominent member of the Methodist Church, he said, and had constrained him to go to church in his youth, where he learned something about conversion. On entering the business of copper smelting, Mr. Mathewson said, he learned more about conversion. A year ago, he confessed, he had been the one discordant note in the convention, but now was thoroughly converted on the gold bonus question. "The ease with which the Pittman Act was put across opened my eyes," said Mr. Mathewson, "and from now on my motto is 'let the man that uses the gold pay the bill.'"

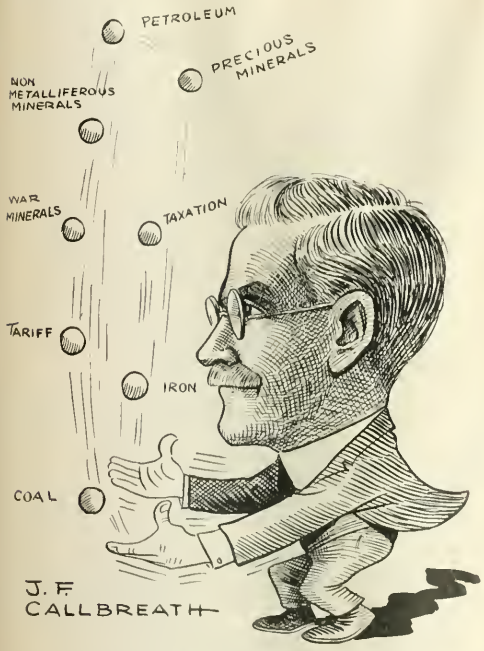
Judge John F. Davis, responding on the behalf of the mining industry of the West, said that this was a producers' convention and not a political convention.

The features of this the first session were an address by Eugene Meyer, Jr., on the subject of the "War Finance Corporation and Its Possibilities as an Assistance to Foreign Trade"; also an address on the new Mineral Land Leasing Law by the Hon. Clay Tallman, General Commissioner of the U. S. Land Office.

In clear forcible language Mr. Meyer explained the origin, work and present object of the Finance Corporation, of which he is chairman. He expressed the hope

that the convention would, in a resolution, declare itself as being in favor of continuing the Corporation.

The Mineral Land Leasing Law, in Mr. Tallman's opinion, marked a departure in the Government's public land policy as great as was the Homestead Law of 1862, prior to which time land was simply sold to those who had money to pay for it. He said that it had taken ten years of agitation to secure its passage. He explained that, in effect, it is a series of compromises due to



many conflicting views and therefore has many inherent defects, but withal is basically sound.

At the evening session, at which Mr. Wells again presided, Governor Shoup of Colorado was the first speaker. In a brief address, which elicited laughter frequently, the Governor discussed the resources of Colorado, and, passing to the subject of the sad condition of mining in the state, said jestingly that practically the only paying mines today were those owned by George Taylor and Bulkeley Wells.

Mr. Wells then delivered his presidential address, briefly describing the accomplishments of the Mining Congress during the year just passed.

The Kansas Industrial Court Law was discussed at length by the Hon. Frank Dumont Smith, of Kansas, speaking as the representative of Governor Henry J. Allen of Kansas. In explaining how this beneficent law had actually been passed, Mr. Smith said that it so happened that the Kansas Legislature this year had had a smaller infusion of jackrabbit blood than any Kansas Legislature that he had ever seen before.

Mr. Smith was followed by Dr. Charles A. Eaton, editor of *Leslie's Magazine*, who in a long address on the subject of the "Present and Future Relations Between Capital and Labor" succeeded in holding the close attention of the audience by his witty and brilliant handling of his subject.

The real business of the convention began on the second day, Nov. 16, when the conferences on gold and taxation were opened. These subjects were discussed at morning and afternoon sessions. An account of the proceedings is given elsewhere in this issue. At noon, the oil-shale men got together at a luncheon given by the oil-shale section of the American Mining Congress, over which Dr. Victor C. Alderson presides.

In the afternoon, the metal-mining section of the Standardization Committee, under the chairmanship of Charles A. Mitke, of Bisbee, Ariz., met to consider the reports of the various subcommittees. The report on the standardization of machine-drill parts, presented by Arthur Notman, superintendent of the Copper Queen, at Bisbee, was noteworthy. A number of other papers had been prepared, including one by T. O. McGrath, auditor of the Shattuck-Arizona Copper Co., on standardization of cost accounting, but lack of time prevented their consideration.

Dr. F. G. Cottrell Addresses Convention

A large audience assembled in the main convention hall in the evening at the third general session. Many had been drawn thither by their desire to hear Dr. F. G. Cottrell, Director of the U. S. Bureau of Mines, and Representative Louis T. McFadden, father of the gold bonus bill. Mr. McFadden was unable to be present, however, to the disappointment of those who had come to hear him.

Dr. Cottrell, who was introduced by Bulkeley Wells,

read a long paper dealing with the work and plans of the Bureau. "The Bureau of Mines has now been in existence for ten years," said he. "This seems an opportune time and place to take account of stock, to look over ground already covered, and to note the direction in which we are headed. It is right, also, to give to the mining and to the general public an accounting for the moneys spent, and to gain from them ideas and suggestions as to how, within our funds and organic

powers, present and probable future needs can best be met."

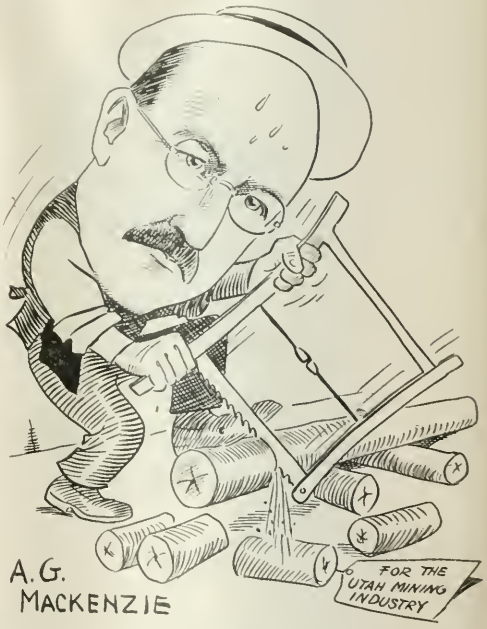
The manner of spending the Bureau's appropriation was described by Dr. Cottrell at some length. Continuing, he said: "The records show that in the beginning the American Mining Congress was vitally interested in and as an organization helped very prominently in creating the Bureau. From your continued co-operation, I am led to believe the results have been at least encouraging."

In talking of the Bureau's research work, Dr. Cottrell expressed the hope that the service of furnishing information as to particular metals, which was rendered the Government, producers, consumers and the interested public during the war, might again be undertaken, at least in certain of its features.

Dr. Cottrell touched briefly upon the co-operative agreements of the Bureau with governmental, state and private agencies. He said in concluding, "The apparent success and increasing call on the Bureau for co-operative work of this character lead me to the belief that its expansion will go far to answer the question so frequently asked, 'What is the Government going to do to foster research?' May not the answer be: 'As much as the industries themselves have enough demand for, and confidence in, to share part of the burden of the work.'"

A subject dear to Dr. Cottrell's heart is what he calls the "Public's Interest in Patents of Invention." He discussed this briefly, after concluding the main portion of his address, and read to his hearers a resolution to be presented to the committee, providing that "the American Mining Congress appoint a committee on patents of invention to co-operate with the proper governmental bureaus and committees of other business and technical organizations in working out methods for insuring to the patentee, to industry, and to the public more comprehensive and adequate guidance of public education and policy in the interpretation of patent rights."

Following Dr. Cottrell's remarks, an address on "Industry and the Government" was made by Gen. L. C. Boyle, of Washington, D. C. Industry needs less governmental control and more team work between capital and labor, stated General Boyle. The need for co-operative effort is great. This nation must first solve its own problems before it can help Europe. The speaker claimed that faulty taxation was one of the main causes of present conditions. Business cannot return to normal, he said, until the tax burden is equitably distributed. The evils of the excess-profits tax and the surtax are penalizing industry, and capital is seeking



the shelter of non-taxpaying bonds. Capital will, therefore, not be available for the development of industry if it remains as highly penalized as at present.

The Sherman Law should be amended so that curtailment and price adjustment by agreement might be permitted under Government supervision, said General Boyle. In this way, he said, waste will be avoided and great natural resources conserved. "Organization is not wrong, but the abuse of it is," he said.

Numerous conferences marked the program of the third day of the convention. These were the War Minerals Conference, presided over by Herbert Wilson Smith, chief of the war minerals division of the American Mining Congress; the continuation of the Gold Conference, which had started the day before; and the Conference of Flotation Users. The proceedings at all of these meetings are given elsewhere in this issue. By far the most important event of the day was the Conference of Flotation Users, the conference room being crowded at both morning and afternoon sessions by delegates expecting a tilt between representatives of

Minerals Separation and those of operators employing flotation, in which they were not disappointed.

In the afternoon, the fourth general session came to order in the main convention hall under the chairmanship of Carl Scholz. First on the program was the reading of a report made on blue-sky legislation by a special committee of the Mining Congress. A. G. Mackenzie, of Salt Lake City, chairman of the committee read the report, which was signed by himself and Sidney Norman of Spokane, the latter a member of the committee.

Judge Finney Discusses U. S. Mining and Leasing Laws

"The Mining Laws of the United States" constituted the subject of the next speaker, Judge E. C. Finney, of the U. S. Board of Appeals, who also represented the Secretary of the Interior. Judge Finney stated that it has been the policy of Congress from the time of the enactment of the first mining laws to encourage the finding and production of the country's mineral resources. This is shown, he said, by the liberal terms and conditions of the general lode and placer mining laws, and the latest enactment by Congress changing the policy of disposition as to oil, gas, coal, phosphate, and sodium is entitled "An act to promote the mining" of the deposits.

The general mining laws, he continued, although they contain no limitation as to the number of claims which might be taken or held by citizens, did require work to be done thereon annually, and authorized relocation by others as a penalty for the failure to perform such work. Newer laws, such as the potash and the oil land leasing laws, continue this policy and extend it. They require a specified amount of work to be done each year until discovery, authorize the Secretary to insert conditions in leases issued after discovery to insure reasonable continuous extraction of the minerals, and impose some limitations not contained in the old mining laws, namely, the fixing of the maximum acreage which may be held by an individual, association, or corporation.

With a few exceptions, Judge Finney explained, the Department of the Interior has been liberal in its construction and administration of the general mining laws, and, subject to the restrictions and limitations imposed by Congress, is disposed to be likewise liberal in the administration of the leasing laws. The department is particularly anxious to be practical and businesslike in its supervision of the working of coal mines, oil and gas wells, and other natural resources, and to that end has welcomed and will welcome suggestions by the American Mining Congress and by mine operators. Judge Finney further said:

> It is sensible and right that none of our resources shall be wasted, and that is particularly true of limited and exhaustible minerals, such as oil and gas, and to this end it is the duty of the department to prevent waste and to encourage better methods of mining, handling and reduction. In this respect the American Mining Congress and the mining operators can perform a valuable service in aiding the department, in their own interest and that of the general public.
>
> Captious criticism and petty fault-finding are of no benefit to the department, to the public, nor to the operators. Suggestions or criticisms should be constructive, and in that form cannot fail to be advantageous to all concerned.
>
> The American Mining Congress occupies a peculiarly favorable position to be of service both to the Government and the mine operators. Its organization permits it to gather information promptly from the entire mining area, to use that information for the general good, to thrash out and harmonize difference of opinion, and to render a real and lasting benefit to all the people. On the occasion of its twenty-third annual convention it merits and receives our esteem and congratulations.

An address on the subject of "State Taxation of Metal Mines," by James G. Fitch, of Socorro, N. M., was next on the program. This was followed by a paper of interest to coal men, entitled "A Powderless Mechanical Process for the Mining of Coal," by D. Vance Sickman, of Denver. The session closed with the presentation of a paper on "The Application of Industrial Medicine and

Health Conservation in the Development of Mine Labor Efficiency," by Dr. Arthur L. Murray, of the U. S. Bureau of Mines. Dr. Murray pointed out that miners should be selected for physical ability and adaptability and placed at work for which they are mechanically and temperamentally fit. The living conditions at any mine, he said, largely determine the type of labor that seeks employment and remains at that mine. The surroundings under which a man is forced to work react on his mental attitude and his labor output in proportion to whether they are helpful or harmful, safe or unsafe. Safety devices and properly directed safety supervision more than pay their cost in decreased loss of labor through lessening of accidents and saving in compensation. On large operations a safety engineer is as great a necessity as a mining engineer, in Dr. Murray's

opinion. Employers who desire intelligent and efficient men must make their working conditions as safe and wholesome as possible. The purpose of industrial medicine is to keep the working force as near physically par as possible by preventive, corrective, and curative measures, the first two being known as industrial hygiene.

Another general session was held on the evening of Nov. 17, T. T. Brewster, of St. Louis, presiding. R. N. Miller, a former solicitor of the Bureau of Internal Revenue, was the first speaker, his talk being on the subject of "The Problem of Next Year's Taxes." Mr. Miller sketched the situation confronting the Commissioner of Internal Revenue. Two things should be done, he said, if the enormous accumulation of work was to be properly and speedily handled. First, it is necessary to provide the commissioner with funds sufficient to enable him to secure an adequate number of men of sufficient calibre to do the work properly. Also, some method must be provided by which taxpayers may be informed, without undue delay, how much they owe the Government, so that such cases may be definitely closed.

The remainder of the evening was given over to the consideration of subjects bearing on various phases of the coal industry. Dr. E. W. Parker, of Philadelphia, chairman of the Anthracite Bureau of Information, delivered an address, "What Happened to the Anthracite Industry in 1920." J. D. A. Morrow, of the National Coal Association, presented a paper on the "General Coal Situation." The meeting then adjourned.

There were many conferences on the fourth day of the convention. Sessions of the conferences on Standardization, Gold, and Taxation were continued. In addition, two conferences were held on Education and Public Service; one on Oil Shale and one on Tariff. All of these are described elsewhere in this issue.

In the morning the annual members' meeting was held. The following directors retired: Walter Douglas, Samuel A. Taylor, L. A. Friedman, Carl Scholz, and Charles S. Keith. The following were elected directors: James A. Douglas, Robert Linton, W. J. Loring, Carl Scholz, and Hugh Shirkie, the last named of Indiana.

A nominating committee was appointed to name officers for the ensuing year. Later in the day the election of W. J. Loring as president was announced. A committee of three was appointed to revise the bylaws, including dues. The income of the Mining Congress during the past year was given at $150,432 and the cash on hand as $9,232. The members, of which there are 2,500, were declared a liability and not an asset.

The annual dinner on Thursday evening was marked by the presence of ladies, who were not invited last year at St. Louis. One diner who had been present at both banquets declared in favor of the St. Louis system, but others differed. Not only was satisfactory material refection provided for the inner man and woman, but spiritual as well. A jolly feature was a corps of young lady singers, gaily if not completely garbed, who wandered singing among the tables, and tarried here and there in the well-known cabaret style.

Thomas B. Stearns was the toastmaster. Senator Charles S. Thomas, as first speaker, spoke somewhat cynically of "Industrial Honesty and Dishonesty." He stated that the prohibition law and other restrictive legislation had made 50 per cent of the population government agents and spies, and its other 50 per cent liars and scoundrels. He laid the present debauch of dishonesty, grafting, and profiteering to the breakdown of morale following the Great War, and said that a similar period followed the Civil War. At present, he said, there were in Washington 125 organized lobbies, of which the Mining Congress was one; and none of them cared for any interest but the one it represented. He stated that every Representative and Senator cared only for the interests of his own constituency, so that nobody represented the United States but the President: hence the people looked to the President alone for broad statesmanship.

Governor Boyle of Nevada, in a few well-chosen and witty remarks, presented to the retiring president a watch as a souvenir of his services.

T. A. Rickard, introduced as a former state geologist of Colorado, made a witty little speech in which he referred to the frequent comparison of himself with Tex Rickard, and the disappointment of his son when he found that they were unrelated.

The toastmaster called upon Carl Scholz as the next president of the Congress, but Mr. Scholz, in correcting the speaker, gave a little sketch of the moonshiners

of West Virginia, with whom he had to deal in his coal-mining operations. W. J. Loring, the new president, next spoke briefly, and asked support for a successful year.

Additions to the program made it necessary to hold two general sessions on the last day of the convention, instead of one, as originally planned. The morning session was given over to addresses by Arthur Notman, mine superintendent of the Copper Queen at Bisbee, Ariz.; Charles A. Chase, manager of the Liberty Bell mine, at Telluride, Col.; L. Ward Bannister, of Denver; and W. G. Bierd, president of the Chicago & Alton Ry.

Mr. Notman's paper, entitled "Conditions of Operation and Production in Open-Shop Districts in Arizona," proved to be a presentation of the conditions of operation at the Copper Queen branch of the Phelps Dodge Corporation. Other Bisbee companies, said Mr. Notman, are working along similar lines, as are companies in other camps in the state.

Mr. Chase in the course of explaining why Colorado mining engineers had adopted the open-shop movement, said that industrial peace had reigned in the metal-mining districts of Colorado in recent years because mining was so stagnant that there was nothing to be gained by labor warfare.

"Denver and the Open Shop" was the subject of Mr. Bannister's remarks, and Mr. Bierd, who had spoken

CHARLES A. CHASE

at the dinner the night before, talked on what he termed the "Relation of Industry to Industry."

The afternoon session was the most important one of the convention, as it was then that the report of the Resolutions Committee was presented to the Congress. This was preceded by an address on the gold situation in California by Fletcher Hamilton, state minerologist of California, and by a brief talk by Arthur F. Fisher, delegate to the convention from the Philippine government. The chairman, Bulkeley Wells, also read excerpts from a paper by James Lord, president of the mining department of the American Federation of Labor, in Mr. Lord's absence.

In all, twenty-five resolutions were adopted by the convention, only one of them being debated. The complete text of these resolutions follows:

Introduced by Bulkeley Wells;
Relating to War Finance Corporation

Whereas, the sharp contraction during the past few weeks in domestic demand for American products has been so acute as to bring about a serious business situation and as to threaten even more unfortunate conditions in agriculture and commercial business and the mining industries; and,

Whereas, the European market has in the past under ordinary world conditions served in large measure as an outlet for the American producer; and,

Whereas, Europe, although desperately in need of American raw material and food products today, both for the purpose of feeding and clothing its population and of giving them employment, is unable to do a large volume of business with the American producer by reason of the need on the part of the European buyer for long-term credits; and,

Whereas, the War Finance Corporation, for the purpose of meeting the world emergency, was vested by Congress in March, 1919, with the power (which has not yet expired), either out of funds heretofore appropriated by Congress or out of funds to be obtained from the public by the sale of its bonds, to make advances on good security to American exporters and American banks to assist in the sale and exportation of American products to foreign purchasers on credits up to five years in duration; and,

Whereas, the War Finance Corporation did, up to May 10, 1920, demonstrate its usefulness to the country by assist-

ing in the exportation of American products on credits of from six months to five years; and,

Whereas, the Secretary of the Treasury in May, 1920, caused said corporation to suspend such exercise of its powers in the preservation and stimulus of American export trade, although such powers still exist under the law, so that said corporation is today inactive at a time when the American people have the most urgent need for its activity; and,

Whereas, this meeting of the American Mining Congress in Denver, Col., Nov. 15, 1920, is informed that said corporation could resume the exercise of its said functions with reference to export trade if the Secretary of the Treasury would consent thereto;

Now, therefore, be it resolved, that this meeting does hereby most earnestly urge upon the Secretary of the Treasury that he now cause the War Finance Corporation to resume the exercise of its powers under Section 21 of the War Finance Corporation Act to make advances in aid of the exportation of American products until such time as its said power in that behalf shall have expired under the law, or until the present dire emergency shall have passed; and, further,

Resolved, that the chairman of this meeting be and he is hereby authorized and requested to forward these resolutions to the Secretary of the Treasury, and a copy to Hon. William M. Calder, chairman of the Senate Committee on Reconstruction and Production.

Introduced by Bulkeley Wells;
On Public Interest in Patents of Invention

Whereas, patents on inventions represent a monopoly granted fundamentally in the public's interests; and

Whereas, in the case of similar monopolies such as public franchises it long ago became evident that some form of public administrative machinery such as public service commissions was necessary to function in a way between the issuing of franchises and final appeal to the courts; and,

Whereas, the extension of these same principles to the study and guidance of public policy with regard to the interpretation and control of patent rights appears to have distinctly lagged behind that of other less technical aspects of trade and industry; and,

Whereas, a broad, intelligent and equitable public policy with regard to patents of invention is of vital importance to the whole mining and mineral industry;

Now, therefore, be it resolved, that the American Mining Congress appoint a committee on patents of invention to co-operate with the proper governmental agencies and committees of other business and technical organizations in working out methods for insuring to the patentee, to industry, and to the public more comprehensive and adequate guidance of public education and policy in the interpretation of patent rights.

Introduced by Carl Scholz;
Against Abolition of Interior Department

Whereas, more than one-half of the acreage of the United States west of the north and south line drawn through the eastern border of Colorado is now owned by the Federal Government; and,

Whereas, the enactment of the Public Lands Leasing Bill creates a continued responsibility upon the Federal Government in handling the public lands of the West; and,

Whereas, this vast expanse of territory contains more than 3,000 million tons of coal, untold oil reserves, oil-shale deposits of unmeasured value, water-power measured in productive force many times greater in value than its oil, oil-shale and coal reserves combined, and immense deposits of phosphates and other minerals; and,

Whereas, the administration of these vast resources will require an increasing service from that department which is charged with the work of supervising the development of the Rocky Mountain and Pacific Coast Western States, namely, the Department of the Interior; and,

Whereas, a proposal has been made looking to the discontinuance of the Interior Department and the creation in its stead of a Department of Public Works;

Now, therefore, be it resolved, that the American Mining Congress in its twenty-third annual session assembled in Denver, Col., Nov. 15-19 inclusive, enters its protest against the abolition of the Interior Department and urges that the Interior Department shall be continued for the above weighty duties and as that department through which the mining industry of the United States shall function in Federal affairs.

Introduced by Carl Scholz;
Approving Henderson Bill, S. 4,369

Whereas, the importance of the mining industry of the United States has been better appreciated during the days of the war when it was realized that the production of minerals was essential to the carrying on of the nation's contests in the great world war; and,

Whereas, the relative importance of mining is shown by the fact that during the year 1919 the railroads of the country received from the transportation of freights approximately 576 millions of dollars, while from the transportation of manufactured products the total amount paid to the railroads was approximately 168 millions of dollars; and,

Whereas, those two activities of the Federal Government which have rendered most specific service to the mining industry are the U. S. Bureau of Mines and the U. S. Geological Survey; and,

Whereas, it is desired that these agencies, with such other agencies as render service to the mining industry, shall be co-ordinated in a more effective way than is possible through the present organization of the Interior Department; and,

Whereas, Senate Bill 4,369, known as the Henderson Bill, provides for the creation of a Division of Mines and Geology within the Interior Department under an Assistant Secretary of the Interior to be appointed for that specific purpose by the President;

Now, therefore, be it resolved, that the American Mining Congress in twenty-third annual session assembled at Denver, Col., Nov. 15-19 inclusive, hereby expresses its approval of the principles contained in the Henderson Bill and urges the enactment by Congress of a bill embodying the principles therein contained.

Introduced by Carl Scholz;
On Bureau of Public Works

Whereas, the enormous burden of taxation which must be met by the industry of the nation requires greater economy in the conduct of governmental affairs, the abolition of all useless expenditures, the highest efficiency in every governmental agency, and the prevention of all duplication of service and expenditure; and,

Whereas, the engineering and construction services of the government are now lodged in various bureaus of the several departments;

Now, therefore, be it resolved, that the American Mining Congress in twenty-third annual session assembled in Denver, Col., Nov. 15-19 inclusive, hereby expresses its belief that a Bureau of Public Works should be created, under the direction of which, so far as feasible, all engineering and construction features of the government service should be consolidated, to the end that greater economy, higher efficiency and more effective service shall be rendered, and all duplication of effort shall be prevented.

Introduced by G. P. De Beque;
On Oil Shale

Whereas, for the past several years the domestic production of petroleum has been insufficient to satisfy the domestic requirements of the United States; and,

Whereas, the deficit between domestic production and consumption of petroleum is estimated to be more than 100 million barrels for the year 1920, making it necessary to import enormous quantities of oil from Mexico and to draw continually on our rapidly waning stocks of petroleum; and,

Whereas, the present rate of increase of consumption of petroleum in the United States makes it appear that in the near future the nation will be largely dependent on foreign sources for its petroleum supplies, a condition which will place the nation in a dangerous position in time of

war and tend to a loss of commercial supremacy in time of peace; and,

Whereas, the nation's enormous deposits of oil shale represent a resource which, when properly developed, will give the nation a practically inexhaustible domestic source of petroleum; and,

Whereas, the commercial development of those oil shales can be immeasurably facilitated by properly conducted scientific research; and,

Whereas, the U. S. Bureau of Mines, a Federal agency properly qualified to conduct such investigations, has requested of the Congress of the United States an appropriation for the construction, equipment and operation of an experimental station for such investigations;

Therefore, be it resolved, that this, the twenty-third annual convention of the American Mining Congress does hereby approve of the plans of the U. S. Bureau of Mines for investigations on oil shale and further urges upon the Congress of the United States the necessity of favorably considering the appropriation requested.

Introduced by George Wolfe;
Against Federal Control of Bituminous Mines

Whereas, for the past eleven months in certain sections of the United States there has existed a shortage of bituminous coal; and,

Whereas, it has been charged that certain tonnage of bituminous coal in certain sections of the United States has been sold by the producers at excessive and exorbitant figures; and,

Whereas, today in the minds of certain of our lawmakers exists a strong belief that government supervision and control of the bituminous coal industry is of earnest consideration,

Therefore, be it resolved, that the fuel supply problem, in so far as bituminous coal is concerned, is one of transportation and that the recent evils of coal speculation were the result of such transportation shortage, and should not be charged against the coal producers who were helpless in this emergency; and,

Be it further resolved, that we feel that no condition exists in the bituminous coal industry at this time calling for Federal control of the bituminous coal mines of our country such as has been advocated by Senator Calder, of the Senate Committee of Reconstruction, and that, if the industry is let alone, the present co-operation between transportation, producers and labor will continue, and the present high tonnage production will be maintained, which will necessarily clear away certain evils heretofore complained of.

Introduced by M. B. Tomblin and Robert J. Kerr;
Against Pending Federal Blue-Sky Legislation

Be it resolved, by the delegates to the twenty-third annual convention of the American Mining Congress, held at Denver, Col., Nov. 15-19, 1920, that we are opposed to all proposed enactment now pending in Congress providing for so-called "blue-sky" legislation.

This was the only resolution presented by the Resolutions Committee that was debated on the floor of the convention. As first presented it read, ". . . providing for so-called 'blue-sky' legislation, and that it is the sense of this convention that state regulatory measures now in force in the several states are sufficient in form, with slight modification, to meet all requirements." The amendment was made on motion by A. G. Mackenzie, of Salt Lake City. The resolution favoring a Federal Blue-Sky Law that is referred to in the account of the fourth general session on another page was defeated in committee.

Introduced by H. W. Seamon, E. P. Mathewson and W. J. Loring;
Endorsing the McFadden Bill

Whereas, the Government of the United States is justly committed to the gold standard; and,

Whereas, the maintenance of a healthy, gold-mining industry is absolutely essential to the maintenance of a gold standard; and,

Whereas, the gold-mining industry of the United States is in deplorable straits, having almost ceased to function, and it is necessary to apply immediate measures for relief; and,

Whereas, the McFadden Bill, HR 13,201, offers the best present solution of the problem;

Resolved, that the American Mining Congress, in convention assembled, heartily indorses the McFadden Bill and pledges its support to the measure, and urges a like support on the part of all our citizens who have at heart the maintenance of the gold standard and the common welfare of the country.

Introduced by H. H. Schwartz;
Proposing To Amend Oil Shale Section of Leasing Law

Whereas, in various parts of the West, particularly in the states of Utah, Colorado and Wyoming, there exist bedded deposits of sandstone, limestone and other rocks impregnated with bituminous or similar organic matter in solid or semi-solid form which may be utilized commercially and which are not oil shales; and,

Whereas, no provision for prospecting, developing, or leasing such deposits is made under the existing laws;

Therefore, be it resolved, that the American Mining Congress recommend to the Congress of the United States that Section 21 of the Act of February 25, 1920 (Public 146), known as the Oil Shale Section of the Leasing Law, be amended so as to include all lands containing valuable deposits of bituminous or similar organic material in solid or semi-solid form.

Introduced by Tax Committee;
Proposing Creating a Bi-Partisan Taxation Board

Whereas, the immediate need of the present moment is a definite fixing of the past tax liability for each taxpayer, especially for the war years, 1917, 1918 and 1919, and this need is emphasized by the present unstable business conditions; and,

Whereas, this need for prompt final tax determination for the war years is so vital as to require immediate provision for final settlement of all unsettled cases for the years 1917, 1918, 1919,

Resolved, that the American Mining Congress recommend to the Federal Congress the enactment of a statute authorizing the President to appoint, by and with the consent of the Senate, a bi-partisan board of ten men, composed of lawyers, accountants, engineers, and business men, who will sit for a period of one year to pass upon and settle the cases of taxation arising during or consequent upon the wartime period of 1917 to 1919, both inclusive. The powers of such board to be of the broadest character; to summon witnesses, to compel the production of books and papers, to determine questions of fact and law, and to make assessments under both the general terms of the statutes and those special remedial provisions embodied in section 210 of the Revenue Act of 1917 and sections 327 and 328 of the Revenue Act of 1918.

The board to be given power to compromise taxes in cases where the need arises, and should be given a power which is not now provided for in our statutes; namely, to postpone the payment of taxes for reasonable periods, or to provide for their payment in installments where the board deems it necessary in order to prevent undue hardship on the taxpayer, requiring, of course, adequate security from the taxpayers to safeguard the interests of the revenue.

We strongly urge that the board shall be an independent body separate and apart from the Bureau of Internal Revenue and the Treasury Department.

The board should have authority to remand the case to the Bureau of Internal Revenue, with instructions how to close it, or on the other hand to summarily dispose of the case and determine the final assessment.

If, however, a determination and assessment is made in the case of any taxpayer and an agreement in writing signed by the taxpayer and the board that such determination and assessment shall be final and conclusive, then

(except upon a showing of fraud or malfeasance or misrepresentation of fact materially affecting the determination or assessment thus made) the statute shall provide that the case shall not be reopened or the determination and assessment modified by any officer, employee, or agent of the United States, and no suit, action or assessment shall be entertained by any court of the United States.

The board to be a large board, one composed of ten members, since the work it will perform may be divided into three or four general classes. The full board should not be required to sit in every case; three members should constitute a sufficient quorum to hear and determine the case, although more members may sit on complicated or important cases. The decision in each case should be subject to the written approval of a majority of the board, including those members who sat on the case.

The board shall have the power to refuse to hear any appeals that they may deem frivolous or vexatious. It shall prescribe rules and regulations for its procedure and the hearing of cases. Proper recourse to the courts to lie from any decision of the board by any taxpayer dissatisfied with the decision of the board.

A sufficient appropriation should be made to adequately compensate the members of the board and to enable the board to employ an adequate staff of clerks and assistants. In addition, it should have power to call upon the Bureau of Internal Revenue for such auditing or other assistance as it might require in any particular case.

We believe the energetic, impartial operation of such a board, clothed with broad and ample powers suggested, would result in the settlement of practically all the cases of war taxation within a year, and leave the department free to carry on its current work. The expeditious settlement and assessments accomplished through the medium of such a board would save in interest alone many times the appropriation needed therefor.

Introduced by Tax Conference;
Urging Repeal of War-Profits and Excess-Profits Taxes

Whereas, the burdens created by the War Excess-Profits Tax Law have become an excessive burden upon business and a deterrence to investment and the undertakings of new business enterprises,

Now, therefore, be it resolved, that we most earnestly urge upon Congress the immediate repeal of the war-profits and excess-profits taxes.

Presented by Tax Conference;
On Deduction for Depletion

Whereas, the Department of Internal Revenue, having under the 1909 Tax Law contended that the net proceeds of mines constituted profits and were all taxable without any deduction for depletion, basing such contention on the general practice of the mining industry at that time, and having succeeded in establishing that view in the courts,

Be it resolved, that it is the sense of this Congress that the rule now adopted by the Bureau of Internal Revenue in ascertaining the invested capital of mining corporations by which a deduction is made from profits for each unit of minerals removed since the commencement of mining operations down to the year 1916, regardless of actual conditions, actual facts and valuations of the mining property, is inconsistent and unfair; and,

It is further resolved, that this Congress take steps to present its reasons to the Bureau of Internal Revenue supporting an abrogation of such rule.

Introduced by A. G. Mackenzie;
Proposing Metal and Mineral Import Tariff

Be it resolved, by the American Mining Congress in twenty-third annual convention assembled, that we favor the imposition at the earliest possible date of such United States customs duties or tariffs on metals, minerals and metalliferous and mineral products, presented for entry into the United States from foreign countries, as shall be sufficient to enable United States producers of like or similar metals, minerals and metalliferous and mineral products to meet such foreign competition and continue to maintain American standards of wages and living conditions.

Presented by California Metal and Mineral Producers' Association; Colorado Chapter American Mining Congress; Colorado Metal Mining Association; Idaho Mining Association; Montana Mining Association; Nevada Mine Operators' Association; New Mexico Chapter American Mining Congress; Utah Chapter American Mining Congress; and Washington State Metal Mining Association;
On Reduction of Ore Freight Rates

Whereas, the continued production of metals and, consequently, the employment of large numbers of men as well as the profitable operations of the ore-carrying railroads are all dependent to a very large extent upon reasonable and living freight rates; and,

Whereas, due to the peculiar character of the rate structure under which ores are moved, the rate advances of June 25, 1918, and of Aug. 26, 1920, have resulted in placing an undue proportion of the burden of furnishing additional revenue to the carriers upon the metal mining, smelting and refining business;

Therefore, be it resolved, that in the opinion of this Congress immediate steps should be taken by the carriers and ore producers and shippers, jointly, to secure such readjustment and revision of the present ore rates as will permit of the continued operation of the metal mines and at the same time will give to the carrier a just and reasonable compensation for the services rendered by it.

Introduced by Gilbert H. Montague;
Commending Proceedings Against Minerals Separation

Whereas, on Nov. 12, 1918, the Federal Trade Commission commenced a proceeding against the British corporation, Minerals Separation (Ltd.), its subsidiaries and its agents, particularly its controlled American subsidiary, Minerals Separation, North American Corporation, charging them with stifling and suppressing competition, and monopolistic and oppressive practices, and violations of the Clayton Act and the Federal Trade Commission Act, in that their contracts and methods have tended (a) to prevent independent inventors and independent manufacturers from licensing and selling independent processes and independent apparatus; and (b) to prevent mine operators from using independent processes and independent apparatus; and (c) to require independent inventors and independent manufacturers to pay to Minerals Separation exorbitant commissions as the condition of licensing and selling their own processes and apparatus; and (d) to discriminate unfairly as between manufacturers and inventors similarly situated in respect to the commissions thus exacted by Minerals Separation; and (e) to compel mine operators, metallurgists and engineers to surrender their own inventions to Minerals Separation; and (f) to prevent mine operators, metallurgists and engineers from publishing data regarding flotation; and (g) to compel mine operators, metallurgists and engineers to withold information regarding flotation in event of litigation; and (h) to exact from mine operators an exorbitant royalty for the use of the processes of Minerals Separation; and (i) to exact from mine operators royalties upon the use of processes and apparatus in which Minerals Separation have no rights whatsoever; and (j) to discriminate unfairly, as between mine operators similarly situated, in respect to the royalties thus exacted by Minerals Separation; and (k) to disparage, falsely and maliciously, independent processes and independent apparatus, independent inventors, and independent manufacturers, and the users and patrons of such independent processes, independent apparatus, independent inventors, and independent manufacturers; and (l) to claim, falsely and maliciously, exclusive rights in excess of those actually possessed by Minerals Separation; and (m) to threaten, with malice, patent infringement suits based upon claims of exclusive rights exceeding those actually possessed by Minerals Separation (Ltd.), its subsidiaries and its agents; and (n) to intimidate and coerce mine operators to refrain from using or patronizing independent processes, independent apparatus, independent inventors, and independent manufacturers by threatening to withhold from such mine operators licenses under Minerals Separation (Ltd.), processes and apparatus; and (o) to

coerce independent inventors and independent manufacturers, through the tactics above described, to enter into oppressive agreements with Minerals Separation (Ltd.), its subsidiaries and its agents; and,

Whereas, the testimony thus far taken by the Federal Trade Commission in support of these charges tends to show, largely from the correspondence and admissions of Minerals Separation officials themselves, that the British corporation, Minerals Separation (Ltd.), its subsidiaries and its agents, particularly its controlled American subsidiary, Minerals Separation, North American Corporation, have suppressed technical information, made indiscriminate charges of infringement, required independent inventors and independent manufacturers to pay commissions on sales of their own apparatus, charged excessive royalties for the use of Minerals Separation processes, falsely disparaged apparatus of independent inventors and independent manufacturers, compelled engineers in the employ of Minerals Separation to sign illegal and iniquitous contracts, made excessive claims regarding Minerals Separation's patent rights, retarded generally the development of the art of flotation, discriminated unfairly between Minerals Separation's licensees in respect of royalty charges, demanded royalties in perpetuity for the use of Minerals Separation processes on which the patents will soon expire, requiring Minerals Separation's licensees to assign their inventions to Minerals Separation, threatened lawsuits to coerce numerous mine operators, seduced and corrupted with bribes the employees of various mine operators for the purpose of obtaining secret, confidential information, and threatened scores of mine operators with infringement suits without pointing out the particulars of such infringement or making any adequate investigation before issuing such threats; and,

Whereas, from the report submitted to this convention by the counsel of American Mining Congress, it appears that the mining industry of the United States, now and for all future time will be in bondage to the British corporation, Minerals Separation (Ltd.), its subsidiaries, and its agents, and particularly its controlled American subsidiary, Minerals Separation, North American Corporation, unless the proceeding brought by the Federal Trade Commission is prosecuted to a successful conclusion;

Now, therefore, be it resolved, by the American Mining Congress in convention assembled, with members and representatives present from every mining state in the Union,

That the American Mining Congress hereby indorses and commends the proceeding of the Federal Trade Commission against the British corporation, Minerals Separation (Ltd.), its subsidiaries and its agents, particularly its controlled American subsidiary, Minerals Separation, North American Corporation, and indorses and approves the action of the officers and counsel of the American Mining Congress in supporting the commission's proceeding; and be it further

Resolved, that the American Mining Congress hereby pledges the assistance of its officers, its counsel, its chapters and its members to assist the Federal Trade Commission in its proceeding to terminate the intolerable bondage which Minerals Separation have now imposed, and hereafter in perpetuity threaten to impose upon the mining industry of the United States.

Presented by War Minerals Conference;
On Appropriation for Relief

Be it resolved, that the American Mining Congress urge the retention in *statu quo* of the appropriation provided in section 5 of the Act of March 2, 1919 (40th U. S. Statutes, p. 1,272) until such time as further Congressional legislation be enacted and the claimants under this said act of March 2, 1919, shall have received the relief intended to be granted thereunder, and that the executive committee of the board of directors of the American Mining Congress are empowered to take such action in this behalf as they deem necessary and proper.

Presented by War Minerals Conference;
Urging Passage of H. R. 13,091

Whereas, in section 5 of the Act of March 2, 1919 (40th Statutes, p. 1,272), provision was made to pay producers of chrome, tungsten, manganese and pyrites net losses suffered by them in an effort to comply with the requests or demands of the governmental agencies mentioned therein to produce the said minerals required by the exigencies of the war and appropriating the sum of $8,500,000 therefor; and,

Whereas, under the constructions which have been placed upon this law many claimants thereunder protest that they have not received the relief this law was intended to administer;

Be it resolved, that the American Mining Congress urge the immediate passage of H. R. 13,091 by the House of Representatives, which bill has already been passed by the Senate, and been favorably recommended to the House by unanimous report of the Committee on Mines and Mining, and accords to claimants who have not received adequate awards under this act the right of appeal to the Court of Claims from the decision of the Secretary of the Interior.

Presented by Tariff Conference;
Urging Passage of Timberlake Bill

Be it resolved, that the American Mining Congress favors the speedy passage of the Timberlake Bill (H. R. 4,437) for the protection of tungsten and its products, which has passed the House and is now pending upon the calendar of the Senate, with a favorable report from the Senate Finance Committee.

Presented by Tariff Conference;
Supporting Anti-Dumping Legislation

Be it resolved, that the American Mining Congress support legislation to prevent the dumping of the products of foreign mineral industries on the shores of this country at prices so far below the cost of domestic production as to make competition of domestic mineral industries impossible.

Introduced by A. G. Mackenzie;
Favoring Collection of Information on Mines and Quarries

Resolved, by the American Mining Congress in convention assembled, that we favor and will co-operate with such joint action by the Federal Congress, the Bureau of the Census and such other governmental agencies as may beneficially participate therein to the end that more informative data than those now available be collected, compiled and published by the national government, and that if found necessary to accomplish this result a special census of mines and quarries be authorized and made.

Introduced by W. J Loring;
Recommending Reduction of Prices of Supplies and Freight Charges

Be it resolved, that in order to bring about a return to normal conditions as rapidly as possible it is the judgment and request of the American Mining Congress that the manufacturers and sellers of mining supplies and equipment reduce prices and public carriers reduce freight charges in accord with the present economic trend to the end that the mining industry may resume its normal activity.

The customary resolution of thanks to the city and county of Denver, the state of Colorado, and to all contributing to the success of the convention was adopted.

George W. Nye, counsel for American Mining Congress, succeeded in securing the adoption of a resolution in support of the Near East Relief Work, after the resolution had been turned down by the Resolutions Committee.

Of all the conferences, the sessions of the Flotation Conference, or the Conference of Flotation Users, as it was officially designated, drew the greatest number. The proceedings at these meetings are briefly described in the following article. One of the most important sub-

jects discussed at the convention was that of standardization. At the conference on this subject, which is described hereafter, the reports read by the various subcommittees of the metal mining section were indicative of the study that has been given the matter. Before closing this account of the general sessions of the convention, it should be said that *Engineering and Mining Journal* is indebted to the American Mining Congress for the cartoons published in this report.

After some discussion as to the best place for holding the twenty-fourth annual convention, a matter to be decided by the directors, in the course of which Chicago, Pittsburgh and Atlantic City were named, the convention adjourned.

The Flotation Conference

THE Flotation Conference was held on Wednesday, Nov. 17, George E. Collins of Denver, presiding. A considerable number of interested members were present, including three members of Minerals Separation, A. A. Cook, counsel and director; E. H. Nutter, chief engineer, and C. B. Allen, secretary, who were present by special invitation. In his opening speech, Mr. Collins spoke of "The Progress of the Art of Flotation." He declared that Dr. W. K. Everson was the true discoverer of flotation, but neither he nor his widow, Mrs. Carrie Everson, was able to bring it to a commercial success. Dr. Everson came to Denver with his idea in 1886-87. Mr. Collins detailed the subsequent history of the idea, through the use of the process at Broken Hill, in Australia, to its practical introduction into America by Sulman and Picard and Minerals Separation, Ltd.

EDWARD H. NUTTER

A paper by W. C. Russell was read by another. It was entitled "Has the Attitude of Minerals Separation Retarded the Progress of Flotation?" Mr. Russell quoted from various publications the universal indictment of Minerals Separation on the ground of suppression of information. He also called attention to the Minerals Separation policy of securing to itself by contract with the licensee the fruits of the latters' inventions. He pointed out that although the application of flotation to Cobalt ores was largely the result of local inventive genius, the excessive royalty of 2½ per cent of the gross value of the concentrates was demanded.

George L. Nye, of Denver, counsel for the American Mining Congress, spoke on the subject of "Particular Practices of Minerals Separation Which Mining Men Have Criticised." Mr. Nye recalled that four flotation processes came into use at about the same time at Broken Hill, in Australia: the Potter-Delprat process, the De Bavay, the Minerals Separation, and the Elmore vacuum process; shortly after which Sulman and Picard introduced commercial flotation into the United States. Mr. Nye, in a stirring direct manner, quite without gloves, charged the administration of Minerals Separation with various practices injurious to the progress of the art of flotation and to mining; such as the suppression of technical information, indiscriminate charges of infringement, and the requiring of inventors to pay royalties on their own inventions. In general, he said, the Minerals Separation claims amounted to this: that "Minerals Separation controls flotation in general." He cited the cases of makers of flotation machines, like Janney, Ruth, and others, who were forbidden to sell their machines without the consent of Minerals Separation.

Mr. Nye charged that the royalties imposed were excessive, being based upon gross recovery and not on net profits; and instanced the case of a mine which in one year made a loss of $70,000, and nevertheless had to pay Minerals Separation $32,000 in royalties. Such a policy at times prevents the operator from using the process. He referred to the fact that Minerals Separation forced its licensees to sign a contract whereby they assigned all their future discoveries in flotation to Minerals Separation; and under the terms of which they agreed not to use any invention without the approval of the same company. According to their contracts, employees were bound to secrecy not only during their employment but forever afterward. Mr. Nye also charged Minerals Separation with breaking and entering to secure evidence of infringement, and of making use of a spy system to the same end, quoting, in support of this, testimony of the president of the company, John Ballot.

The next speech was made by Gilbert H. Montague, of New York, associate counsel in assisting the American Mining Congress in presenting the evidence on behalf of the mining industry to the Federal Trade Commission. Mr. Montague stated that the law of the United States was to the effect that the purpose of granting patents was to advance science and the useful arts, and that the courts have held that where patents

do not do this, they are illegal. Mr. Montague went on to enumerate the chief Minerals Separation patents, and the principal litigation cases which have arisen under each.

In the afternoon session, Mr. Cook took up the case for Minerals Separation. He refuted a charge of German ownership of Minerals Separation, which he stated Mr. Nye had made in his speech last year, and for which he blamed the American Mining Congress, although later it had apologized. He accused those attacking Minerals Separation with having made fragmentary quotations, leaving out portions which would have given the whole a better significance for the company. He referred to a passage in Mr. Montague's address where the latter stated that although the oil patent expires in 1923, licensees were required, according to the contract which they had been forced to sign, to pay royalty indefinitely beyond that period; and stated that this was not his understanding. He understood that there would be no further royalty on account of the oil patent; but if the licensee is using another Minerals Separation patent, he of course continues to pay royalty. He further stated that since December, 1917, the manufacturer of flotation machines may sell his machines to a Minerals Separation licensee; the licensee must ask Minerals Separation for its consent, which the latter is obliged to give. In general, Mr. Cook asserted that many of the accusations of Mr. Nye and Mr. Montague were based upon the old contract, now supplanted. He was interrupted by Mr. Montague, who stated emphatically that all the charges made had been based upon the latest contract.

Mr. Cook, resuming, stated that although the contract stipulates that all inventions by the licensee shall become the property of Minerals Separation, and that this includes the inventions of employees of licensees in their capacity as employees, yet it does not apply to inventions made by employees in their individual capacity; anyhow, he said, no patents arising from the inventions of licensees had yet been acquired. He explained the ruling of Minerals Separation to the effect that makers of flotation machines must sell only to licensees and not to infringers, by stating that the law makes the vendor of the machine to an infringer a contributory infringer. He claimed that many of the earlier restrictive agreements had now been withdrawn. Concerning the charge of lack of literature covering flotation, he referred to the history of Minerals Separation's patents, which was supplied to every licensee. He called attention to the fact that every discovery made by any licensee belongs to every other licensee, without increased royalty. He cited the fact that the Supreme Court of the United States had decided the right of Minerals Separation to the patents for air-froth flotation, which they had been the first to introduce into this country, and thought that that should settle it.

Mr. Cook cited the benefits which flotation had brought to the American mining industry, as in the case of Butte & Superior and the porphyry copper companies; and enumerated the principal cases of what he regarded as infringement. He declared that no definite proofs were given of Minerals Separation policy having hampered the mining industry. Referring to the charge that the Anaconda Copper Mining Co. had a better contract than other licensees could obtain, he said that was true, and was a recognition by Minerals Separation of generous treatment received by John D. Ryan before the Minerals Separation claims were fully established. Finally, Mr. Cook suggested that the American Mining Congress appoint a committee to take up and discuss the various problems with Minerals Separation.

The conference ended with some little tension, Mr. Cook being asked for a definite assurance by Oscar Rohn, a licensee, that he would not be obliged to pay royalties under his contract, after the expiration, in 1923, of the Minerals Separation oil patent; and Mr. Cook responded that, not being a patent lawyer, he was not absolutely certain. Mr. Montague thereupon commented forcibly on the circumstance that the counsel and a director of Minerals Separation did not know the meaning of the company's contract with licensees. This plainly nettled Mr. Cook, who declared he had no more to say.

Mr. Nye made a last speech in which he took up and replied to points in Mr. Cook's speech, and reiterated points already made by himself and Mr. Montague. Dr. Cottrell, Director of the Bureau of Mines, took the occasion to cite the case under discussion as an evidence of the necessity of his own patent program.

The conference was resumed on Thursday morning. Mr. Cook announced that he had wired to the president of the company, John Ballot, concerning Mr. Rohn's question as to whether licensees would be required under their contracts to pay royalties on the oil patent license after the expiration of the patent, and had received the answer "No." This answer was hailed by Mr. Montague as a great victory for the American Mining Congress. Mr. Nutter, chief engineer for Minerals Separation, taking the floor, denied that it was a victory, since, as early as 1914, the matter had been decided that Minerals Separation could not collect royalties after the expiration of the patents involved, and had so advised licensees; concerning which Mr. Montague afterward commented that though Mr. Nutter had known this for six years, Mr. Cook did not know it the night before. Proceeding, Mr. Nutter described the laboratories of the company in San Francisco, and stated that all testing was done free; and instanced the advances in metallurgy that had been "initiated" there.

Mr. Montague, taking the floor, stated that the next thing the American Mining Congress wanted to know was whether, in Mr. Rohn's case for example, after the oil patent had expired but the licensee was still operating under, or could be charged with operating under, any of the other fifty or sixty patents of the Minerals Separation, the licensee was free to litigate concerning being bound by these lesser patents, or was withheld from litigation by the terms of his contract. Mr. Cook again urged the appointment of a committee to discuss and ascertain all these points.

T. A. Rickard scouted the idea that anything had been accomplished by the telegram from New York, declaring that licensees had been in the soup, and were now in the mulligatawny. He proposed the plan of buying out the rights of Minerals Separation, and payment of the purchase price out of royalties; after being paid for, the processes and rights to belong to the public.

A very brief technical session was held after the termination of the forensic debate above described. Philip Argall, of Denver, read a brief paper on the history and technique of flotation; and another was presented by Dr. Francis A. Thomson. Dr. Thomson advanced some interesting figures as to the relative tonnages of ore treated by the different metallurgical processes.

The Standardization Conference

THREE conferences, over as many days, were held from Nov. 16 to Nov. 18 by the metal-mining section of the standardization committee, under the chairmanship of Charles A. Mitke, of Bisbee, Ariz. Arthur Notman, mine superintendent of the Copper Queen branch of the Phelps Dodge Corporation at Bisbee, read an interesting paper on standardization of machine drill parts that had been prepared by a member of the company's engineering staff. This, together with the discussion that followed, occupied the entire time of the first session.

At the second session on the following day the program was more varied. Mr. Mitke, the chairman, after calling the meeting to order, read a paper prepared by himself on "Relation of Standardization to Mine Management." Mr. Mitke summarized conditions existing in the mining industry and told of efforts being made to standardize equipment.

Too much dependence is placed on practical experience, he continued, and too little on scientific principles in mining. Speaking of equipment, Mr. Mitke said that the mining industry is using many different rock drills and the effort to keep up to date causes frequent scrapping. These drills are designed to keep up with the needs of the industry, but the trouble is that they represent the varying ideas of many individuals. In closing, Mr. Mitke said that standardization does not preclude innovations. He then introduced Dr. P. G. Agnew, of New York, secretary of the American Engineering Standards Committee.

Dr. Agnew discussed the work of the committee, the scope of which, he said, was very broad. The old definition of standardization, he said, was crystallization and stagnation. This, he asserted, is now untrue. Taking the incandescent lamp as an example, he claimed that the public would never have profited by the research work spent on the lamp if it had not been for standardization.

A paper on the standardization of mine accounting was read by T. T. Brewster, of St. Louis. Colonel Milliken, of the Industrial Car Manufacturing Institute, of Pittsburgh, had his address put in the record without reading. He suggested that the committee should not try to cram standards down people's throats, but, instead, should recommend practices. He remarked that it was noticeable how few standards there are in building mine cars.

At the third and last session, Dr. George K. Burgess, chief of the division of metallurgy of the U. S. Bureau of Standards, described the functions and scope of work of the various divisions of the Bureau.

Committee's Work to Include Operation

Following Mr. Burgess' remarks, the chairman announced that it had been decided by the American Mining Congress, and by other societies which had allied themselves with the Standardization Division, that the scope of the various working committees of both the coal and metal sections be enlarged to cover operation as well as equipment.

T. O. McGrath, chief accountant of the Shattuck-Arizona Copper Co., of Bisbee, Ariz., read a paper on "Standardization of Metal Mine Accounting," in which Mr. McGrath confined his discussion to the fundamental principles of general accounting and to a recommendation for cost accounting which can be adopted as standard by all metal-mining industries. An interesting feature of this report was a chart giving what Mr. McGrath termed a flow sheet of the mining business.

The preliminary report of the timber committee was to have been presented by John Kiddie, superintendent of the Arizona Copper Co.'s mines at Morenci, Ariz., in the absence of Norman Carmichael, chairman of the committee. Mr. Kiddie was unable to be present, however. The final report is expected to be out next year. It will cover the operations of seventeen companies handling a quantity of timber estimated at 114,000,000 ft. per year.

CHARLES A. MITKE

Will Counibear's report as chairman of the committee on fire fighting equipment was read by another in his absence.

Dr. F. G. Cottrell, Director of the U. S. Bureau of Mines, addressed those present on the standardization work of the Bureau, giving a résumé of the work that had been prepared by O. P. Hood, who is the engineer in charge of the mechanical department of the Bureau.

Norman Braly, general manager of the North Butte Mining Co., and chairman of the committee on steel, expressed his opinion that the standardization of rock drills will necessarily be slow. Three companies have grown up, he said, that have records of which they are proud, and it will be difficult to get them to change their designs. He also pointed out that many operators on buying new machines strip them and put their own fittings on. Manufacturing companies have been asked

if they cannot work out standard fittings. In his opinion, operators are not capable of designing a machine drill.

A paper on mine accounting by Lawrence Diffenderfer was presented by title by T. O. McGrath. Joseph F. Merrill, director of the School of Mines and Engineering of the University of Utah, and representing the World Metric Standardization Council, introduced into the record a paper entitled "Why Not Adopt the Meter-Liter-Gram."

National Mine Tax Conference

THE practical and constructive character of the convention was emphasized by the action of the National Mine Tax Conference, which convened as part of the Denver meeting. The most important findings of the tax conference were embodied in resolutions calling for national legislation to enable the President to appoint a bi-partisan board of special commissioners of revenue to effect prompt determination of accumulated war taxes, and in resolutions urging the immediate repeal of the excess-profits tax and pointing to unfair administrative regulations under the existing revenue act. The text of these resolutions is given elsewhere in this issue.

The conference was conducted by the Tax Committee of the Mining Congress, headed by Paul Armitage, of New York, and by Robert G. Wilson, chief of the tax division of the Mining Congress. The successful effort to confine the proceedings exclusively to practical discussions was due in large measure to the participation of J. C. Dick, chief of the subdivision of natural resources of the Bureau of Internal Revenue, and Robert N. Miller, former solicitor of Internal Revenue.

Other authorities who responded to the inquiries and suggestions of the delegates were Paul Armitage, R. C. Allen, George E. Holmes, William B. Gower, T. O. McGrath, Robert G. Wilson, and Cass Fisher.

The resolution recommending the creation of a board of ten men at a salary of $25,000 each, to sit for one year, was criticized during the conference by some of the delegates on the ground that it would be impossible to get Congress to authorize the appointment of such a committee. This resolution, with the specification as to salary omitted, was later reported to the convention and adopted. The report made on it by the Committee on Taxation, headed by Paul Armitage, of New York, is given in part as follows:

Many large taxpayers, employing expert talent to present and argue their cases, have been able to settle their taxes with the department for the war period and up to the present date. But thousands of smaller taxpayers find their cases still unsettled, even so far back as 1917, and are either worrying over the amount of additional taxes they may be called upon to pay, or are blissfully unconscious of the claim which the Government may at any moment assert against them.

The Revenue Act of 1918 contains several extraordinary relief provisions such as the provision for inventory losses, amortization of war facilities and the treatment of net losses arising within the period beginning Nov. 1, 1918, and ending Dec. 31, 1919. These special provisions are peculiar to the problems of taxation arising during the war period and immediately thereafter. Their administration is throwing an additional and extraordinary burden upon the Bureau of Internal Revenue. The questions arising in the course of their administration, together with the difficulties of valuation that enter in the computation of invested capital, require the keenest intellect, the soundest judgment and the widest discretion for their proper solution.

We propose, therefore, that the American Mining Congress recommend to the Federal Congress the enactment of a statute authorizing the President to appoint, by and with the consent of the Senate, a bi-partisan board of ten men, composed of lawyers, accountants, engineers and business men, who will sit for a period of one year, to pass upon and settle the cases of taxation arising during or consequent upon the wartime period of 1917 to 1920, both inclusive.

Your committee believes that men of the character and ability required to perform the important duties of this board could be found if the work would not last for a period of more than a year and the compensation were commensurate with their ability. We therefore strongly urge that the compensation to each member of this board should be fixed at a sum not less than $25,000 per annum. It must be borne in mind that this board will have an exceptional and extremely difficult task, to which the very best talent should be directed, and men of the stamp required must be paid at a rate somewhat approaching the current market value of their services, and that to take less able men or to attempt to attract able men by offering compensation ridiculously below the value of their services would be a short-sighted policy certain to doom the whole plan to failure.

The Gold Conference

THE National Gold Conference opened on Tuesday morning, Nov. 16, with Harold N. Lawrie, the economist of the American Mining Congress, in the chair. It seemed as if little could be said that had not already been spoken on the subject of relief for gold producers. The meeting, however, was well attended by representative men of the gold mining industry.

Mr. Lawrie, in a few preliminary remarks, pointed out the need of increased production of gold, in order, as he put it, to bind up the financial wounds of the country. As chairman he then introduced the first speaker, George E. Collins, of Denver.

Mining conditions in Colorado today are at their worst, according to Mr. Collins, who reviewed the general situation in the state. The production of metals is steadily decreasing, he said. He was not optimistic as to the outcome unless measures of relief for gold producers could be devised. The situation as affected by railroad freight rates was improving somewhat, he said, thanks to co-operation between producers and traffic managers of the various roads.

An address by Dean Milnor Roberts of the College of Mines of the University of Washington was scheduled, but as he was not able to be present, his paper was read by Horace F. Lunt, State Commissioner of Mines for Colorado.

The next paper was read by Dr. H. M. Parks, director of the Oregon Bureau of Mines and Geology. In Oregon the gold production of 1920 will not be more than one-

fourth of that of 1916, as many of the mines have shut down and more are shutting down.

W. H. Seamon, W. J. Loring, and E. P. Mathewson were appointed a committee to draw up resolutions as the result of the conference.

E. P. Mathewson acted as chairman at the afternoon session. Bruce C. Yates, general manager of the Homestake Mining Co., of Lead, S. D., described the condition of the gold industry in South Dakota. Four years ago, he said, there were forty-two producing mines in the Black Hills—now there are only two, the Trojan and the Homestake.

W. H. Seamon, president of the Trojan Mining Co., of South Dakota, presented a resolution favoring the MacFadden Bill.

Governor Emmet D. Boyle of Nevada was called upon, and confessed that after having been one of the most ardent supporters of the McFadden Bill he had been drawn into a position of doubt. The bankers, he said, had economic arguments, and there was little doubt that to date they had somewhat the better of the argument. In a later speech he noted that there were several classes of bankers, one of which favored methods for increasing the gold basis of currency; but there was a possibly larger class who accepted from the economists the quantity theory of money, to the effect that the rise in prices in the period preceding the war had been due to the unprecedented gold production.

T. A. Rickard, of California, declared himself as in a position of seeking enlightenment, and said he was anxious to be converted. He explained the British gold "premium," illustrating it by saying that the premium, which resulted simply from depreciated exchange, was greater in Italy than in England. He emphasized the point that the problem was an international one and must be looked at in that way.

E. C. Voorheis, of California, suggested the passage of a law prohibiting the sale by the Mint of gold for use in the arts, as a means for conserving the metallic basis of currency; this would have the effect, he said, of driving consumers to purchase in the open market, where a premium would actually be established.

Mr. Collins' Resolution Causes Sensation

Somewhat of a sensation was produced by George E. Collins, of Denver, who proposed, in case the bankers opposed measures for the relief of gold miners, that the program should call for the following resolution:

Whereas, The gold producers of the United States are in urgent need of assistance to maintain their properties and organizations in such condition as shall permit them to maintain production, in the event that the Congress of the United States shall, through the McFadden Bill or other means, provide assistance such as shall enable them to operate; and,

Whereas, The opposition by certain interests to the McFadden Bill suggests the possibility that this sound and well-considered measure may be delayed in passage through Congress; therefore, be it

Resolved, That the Directors of the American Mining Congress immediately take such measures as may be necessary, in the event of the failure of passage through the forthcoming short session of Congress of the McFadden Bill, to organize the gold producers of the United States and Alaska for the following purposes:

A. To deposit the gold produced by them in the Mint and demand coined gold in exchange therefor.

B. In the case of gold ore sold through smelting companies, to arrange for the equivalent of the gold contained to be deposited in the Mint, withdrawn as coin by the smelting company, and delivered to the producer in settlement for the ore.

C. To place such gold in circulation, by using it in liquidation of payrolls, in payment of supplies, etc.

D. To arrange with local bankers in gold-producing localities to furnish gold in all withdrawals to an amount equivalent to deposits of gold made locally with them.

E. To provide for cases where local banks are unwilling to adopt this course, by the organization of a central Gold Bank, with branches in various mining camps organized under the state banking laws.

F. To conduct a concerted propaganda in favor of the use of gold and silver, or gold or silver certificates, in preference to Federal reserve notes.

The Tariff Conference

At the tariff conference on Thursday, Nov. 18, Nelson Franklin presided. He stated that legislation was needed to protect the little industries of the country. He had been in Washington trying for seven months to get a tariff on tungsten. This bill had passed through the house, but in the Senate, to his great disappointment, had been crowded out by consideration of the League of Nations. It would come up at the next session. The bill providing for a zinc tariff was also on the calendar of the Senate. He feared that it would be difficult to get legislation on any other metals before March 4; but he believed that the first session thereafter would see tariff bills on all war minerals. As for tungsten, the cost of production was $13.60 per unit of 20 lb.; while Chinese tungsten was being delivered in American ports for $5 per unit. The present bill provides for a tariff of $9 per unit, which would allow producers to reopen their mines. At present there is no tungsten mine in operation in the United States.

E. C. Voorheis, of California, owner of the Atolia tungsten mine, said that tungsten mines cannot be operated in the United States without a tariff. Enough Senators were pledged to pass the bill, and he hoped for favorable action by the President.

Congressman Charles B. Timberlake, of Colorado, the author of the tungsten bill, gave as his interest in the matter the necessity for this country to protect itself in the event of future wars by supplying itself with war minerals.

Judge John F. Davis, of California, urged for the cessation of cheap criticism of Congressmen and Senators. A. Cressy Morrison described the ferro-alloys and their uses, and pleaded for the protection of the ferro-alloy industries.

Herbert Wilson Smith spoke in favor of protective tariffs on the lesser minerals, and against the theory of the conservation of their supply in this country.

The Oil Shale Conference

Discussions of cost of mining and method of treating oil shales characterized the Oil Shale Conference, which was held on Thursday afternoon, Nov. 18, in the Albany Hotel. Dr. Victor C. Alderson occupied the chair. A paper entitled "The Next Mining Problem," by M. G. Gavin, of the U. S. Bureau of Mines, was read in the author's absence. Mr. Gavin said that the mining of oil shale is likely to be the greatest item in the total cost of placing refined shale oil products on the market. A reduction of 10 per cent in the cost of mining is likely to be equivalent to a reduction of as much as 25 per cent in the cost of retorting or oil refining operations.

The problem of securing and housing mine labor for the American oil-shale industry, according to Mr. Gavin, deserves serious consideration, as ultimately the labor employed will be comparable with that of the present coal-mining industry.

G. B. Morgan, state geologist of Wyoming, discussed Wyoming oil shales. At present there is very little prospecting for shales in that state, he said, but there was likely to be in the near future. He gave a brief description of the geology of these formations. They had been sampled, he said, by the Geological Survey and some analyses running 23 to 60 gal. oil per ton had been received in the state geologist's office. Wyoming will run Colorado a close second in the oil shale drive ahead, he prophesied.

Horace F. Lunt, state commissioner of mines for Colorado, spoke on "Mining for Oil." He was followed by Dr. Alderson. The cost of mining Scotch oil shales was covered briefly by the chairman, who said that the Scotch miner, working on the equivalent of the ordinary leasing system, received $1.14 per ton of shale mined from the company. There was some disagreement between Messrs. Lunt and Alderson as to the cost of mining shale, which was apparently settled finally to the satisfaction of each.

J. B. Jensen, a petroleum geologist of Salt Lake City, had prepared a paper on "Colorado and Utah Shale Fields," but was unable to present it.

Dr. David White, of the U. S. Geological Survey, was present, and, though not on the program, gave a short talk on the shale deposits of the East and the West at the invitation of the chair. Such deposits, Mr. White said, were fairly widespread in the United States, but those in the Eastern States rich enough to be worth distilling are restricted in area. Following this the meeting adjourned.

War Minerals Conference Reviews Work of Past Year

The delegates to the convention of the American Mining Congress who were interested in the War Minerals Relief Act and its administration met in informal conference Wednesday morning, Nov. 17. Judge John F. Davis, of San Francisco, presided at this meeting, which was devoted to a consideration of a year and half's administration of the War Minerals Relief Act, and the further remedies, through legislation and otherwise, necessary for claimants whose claims have not been adequately adjusted.

Herbert Wilson Smith, chief of the war minerals division of the Mining Congress, made a statement of the organization's activities on behalf of war minerals claimants, covering the first session which led to the passage of the act, the appearances before Federal Congressional committees, and before the Secretary of the Interior, and concluded his statement by presenting the brief submitted by the American Mining Congress to the Attorney General of the United States, on the question of the existing ruling on the validity of a request or demand.

John H. Haak, of Oregon, made a statement concerning his own experience in Washington in the presentation and collection of his own claim. Mr. Haak said in part: "I have had my claim adjusted, and am satisfied with the adjustment made. It was, however, a tremendous strain. Many claimants in Oregon received nothing, others very little. The same is true in California."

To meet this situation the American Mining Congress is now urging the enactment of a bill providing for an appeal from the decision of the Secretary of the Interior for dissatisfied claimants to the Court of Claims. This bill has already passed the Senate, and the claimants in conference moved that a resolution be drafted urging the immediate passage of this legislation.

At the close of its conference the following resolution, introduced by A. Cressy Morrison, was adopted:

It is the desire of the War Minerals Conference to give expression to its recognition that the work performed by Herbert Wilson Smith in behalf of the war minerals claimants has called for a broad knowledge, diligence, patience, poise, and withal a common sense which is the outgrowth of an exceedingly well-ordered mind.

All of these qualities are manifested to a high degree in his report; in the result so far obtained, in the superb marshalling of facts in his brief, filed with the Attorney-General, on the purpose and application of the law, and his plans for future action.

The Educational and Public Service Conference

When the Educational and Public Service Conference met, a paper was presented, written by H. H. Stoek, dean of mining at the University of Illinois, Urbana, Ill., on the importance of English in the curriculum of engineering students. A lively discussion arose as to the importance of having English taught by engineering professors and in such a way as to couple it up closely with professional needs. Those present were strongly against regarding English as a cultural subject and emphasized that it should be taught merely as a tool for the engineer's use. It seemed to be the general consensus of opinion that engineering students strongly resented spending any time in the study of English.

The Columbia School of Mines, New York, had appointed Thomas B. Stearns and Edward W. Parker as its representatives, Robert Peele, professor of mining at the same school, sending a paper on the importance of mathematics in the engineering curriculum, which was read by A. X. Illinski, president of the New Mexico School of Mines.

After a lunch at which A. Bruce Minear, secretary of the mines division of the Denver Y. M. C. A.'s industrial department, and others spoke, the meeting proceeded to organize, and Charles H. Fulton, director of the Missouri School of Mines, Rolla, Mo., was elected chairman, the vice-chairmanship going to A. X. Illinski. Francis A. Thompson, dean of the Idaho School of Mines, was elected secretary. Mr. Thompson had been presiding officer of the conference. The executive committee members appointed were C. H. Clapp, president of the Montana School of Mines, and Dorsey A. Lyon.

Morton F. Leopold, safety engineer of the U. S. Bureau of Mines, Washington, D. C., talked on the educational work of the Bureau. Edward Higgins discussed the mine-accident prevention work in California. Dr. David White, chief geologist of the U. S. Geological Survey, made an address on the work of the Survey, and Dr. F. L. Ransome, also of the Survey, presented other considerations of like character. Dr. Henry Landes, state geologist, Seattle, Wash., described the work of his department, which is run in co-operation with the Geological Survey. During this conference other addresses were also delivered, including one by I. A. Palmer, professor of metallurgy in the Mackay School of Mines, Reno, Nev.

Government Officials Influential in Mining

Louis T. McFadden

By Paul Wooton

SINCE Louis T. McFadden, who represents the Fourteenth Pennsylvania District in Congress, has been at the head of the Banking and Currency Committee of the House of Representatives, that committee has been one of the most active in the House. An idea of its activity may be obtained by glancing through its record during the last Congress. The following bills which came within the jurisdiction of the committee were enacted into law: Amendment to the Federal Reserve Act relating to financing exports; amendment to Federal Reserve Act to permit banks to invest in stocks of corporations engaged in financing exports; amendment to Federal Reserve Act relating to rediscounts and excessive borrowing; amendment to revised statutes relating to discounting of commercial paper secured by warehouse receipts; various amendments to the Farm Loan Act; purchase of farm-loan bonds by the Treasury; gold certificates of the United States made payable to bearer on demand, legal tender; negotiation of and signatures for circulating notes; private bankers permitted to accept directorship in export finance corporations; investigation of short-time rural credits; and abolishment of subtreasuries.

LOUIS T. McFADDEN

Mr. McFadden is widely known for his efforts to prevent the confirmation of John Skelton Williams as Controller of the Currency. He has vigorously pushed his bill providing for a premium on gold, and has been actively interested in various pending measures having a bearing on the currency system.

Of all of the measures initiated by Mr. McFadden, none has attracted the attention of bankers, financiers, economists, miners and the public in general so much as the bill providing for a premium on domestic gold production. The fixed price for gold placed a serious handicap upon the gold producer. Increasing costs for both labor and materials decreased his margin of profit until many gold mines were compelled to shut down, others to curtail, and still others, more courageous, to operate at a loss. The bill provides for a tax of 50c. per pennyweight of fine gold contained in all gold manufactured, used, or sold for other than coinage or monetary purposes. A premium of $10 per fine ounce is to be paid to the producer of new gold in the United States or its possessions for a period of five years after May 1, 1920, from the proceeds of this tax. The manufacturing jewelers and certain financiers have opposed the bill, but it has been looked upon more or less favorably by many not especially included in the gold-mining industry. Needless to say, a substantial proportion of gold producers in the United States and Alaska favor the bill. The unfavorable report by the gold committee of the American Bankers' Association was ably answered by Mr. McFadden, who said: "Particularly, in view of the fact that Congress has fixed the price of gold, it seems that Congress has now the power to stimulate the production of gold by creating the machinery whereby the consumer of gold in the industrial arts may pay more nearly the cost of production for his raw material, thereby enabling the producer of new gold to increase his output to meet the industrial requirements of the arts and trades and protect the monetary gold reserves from further industrial depletion."

Mr. McFadden was born in Troy, Pa., on July 25, 1876; was educated in the public schools of Bradford County, and was graduated from Warner's Commercial College, Elmira, N. Y. In early life he worked on a farm. At the age of sixteen he entered the employ of the First National Bank, Canton, Pa., as office boy; in 1899 was elected cashier of that bank; in 1906 elected treasurer of the Pennsylvania Bankers' Association; in 1914 elected president of the same banking organization; and in the same year was appointed by the agricultural societies of Pennsylvania as a trustee of State College to fill a vacancy caused by the death of ex-Governor James A. Beaver of that state. In 1915, Mr. McFadden was elected to represent his Congressional district in the national House of Representatives. Since that time he has been returned to Congress with increasingly large majorities at each succeeding election.

By the Way

The Lone Prospector

I

The Lone Prospector he come a-trampin' up the track,
Come a-trampin' up the track, as spry could be,
Punchin' ahead of him his twinkle-legged little jack,
Loaded down with two months' bacon, beans and tea.

"Durn ye, Jack, me boy," says he, "we're off to the hills—so smile!
And we'll camp at the spring we know a month or more
Where the water's fine, and the grass is green, and we look a hundred mile,
And the country looked bully when we were there before.

"I'm a natural prospector," he says, "with a natural nose for ore,
Not like them spectacled hobbled half-blind fellers you see
Havin' a nose for books and whys that puzzle 'em all the more,
And that there mountain looks pretty gosh-blame good to me.

"Hi you, Jack, you cuss, wake up and chase yourself, back on the trail,
Or I'll bust your head, next rock I have to throw—
You can betcher sweet life this time I'm bringin' home the kale,
When we come a-loaded with samples, down below:

"Won't old Silberstein look up from sellin' his pants, and grin,
When I show him the quartz with the gold stickin' out all roun'—
Lucky day fer him when he grubstaked the pair of us in—
Now he can build the swellest palace for pants in town!

"Me—I'll build me a house with twenty rooms and a cellar of wine,
Buy me a auto or two, and a orchard planted to fruit;
Dagoes and hunkies can do all the work, while I set under me vine,
Wearin' my slippers and puffin' away at the big cheroot;

"Handin' of em out to the boys when they come hikin' along,
Tryin' to find out the facts of what they heered might be true,
How I struck it so rich, and how the lode I found was so strong,
Searchin' in these here hills that we're jest a-comin' up to.

"You, Jack —— hi, there! Git back on the trail
You —— —— —— —— —— —— —— ——!
We want to git *some* place to camp before the sun goes down!

II

"One side falls the canyon, on the other is the cliff,
And the sun is bright, and the air is free and fine—
Wait till we strike that limestone contack, and foller up that float
Where the granite shows, not far above timber-line.

"There's no tellin' how big that lode, nor tellin' how much she will run;
Comstock was located by men with sagebrush in their hair:
Look at Butler, Stratton, or Frenchy that lit on the Flin Flon—
Yet the puttee-legged experts had damned 'em all fer fair!

"All the bonanza mines has been found by some poor prospectin' dub,
Sometimes a drunk, or a burro in other cases yes:
Therefore you and me, Jack, and the bottle in the pack
Surely combines the three—and here's to our success!

"Listen! we've got to get above timber-line, Jack, me lazy lad,
Where it's harder to live is where the mineral's more;
God A'mighty figured where he couldn't raise no grass,
Should be somethin', so he seeded it down to ore.

"Stuck in the quartz and the free, and soaked in the whoopin' veins
Needin' us to find, then capital and a mill—
Needin' a lot of water—and we'll pump it from the plains,
And we'll have a railroad zigzaggin' up that hill.

"Down there in the canyon we've got to build a bridge—
Hell! what's that, with a lode so big and rich and bold?
Millions of tons—bet the Guggies 'll try to buy me out—
Nothin' doin'! Silberstein and me will hold.

"Raise a little dough and build a dandy hoist and mill
Sell some stock, and lay the rails, and make a winner—
I'll be railroad president, and git a pass to Frisco,
Sittin' in the smoker till the n'gger calls fer dinner!

"So hi, there, Jack! Git back on the trail
You —— —— —— —— —— —— —— ——
—— —— —— —— —— —— —— ——
"We got to git *some* place to camp before the sun goes down!"

An Obituary

"Come 'ere, m'son," said Cap'n Dick, "Ere's a bit of a story I read in one o' they Western papers h'other day. Told by a chap named Crowley, an', dam-me, 'e's some beauty too. 'Ere's tha way she goes: "T'wuz daown on Mo'arve desert, nigh h'on ten year h'ago,—I wuz nothin' moor'n a bloke then, putterin' raoun' Grass Valley—Bill an' Dick 'ad been prospectin' together, 'avin' a bit o' luck naow an' again. I 'appened to be in Barstow with feyther, one time, w'en they come h'off tha desert. Tidy bit o' money they 'ad, I 'eard feyther say. An', min' you, 'ot h'ol town wuz Barstow them days, too—dancin' 'alls an' poker playin' tha 'ol bloody night. Splendid drinkin' men they were, too. Stony broke in less'n a week, so back they gaws to tha 'ills. Some years later Dick died, so I 'eard. Sleepin' in tha tent long side o' 'is partner w'en one o' they tarantulas, or scorpions, or some h'other bloody reptile, bit 'e on tha 'and, an' w'en Bill went for to call un nex' moornin' 'e were dead. So Bill 'e brings tha remains to Grass Valley. Church-goin' people there wouldn't look at un, for don't suppose poor Dicky 'ad been h'inside a church for twenty year, nor 'ad Bill. 'E 'ad devil's h'own time for to get six men to pack un to tha cemetary—w'ot dost thee call un, pall-bearers? H'at tha grave Bill h'asked some one to say a few words or read sumthin', but, dam-me, nobody sez nothin', so Bill takes h'off 'is 'at an' sez, 'Afor' we puts un daown I mus' remark that h'our friend 'ere wuz a 'andy man with a 'ammer, an' as tasty raoun' a set o' timber as h'ever I 'opes to see. 'E loved 'is glass o' beer an' 'is shot o' 'ooch so well as h'any man present. Give un two bells.'"

Nome Deserted

The housing situation is said to be easier in Nome. Recent reports state that only 200 persons remain in this once famous mining camp, which in 1898 boasted a population of 15,000.

CONSULTATION

The Pumice Industry

"Will you please give me some information in regard to the pumice-stone business—its supply and demand. Is there a market for it? What is it worth? Any other information which will furnish an idea of the situation in this country will be greatly appreciated."

Before the war those trades which used the best grade of pumice, that is, lithographic work, copper, silver, and other finishers who polished metals with pumice before plating, depended almost wholly on imports of Italian pumice, which could be supplied in lumps of very fine even texture containing no extraneous material. As imports of Italian pumice were prevented in 1918 by an embargo, consumers in the United States had to rely upon available stocks and domestic supplies. The domestic production came chiefly from California, near Mount Shasta and the Salton Sea. Although not as high grade a material as the imported varieties, the domestic supplies satisfied ordinary requirements. According to the U. S. Geological Survey, the domestic product is not properly called pumice, as it consists almost wholly of finely comminuted volcanic dust or "ash" composed of minute fragments of pumiceous, glassy lava, but it differs little from the product made by grinding the imported lump or black pumice, and may be substituted for it.

Besides the difference in quality between the domestic and foreign pumice, there is the higher cost of production for the American variety. The lower production cost that most Italian pumice possesses is an advantage in competition with the American material that is augmented by the foreign exchange situation, which virtually acts as a premium to the Italian producer. Foreign pumice can thus stand increased ocean freight rates and higher labor costs and still compete with American material. For these reasons and high domestic costs, the deposits of lump pumice in California which were worked during the war have been abandoned.

In 1918, six states produced pumice for abrasive purposes. They were, with the counties responsible for the output, California, from Humboldt, Inyo, Imperial and Siskiyou counties; Kansas, from Harper, Meade, Morton, and Phillips counties; Nebraska, from Furnas, Lincoln, and Harlan counties; South Dakota, Custer County; Idaho, Cassia and Power counties; and Utah, Willard County.

The pumice produced and sold in the United States, as given by the U. S. Geological Survey, follows:

Year	Quantity (Short Tons)	Value	Price Per Ton
1910	23,271	$94,943	$4 08
1911	21,689	88,399	4 08
1912	27,146	86,687	3 19
1913	24,563	55,408	2 26
1914	27,591	59,172	2 14
1915	27,708	63,185	2 28
1916	33,320	82,263	2 47
1917	35,293	84,814	2 40
1918	30,637	91,178	2 98

The demand for pumice is now about on a war level. Prices vary widely. Domestic lump is quoted in the market report at 6c. per lb. f.o.b., New York; imported grades 4@50c. per lb., New York.

Copper Yield and Most Important Producing Districts

"I would like to know how the average grade of copper ore treated by the copper mines and mills of the country has varied during the last ten years or so, and also how the largest copper-producing districts, not states, rank in order of production."

The average copper content of the copper ores produced in the United States has shown an almost unbroken decline. In 1906 it was 2.50 per cent; in 1918, the last year for which the U. S. Geological Survey has furnished complete statistics, the yield was 1.51 per cent. The following table brings out the rate of decline:

	Copper Ores Produced in Tons	Per Cent Yield in Copper
1906	18,000,000	2 50
1907	20,253,000	2 11
1908	22,290,886	2 07
1909	27,932,618	1 98
1910	28,497,238	1 88
1911	29,988,235	1 82
1912	35,656,414	1 71
1913	36,336,682	1 67
1914	35,175,541	1 60
1915	43,404,182	1 66
1916	57,863,365	1 70
1917	58,482,694	1 60
1918	62,289,069	1 51

The ten most important copper-producing districts, in the order of importance, are (1) Butte, Mont.; (2) Lake Superior, Mich.; (3) Bingham, Utah; (4) Globe, and Miami, Ariz.; (5) Bisbee (Warren District), Ariz.; (6) Jerome, Ariz.; (7) Ely, Nev.; (8) Ray, Ariz.; (9) Santa Rita, N. M.; (10) Morenci-Metcalf, Ariz.

Electrolytic Purification of Clays

"Have you any information regarding the electrolytic treatment of clay in order to eliminate certain impurities such as iron compounds, feldspar, and other compounds? This is a new angle to clay purification to me, and I am anxious to get all the references possible."

Clays are ordinarily purified by washing and gravity separation. The electrolytic purification of clay is a recent development upon which little has been published. The South African *Journal of Industries* in its September, 1920, issue calls attention to the utilization of electrolysis for the separation of impurities in china and other clays. According to this publication, the clay is mixed with water, certain alkalies are added to the solution, and the mixture is allowed to settle and become more liquid. The passage of an electric current through the solution causes the particles of clay to collect at the anode while the impurities, mica, feldspar, quartz and iron compounds, are either precipitated or migrate to the cathode.

On an industrial scale the process is carried out in a large vat, in which slowly rotates a metal cylinder, forming the anode and near which the cathode is placed. The clay paste, after the electrolyte is added, is left to clarify in other tanks, and is then passed into the electrolyzing vat for final purification, when it is collected by special rakes.

In addition to being pure, it is stated that clay thus treated has a lower temperature of agglomeration, moulds more easily, and is more plastic and refractory.

THE PETROLEUM INDUSTRY

A World View of the Oil Supply

Considerations Governing a System of Priority in Uses of Petroleum — Advocation of Open-Door Policy in Development of Future Resources — Need for Thrift in Safeguarding Production and Consumption, and for an Adequate Distribution Plan*

BY GEORGE OTIS SMITH
Director, U. S. Geological Survey

THE present realization of the world's interest in its supply of petroleum has naturally led to estimates of recoverable resources, first in the United States and then in other countries; and whether we dignify these quantitative measurements of oil reserves by terming them official estimates, or describe them by calling them scientific guesses, they are the best we have, and they will serve fairly well in guiding national and international action.

It may be noted that the U. S. Geological Survey's estimate of the petroleum resources of the world shows that the distribution, while unevenly balanced among nations, is evenly balanced between the eastern and the western hemispheres, although the northern hemisphere appears to have at least five times as much oil as the southern. This preponderance of the oil supply of the northern hemisphere should, however, be discounted by a fact and a possibility: the land area of the northern hemisphere is three times that of the southern, and the larger unexplored areas are in South America, Africa, and Oceania.

Accepting the Stebinger-White distribution of the world's oil reserves, we may roughly set down the continents in order of wealth in oil as North America, Asia, South America, Europe, Oceania, and Africa. In terms of regional distribution, more than half the world's oil reserves are believed to be concentrated in the two intercontinental areas; one of these oil-rich provinces includes the North American and South American countries bordering the Caribbean Sea, and the other includes the countries of western Asia and southeastern Europe, with the Caucasus as an axis. On these two areas, then, each comprising only about 2 per cent of the earth's surface and each containing about 30 per cent of the world's future supply of oil, is focused the attention of the great nations that most need oil.

OIL SHALES CONSTITUTE REAR DEFENSE

The resources of the world's oil shale are far too large to be lost sight of as a substitute source of oil. The United States alone is believed to possess deposits of oil shale that contain at least ten times as much oil as there is natural petroleum available in North America, but oil won by mining and distilling these shales, situated in the interior of a continent, cannot enter the world's markets as labor-cheap as the petroleum that flows from Mexican wells close to the coast. Such resources must therefore be regarded as a rear line of economic defense and as a source of power that will be of greater value to other generations than to this, even if a more general utilization of oil shales begins in the near future. No other continent is known to have resources of oil shale at all comparable with those of North America.

In this rapid review of the world's sources of energy we see North America taking first rank among the continents, with Asia a close second and Europe a poor third, although we should remember that Europe has a much smaller area than either of the other two.

COAL REPLACEMENT BY OIL IMPOSSIBLE

If we should put the whole burden of power production on our coal mines, not using even the water power now used, we would find that by adopting the best steam practice of today the present power requirements of this country could be met with coal for 57,000 years, although we know that long before the end of that period the greater depth of the coal mines and their increased distance from market would alone create power demands for mining and transportation that would considerably cut down the amount of power available for other uses.

A comparison between three sources of energy—water, coal, and oil—becomes striking and instructive when we consider the adequacy of the petroleum reserves of the United States to drive the prime movers of the country. Adopting the best steam practice of today, as known in the largest public-utility stations where fuel oil is used, and trying to carry the whole power load of the country with oil alone, we find that the oil reserves of the United States, although measured by billions of barrels, would last only nine years and three months. Without allowing for the fact that steam raising for power is but one of the many uses of coal, these two figures—57,000 years and 9¼ years—are sufficiently impressive to make us fairly receptive to the general truth of Mr. Eckel's statement in his recent book "Coal, Iron and War": "We have just as much real chance of replacing coal by oil as we have of finding enough gold to use it in place of steel."

Granting that we have not enough oil to permit its utilization where either coal or water power can be had, we face the question of priority in use. First in any priority list must stand essential uses, in which there are no adequate substitutes. In view of the rapid increase in the employment of machinery, first thought should be given to the unique function of oil—that of saving power. The world will always need a supply of

*Abstract of an address delivered at the meeting of the American Petroleum Institute, Washington, D. C., Nov. 17, 1920.

lubricants, and as the demand will be an increasing one, no adequate substitute for the lubricating oils and greases now derived from petroleum appears to be available. The claim of illumination for priority is less well established if we regard the future, for the kerosene lamp and even the fixtures burning oil-gas or enriched water-gas must eventually give place to the electric light as this world of ours is more and more covered with a network of transmission lines. At least we may set down this use of petroleum products as of larger importance at present than in the future.

Priority Use in Motive Power

The "flash point" in any discussion of priority in the use of petroleum products is reached when any curtailment in the use of gasoline by pleasure automobiles is suggested. Yet by every known rule of determining priority, the non-essential use is the first to be regulated, and this use of a petroleum product as a luxury can find no economic justification in comparison with its commercial use. A more logical plea for motor fuel can be made, however, by the trucks that already form so large a part of our distribution system and the tractors that by the million will soon be helping to meet the world's increased demand for food. Truck and tractor must be given the first places in the long line of automobiles seeking motive power at the gasoline station.

Fuel oil has won favor as a source of power for transportation because it has been relatively cheap, is easier to handle, and occupies less space than the equivalent heat units in the form of coal. In these respects fuel oil is superior for use in transportation, and this use deserves priority over that for firing stationary boilers, for which coal should be substituted. Indeed, thoughtful regard for the future leads us to disallow even the claim of steam locomotives for fuel oil, for electrification of the railroads by water power alone or from water-power stations and steam stations linked together is now the obvious way to make the best use of our resources of expendable fuel. Austria, bankrupt in fuel, having lost her coal and oil, has begun to electrify half her railway mileage. Shall other nations wait until they too are bankrupt in oil before awakening to the need of a change in sources of power?

Yet in acknowledging the superior claim of the marine use of fuel oil, this priority must be qualified by the condition that even on the seas the best use should be made of the invaluable fuel. The marine steam engine, even of the turbine type, must give place to the heavy-oil engine, under the rule of getting the most out of a limited resource. The very facts that support the argument for the marine use of fuel oil—greater efficiency and economy of space and labor—can be cited in favor of the internal-combustion engine of the Diesel type as against the steam engine. The increased thermal efficiency of the new engine, with its resulting addition to available cargo space or to cruising radius, is more than 2½ times that of the steam engine. The experience of the Bethlehem Steel Co. is that its new oil-engine ore-carrier, the "Cubore," in continuous service between Cuba and Sparrows Point, Md., uses only 36.7 per cent of the fuel oil consumed by a sister ship differing only in that it has the most modern type of steam plant. The tremendous economy thus possible in the marine consumption of fuel oil demands the immediate adoption of internal-combustion engines if the world wants to make the largest use of its oil resources for the longest time.

The monthly consumption of crude petroleum in the United States and the exports of refinery products, taken together, have but once in the last two years been less than our domestic production, and for about half of the time the consumption has exceeded both the domestic production and the imports. This living beyond our means makes the question of our present oil supply not only a national but an international problem. And the outlook is not improving; indeed, never was the gap between consumption and production wider than it is now. Our monthly statistics take on the importance of danger signals, which must be read "Run Slow." Perhaps these figures can be best grasped if they are stated in terms of a daily balance sheet. In September of this year, as in August, the daily output of the United States oil wells was slightly over 1¼ million barrels, but the daily consumption rose to 1⅝ million barrels. This daily deficit of three-eighths of a million barrels was met by imports from Mexico. To this extent, then, we are already dependent upon a foreign supply of oil, and even our accumulated stocks of domestic oil at tank farms, although a reminder of the days of plenty, afford too small a promise of relief, for the oil really available in storage is less than that which will be imported from Mexico this year. Although reputed to be the nation richest in oil, the United States cannot stand alone.

The standing of this nation as the world's leading oil merchant has been based upon its plentiful supply of the raw material, to which have been added skill and ingenuity and courage at every step of oil production, oil manufacture, and oil finance. American methods and equipment and supplies have found world-wide acceptance, and the standing of the American industry is indicated by the fact that a dozen of our oil companies can show aggregate assets of over three billion dollars. However, the past and even the present division of the world's oil output among nations is but the background for our vision of the future. Whence must we expect the world's supply of oil?

With the oil fields of the United States perhaps 40 per cent exhausted, it is not reasonable to assume that 60 per cent of the world's output will continue to come from wells in the United States.

Open-Door Policy Advocated

Our present knowledge of the facts of world supply and demand is amply sufficient to warrant us in continuing to advocate the open-door policy. Much can be gained for all nations by pooling the world's resources of so essential a raw material as petroleum. With about 60 per cent of the world's future supply concentrated in two regions, and by far the greater part of the demand outside those oil-rich regions, there must be a world commerce in oil. The United States has given to all comers, whatever their nationality, opportunity to acquire oil lands within its territory, and the new leasing law puts no limit upon foreign participation in operating the public oil lands unless there is an absence of reciprocal treatment. Of course, any nation realizes that the adoption of the open-door policy need not involve throwing away the key.

Not only has the United States been generous in welcoming foreign capital to our domestic oil fields, but it has been prodigal in marketing the products of the

American wells and refineries. Whatever our motive has been in winning so large a share of the world's oil trade, the record of the past fully justifies the United States in asking for reciprocity in the future from all other nations.

There is urgent need of pioneering the world for oil to meet requirements of this generation, but there is no warrant for regarding this advance into new fields as beginning a contest whose aim is world conquest. The present need of the United States for oil from abroad can be met only by world-wide exploration, development, and operation by American companies backed up by our Government; and we should expect other nations that are embarrassed by a similar or even greater discrepancy between consumption and production to adopt the same policy.

However great our own exigencies, we may set down this principle: The rights of the company that discovers and develops a foreign oil supply are subject to national rights, and even a mandatory is created to develop the weaker nation, not to exploit it. If the nations of the world shall join to bring about a changed order, one that expresses the spirit of peace rather than of war, there can be no place in the international scheme for special partners or preferred stock, even though the Argonauts of today, in their search for a flood of oil, are seeking a treasure of far greater value than any golden fleece.

Oil Thrift Essential in World Policy

A world policy, if it is to safeguard the future, must draw up a program that will favor thrift in the use of the oil currently produced, and in that program also there must be a joining of the nations in continued effort for the common good. When the world runs short of oil, all nations will suffer, regardless of the geographic location of the remaining wells. America has led in teaching the world to use petroleum, whether in lamp or automobile or tractor, and it should be America's special duty to teach the world to use petroleum most efficiently. No longer is there any need to make a market for oil; the task is to find the oil to supply the demand already created.

Plainly, the common interest in a limited resource is not served simply by regulation of price. It is of greater consequence to the public, either the people of a single nation or humanity as a whole, that the best use rather than the freest use be made of an invaluable resource. The danger that lies in cheapness is the wastefulness of today that will lead to the consequent scarcity and corresponding high prices of tomorrow. Wise action, therefore, in behalf of this and other generations does not include the encouragement of small units in production, simply to provide competition, where large units are more efficient and economical; nor, on the other hand, should the public interest permit unlimited monopolization of any process or device that makes possible a larger utilization of a natural resource, for it is well to remember that the Constitution recognizes the "patent" idea only as a means to an end, and that end is progress of the useful arts. Whatever retards progress and fails to promote general welfare is without constitutional defense.

The application of these principles to the petroleum problem is obvious. Our plans for the future must include every possible economy in the handling of this limited resource of unlimited usefulness. We should exercise economy in the development of the resource by avoiding all the wastes of the past and present, wastes largely inherent in the small unit system of operation, with competition and mismanagement running wild. There should be also economy in use; the whole of the petroleum ought to be used, and each part put to its highest use—a purpose that is not easily attained but that should be clearly set forth and publicly accepted. No process that promotes the more efficient operation of wells or that effects larger recoveries in the refineries should be so monopolized that the economy is applied to only a part of the nation's resources; for though the owner of the patent can rightfully claim the profit to be received from the use of his invention, the public also should profit in the larger utilization of its resources as a whole, not limited to such part only as may be controlled by any one interest.

Distribution Program Should Be Planned

Economy in the transportation of oil is a topic that especially deserves the world view. As in the interstate traffic in coal, so in the world commerce in oil, cross hauls are to be avoided. Economy on a large scale demands that the oil come from sources as near at hand as possible. The conception of American tankers encircling the world with cargoes of Texas fuel is more picturesque than practical if other and nearer supplies are available. The western and eastern hemispheres should be as independent as possible, for it is indefensible waste to burn oil to carry oil across the Atlantic or the Pacific in both directions. The ideal plan for fuel-oil bunkering will provide well-distributed stations, backed up with near-by reserves of oil, and such a system seems to be an essential part of any shipping program, whatever the flag of the oil-burning ship. This type of thrift in oil would mean foreign supplies of oil with which to bunker American ships.

With five-sixths of the world's output of oil coming from the western hemisphere, however, it is too soon to expect the economy in the transportation of oil that has here been suggested, yet it is not too much to seek to make the rest of the world more self-supporting in oil and less of a drain upon the Caribbean region. A kind of oil-zoning system for the world may some day not be too extreme a proposal if we are to give full force to plans for economy in oil. So, too, a question that may sometime be asked is whether national or international oil bunker stations are better justified.

The oil problem can be solved only through a keener realization of the world's future needs and a stronger determination to serve future interests. Any taking over of the rules of war into the economic competition for new supplies of oil or for markets for oil products will waste a limited resource as well as threaten world peace. If a high executive of one of the largest steel companies can address the American Iron and Steel Institute on the Golden Rule in Business, the same thought may well be given this wider application before the American Petroleum Institute.

Diplomacy—whether Old World or New World—can offer no better guide in these questions of world economies than is found in the Golden Rule. No other theory of international conduct is so worthy of a democratic nation or can be so easily applied to practical issues, and its application to oil is absolutely necessary if we are to make the world's oil serve the greatest number of generations.

NEWS FROM THE OIL FIELDS

Deepest Mexican Well Anticipated

From Our Special Correspondent

The Aztec well, on Lot 188, Amatlan, is drilling in the limestone and is showing considerable gas and a small amount of oil. The well is being watched with great interest, as it is at a depth of over 3,700 ft. If it is brought in, it will probably mean that a deeper pool has been discovered, as the oil is reported to be of a heavier grade than that formed at shallower depths in the vicinity. It will be the deepest producing well in Mexico.

The "wildcat" well which was drilled on Lot 24, Zacamixtle, by the Huasstica Petroleum Co., on Oct. 8, was deepened 10 ft., this increasing the production to over 75,000 bbl. daily. The final depth of the well is 2,435 ft.

The Union Oil Co. drilled in its second well on Lot 114, Chinampa, on Oct. 28, and it is reported to be good for about 80,000 bbl. per day. This well was drilled to pay in two months, which is a good record for Mexico.

The Agwi Co.'s well, which is located in the federal zone of the Tancochin River near Naranjos, and which was brought in about the middle of October, has been sealed by the government pending the result of litigation between the Cias del Agwi and the Mexican Petroleum, "El Aguila." This well affects the Agwi No. 3 well on Lot 251, Amatlan, and Aguila well No. 6, on Lot 260.

The Transcontinental Co. drilled in another large gusher on its Lot 134, Chinampa, Nov. 5. The well was brought in at a depth of 1,985 ft. and is estimated at 60,000 bbl. daily flow.

Much activity is being shown in the vicinity of lot 114, Chinampa, during the last few weeks. Several wells are setting casing at depths of about 1,800 ft. and at least three others have changed from rotary to standard tools. The Pierce Oil Co. abandoned its hole at a depth of 1,200 ft. and the derricks on the Jones & Buchanan well 7 and the Buckley, Woolett & Thompson well 3 have been taken down, owing to the intrusion of the salt water. The Metropolitan and the Transcontinental rigs offsetting this lot have also been closed down. The life of this pool is estimated to be about three months more. Within the next two weeks at least three of the wells being drilled will reach the limestone if no ill luck overtakes them.

The rainy season has set in, and the roads are fit for traffic only two or three days a week. Automobile trucks and tractors are being used to advantage on the good days and they manage to keep the string of material moving which is necessary to carry out the big drilling program in Zacamixtle and lower Amatlan.

Largest Wyoming Well Is in Rock Creek Field

From Our Special Correspondent

During October 37 wells were completed in Wyoming, producing a total of 4,540 bbl. oil daily and 133,000,000 cu.ft. of gas. Of the 37 wells 29 were oil producers, 2 gas producers and the rest failures. The largest well was in the Rock Creek field, producing 1,000 bbl. daily. From this the production ranged down to 10 bbl.

The California Pipe Line Co. will build a refinery at Grenville, on the Union Pacific Ry. Material is now being received. Oil from the Lost Soldier field will be treated. This oil is now piped to Fort Steele and shipped to Salt Lake.

In the Rock Creek field the Ohio Oil Co. is drilling 25 wells. Two of these are each over 2,800 ft. deep.

The Western States Oil & Land Co. completed three producing wells during October in the Mule Creek field.

Decrease Shown in Louisiana Fields

From Our Special Correspondent

The Claiborne field of northern Louisiana is showing a decline in production. Furthermore, there is also a decrease in the number of wells being drilled, so that the drop in production may soon be considerable. Only a few wells are being completed in the deeper sand, most of the production coming from the shallow sand. Bull Bayou field is at a standstill, though Caddo has been increasing slightly. The daily production of the coastal fields of this state is about 6,000 bbl., with Vinton the largest producing field.

New Completions in Kentucky

From Our Special Correspondent

New production made by Kentucky fields during October is reported at 257 wells, of which 18 were failures, showing an increase of 34 wells over the record of the preceding month. Several completions are credited with big yields in Warren County. Future Oil Co. made a strike which started at 200 bbl. A flowing well at the first test is reported on the Tyler lease. The Davenport Oil Co. has a flowing well as its latest strike with an estimated yield of 100 bbl. A showing of 100 bbl. at the start is reported by the Elk Basin Oil Co. on the Gum lease. A total of 23 new completions in Warren County was reported.

Well 3 on Will Miller lease was struck with pay sand at 983 ft. and has flowed steadily since being brought in. No. 2 on the same lease, brought in at 486 ft., continues to flow.

Texas Companies Required To Have Pipe-Line Certificates

From Our Special Correspondent

The oil and gas division of the Texas Railroad Commission has ruled that every oil company must have a pipe-line certificate before it will be permitted to make pipe-line connections. All pipe-line companies have been advised regarding this ruling, which applies except in case of emergency and then only for a reasonable length of time. Two weeks from Nov. 13 is the time granted present operating companies in which to obtain certificates.

Texas City is rapidly becoming an oil-shipping station of the first magnitude. During October about 1,250,000 bbl. were handled through this port. Of this 980,000 bbl. were Texas coastal crude shipped to the Eastern seaboard, and 116,000 bbl. were imported from Mexico. Bunker oil to the amount of 152,000 bbl. was also loaded out during October.

In the north Texas fields Stephens County has been increasing its production by leaps and bounds. A few months ago it was in second place among the oil-producing counties of Texas, with less than 80,000 bbl. daily production, and now the daily output is over 150,000 bbl. At the same time the Burkburnett district of Wichita County, formerly the largest oil producer in the state, has steadily declined in production until now it is making little over 60,000 bbl. daily. Many wells are being drilled, however, and there is much undrilled acreage on the larger lease tracts, owing to the fact that most of the wells were drilled at first as offsets around the boundaries, so the field will continue as a large producer for some time to come. The North Extension and the Kemp-Munger-Allen sections are the most active

On the Gulf Coast big producers are still being completed in the north extension of the West Columbia field, Brazoria County. On Nov. 10 the Texas Co. brought in its No. 2 Abrams well as an offset to the No. 1 Robinson well of the Humble Oil & Refining Co. It came in at 3,125 ft., making 350 bbl., but later by the use of air the production was increased to 1,500 bbl. The Texas Co.'s No. 1 Abrams and No. 49 Hogg wells were closed in when No. 51 Hogg, a gas well, caught fire recently, but upon being reopened resumed flowing at 5,800 bbl. and 26,000 bbl. respectively.

The Canadian government has given permission for the prospecting for natural gas and petroleum and their development in the forest reserves of Western Canada, subject to certain regulations.

Annual Meeting of American Petroleum Institute

Discussion of the Financial, Political, and Utilization Problems of the Oil Industry Characterizes Sessions Held at Washington Separate Group Meetings Co-operation and Conservatism in Production, Distribution, and Use Urged

THE opening session of the annual meeting of the American Petroleum Institute was held in the ballroom of the New Willard Hotel, Washington, D. C., at 9:30 o'clock on Thursday morning, Nov. 17. Thomas A. O'Donnell, president of the Institute, outlined the purposes of the organization and the objects of the meeting. Following this, various group meetings were held in rooms of the New Willard and Washington hotels. These group meetings, of which there were seven, consisted of conferences on the following subjects: Taxation, Uniformity in Testing Methods, Utilization of Fuel in the Petroleum Industry, Transportation, Statistics, Laws and Regulations and Utilization of Fuel Oil, Motor Oil and Lubricants, etc. The meetings were well attended and many important features concerning the various phases of the industry were discussed.

At the first general session, which was held in the afternoon, the speakers were W. C. Teagle, president of the Standard Oil Co. of New Jersey, and George Otis Smith, director of the U. S. Geological Survey. In speaking on the topic "The World Petroleum Problem," Mr. Teagle stated that if foreign governments pursued the policy of nationalizing oil lands and keeping their petroleum deposits for their own future benefit, while depending upon the United States for their current supplies, it would be necessary for this country to consider the adoption of reciprocal methods to conserve its own petroleum resources. Although the United States might compel a new allotment of foreign oil territory, Mr. Teagle does not believe that such a step would be necessary.

Dr. Smith's address on "A World View of the Oil Supply" is reproduced in abstract elsewhere in this issue. A continuation of the discussion of the world petroleum problem was held at the evening session, and the speakers were Richard Airey, vice-president of the Roxanna Petroleum Corporation of the Royal Dutch group, and Frederic R. Kellogg, general counsel of the Pan-American Petroleum Co. Mr. Airey, who spoke on the attitude of Great Britain toward the petroleum problem, stated that his remarks were to be taken as merely a personal view and not as an expression of the international viewpoint. He referred to the importance of petroleum supply during the war and stated that at the end of the conflict Great Britain found her supplies so greatly depreciated that it was necessary to take decisive steps to replenish her stock. He is of the opinion that in so doing Great Britain will respect the legal rights of the United States and will work out a policy which will be fair and non-discriminatory.

One of the spectacular features of the convention was the address of Mr. Kellogg. He made scathing allegations as to the petroleum policy of the Mexican government and so sensational were these charges that the special representative in Washington of the Mexican government, R. D. Pesquiera, sought and obtained special permission from

THOMAS A. O'DONNELL

the Institute to reply. Mr. Kellogg stated that Carranza respected no rights or supposed rights of stockholders, bondholders, or others interested in railroads and other enterprises, but appropriated such utilities for his own purposes as he saw fit. However, these policies did not affect the petroleum interests, owing to certain existing conditions. Later, by means of Article 27 of the Mexican constitution, it was possible to secure the same hold on the petroleum interests.

Mr. Pesquiera, replying at a later session, denied most emphatically that Article 27 of the new constitution is retroactive. However, his defence was largely confined to generalties.

The morning of the second day's sessions was devoted to the continuation of the group meetings. At the general session held at 2:30 p.m. three speakers discussed the general subject of "Production." R. D. Benson, president of the Tidewater Oil Co., pointed out the reasons for the present high place of petroleum in industry, and stated that in his opinion it was impossible to separate the production of crude oil from its market price.

Thomas A. O'Donnell, president of the American Petroleum Institute, in speaking on the topic, "The Future," stated that one of the important factors in the extraordinary development of petroleum resources of the United States has been the opportunity for all people to participate in development.

Henry L. Doherty, of Henry L. Doherty & Co., spoke on the future of the oil industry, particularly in regard to regulation and finance. "General business conditions are inauspicious," stated Mr. Doherty, "and problems that seem no more a matter of concern to the general business of the country are in reality a greater threat to the petroleum industry than to most industries."

The general session of the evening was given over to a discussion of the subject "Consumption." Admiral W. S. Benson, chairman of the U. S Shipping Board, in speaking of the demands of shipping for oil, stated that he had found that comparatively little was known concerning the requirements for fuel oil and that considerable difficulties were experienced by the Shipping Board in securing sufficient amounts.

C. F. Kettering, of the General Motors Co., spoke on consumption as relating to the automotive industry. The final sessions were held Friday, beginning at 9:30, when the annual meeting of the Institute for reports of officers and election of officers and directors took place. All officers and directors were re-elected for the ensuing year as follows: Thomas A. O'Donnell, president; S. Messer, vice-president; Henry L. Doherty, vice-president; J. W. Van Dyke, vice-president; H. F. Sinclair, treasurer; R. L. Welch, general secretary and counsel; C. C. Smith, assistant general secretary and assistant treasurer.

At the afternoon general session, an address on the subject of conservation was delivered by Mark L. Requa, vice-president of the Sinclair Consolidated Oil Corporation, and formerly United States Oil Administrator. Mr. Requa stated that in his opinion the American Petroleum Institute was well fitted for the task of coping with the several problems which are essential if co-operation and conservation are to be secured in the industry.

At the banquet held in the ballroom of the New Willard Hotel, the speakers were: Hon. Thomas A. Le Breton, Ambassador from Argentina; Hon. Victor Murdock, of the Federal Trade Commission, and Pat Malloy, president of the Western Petroleum Refiners' Association. The president of the Institute, Mr. O'Donnell, acted as toastmaster.

Hoover Chosen President of Federated Societies

By PAUL WOOTON
Washington Correspondent

THE FEDERATED AMERICAN ENGINEERING SOCIETIES is a reality. The council of that body perfected the organization at its first meeting, held in Washington, Nov. 18 to 20. Herbert Hoover was chosen as president of the federation. Washington was selected as its headquarters. The immediate guidance of the affairs of the organization will be in the hands of an executive secretary. A revised plan of the scope of the society's activities was suggested by President Hoover. It follows:

1. To serve the public interest by investigation and advice to all public governmental and voluntary bodies, dealing with national economic problems.
2a. Department of Public Works.
2b. Conservation of natural resources.
3. Co-operation with other national organizations, technical, industrial and commercial.
4. Technical education.
5. Transportation, particularly highways.
6. Advice to state regional and local societies.
7. National Bureau of Economic Research.
8. Public fire protection.
9. Patents.
10. National Board of Jurisdictional Awards.
11. International affiliation of engineers.
12. State organization of local affiliations.
13. Licensing and local registration of professional engineers.
14. Classification and compensation of engineers.
15. Engineering societies' service bureau (employment bureau).

Realizing that the executive secretary will be the mainspring of the organization, the executive board appointed a special committee of its members to go carefully into the matter, so that a man thoroughly qualified for the position might be selected. The new organization will begin to function Jan. 1. The officers selected were:

President, Herbert Hoover.

Vice-presidents, two-year terms, Calvert Townley (A. I. E. E.) and William E. Rolfe (Associated Engineering Societies of St. Louis).

Vice-presidents, one-year term, Dexter S. Kimball (A. S. M. E.) and J. Parke Channing (A. I. M. E.).

Treasurer, L. W. Wallace (The Society of Industrial Engineers).

The executive board is to consist of thirty members, in addition to the six general officers of the society. Each of six sections of the country is to have a representative on the board. There will be twenty representatives of founder societies. Only fourteen of these latter representatives were named, four vacancies being left for societies which may take advantage of the privilege of becoming charter members if they elect to join the Federated Societies before Jan. 1.

The representatives of the districts are as follows.

District 1 (New England and New York)—E. E. White, of Utica, and W. B. Powell, of Buffalo, one-half vote each.

District 2 (Michigan, Wisconsin and Minnesota)—B. A. Parks, of Grand Rapids, and D. J. Sterrett, of Detroit, one-half vote each.

District 3 (Ohio, Indiana and Illinois)—J. F. Oberlin, Cleveland.

District 4 (New Jersey, Pennsylvania, Delaware, Maryland and District of Columbia)—W. W. Varney, of Baltimore.

HERBERT HOOVER

District 5 (All South including Texas)—O. H. Koch, of Dallas, Tex.

District 6 (All states west of Mississippi River)—L. B. Smith, of Topeka, Kan.

The representatives of the individual societies were designated as follows:

A. I. E. E.—H. W. Buck, William McClellan, C. F. Scott, and L. B. Stillwell.
A. I. M. E.—A. B. Dwight, Edwin Ludlow and Philip N. Moore.
A. S. M. E.—L. P. Alford, A. M. Greene Jr., E. S. Carman, and F. J. Miller
Am. Inst. Chem. Eng.—H. E. Howe
The Taylor Society—M. B. Cooke
Am. Soc. Agric. Eng.—S. H. McCrory

The committee charged with the selection of an executive secretary consists of: L. W. Wallace, chairman; Philip N. Moore, Charles F. Scott, L. P. Alford, Calvert Townley, John F. Oberlin, and ex-officio Herbert Hoover.

Resolutions were adopted pledging support of the following projects:

(1) The compilation and preparation of critical tables of physical and chemical constants, as undertaken by the National Research Council. (2) In support of the proposed Federal Department of Public Works, as advocated by the Engineering Council. (3) Indorsing the proposal by Mr. Hoover for the investigation of industrial waste and authorizing him as president to form an organization under the auspices of the federation to work immediately to this end.

It is estimated that the income of the federation during the first year will not be less than $59,000 and probably not more than $80,000. A budget was made on the basis of the minimum income, which allots $27,000 for the salary of the executive secretary and office expenses; $12,000 for service bureau; $7,500 for committee work; $7,000 for traveling expenses; and $3,000 for office equipment, thus leaving a small balance for other incidental items.

The opening address at the first meeting, on Nov. 18, was made by Richard L. Humphrey, chairman of the Joint Conference Committee. After summarizing the work of this committee, Mr. Humphrey stated that he was confident that the new organization would uphold the high ideals of engineering and would add to the traditions of the professions, and so justify the confidence that had been placed in it. He urged that the organization guard against the possibility of promoting special interests and those that are not for the general good of the profession.

J. Parke Channing, chairman of Engineering Council for the last three years, and one of the newly elected vice-presidents of the Federated Societies, delivered an address on "Engineering Council" at the afternoon session on Thursday, Nov. 18. Mr. Channing outlined the several accomplishments of Engineering Council.

Herbert Hoover, speaking at the evening session on Friday, Nov. 19, outlined three sources of waste in production and suggested means of combating each. Those sources mentioned were intermittent employment, unemployment that arises in shifting industrial currents, and strikes and lock-outs. Mr. Hoover stated that engineers were best qualified to undertake the great task outlined, inasmuch as they had no special economic interests for themselves in constructive solution of the problems, their only interest being in creating a force for public service.

MEN YOU SHOULD KNOW ABOUT

N. H. Darton, who has been doing geologic work in Mexico, has returned to Washington.

C. E. Weed, superintendent of the Hancock Consolidated Mining Co., has left for Arizona.

Dr. L. M. Williams, of Long Beach, Cal., has been elected vice-president of the Nacozari Consolidated Copper Co.

J. H. Reeder, former superintendent of the Naumkeag Copper Co., has accepted a position with the Miami Copper Co. in Arizona.

A. E. Flynn, superintendent of Rand Consolidated Mine., Ltd., of Goudereau, Ont., has moved to Ambler, Pa., since the mines closed down.

David White, chief geologist of the U. S. Geological Survey, has returned to his Washington office after an extended trip through the West.

G. R. Airth, of London, England, managing director of Anglo-French Exploration Co., Ltd., is in Toronto, Ont., as the guest of J. B. Tyrrell.

Walter Douglas, president of the Phelps-Dodge Corporation, is visiting the companies' properties in the Southwest. He is at present at Douglas, Ariz.

J. Parke Channing, of New York City, vice-president of Miami Copper Co., of Arizona, has been recently elected president of Seneca Copper Corporation.

Louis D. Huntoon, consulting mining engineer of New York and Los Angeles, Cal., left for the Southwest on Nov. 17, and expects to return East about Jan. 1, 1921.

S. S. Sorenson, vice-president of Braden Copper Co., and general manager at Rancagua, Chile, for several years, has returned to the offices at 120 Broadway, New York City.

Dr. McLaughlin of the U. S. Geological Survey, and **C. M. Gary**, assistant in the office of V. C. Heikes, have been visiting various mining camps in the vicinity of Salt Lake City.

Dr. W. H. Collins, who for fifteen years has been connected with the Department of Mines at Ottawa as a geologist, has been appointed Director of the Canadian Geological Survey.

W. E. Thorne, mining engineer, of the New Consolidated Goldfield, Ltd., staff in Africa, is at his home in Santa Cruz, Cal., on a short vacation. Mr. Thorne expects to return to Africa early in 1921.

H. Herman, director of the Geological Survey of Victoria, has resigned that position to become engineer in charge of briquetting and research on the staff of the electricity commissioners.

Herbert Hoover, mining engineer, was called into conference on Nov. 16, by the executive council of American Federation of Labor in New York City during its discussion of economic and industrial conditions.

Gerald G. Dobbs, formerly with St. Louis Lead Co., and at present general manager, Southern Mineral Co., Winnfield, La., has resigned to accept the position of general superintendent of the ore mines and quarries of the Tata Iron & Steel Co., Ltd., Bengal. Mr. Dobbs will sail from New York on the "Imperator" on Dec. 23, to assume his new duties in India, where he may be addressed in care of Tata Iron & Steel Co., Ltd., Gurumahisani, via Tatanagar & B. N. Railway, Bengal, India.

RICHARD LEWIS HUMPHREY

Richard Lewis Humphrey, consulting engineer, and former concrete expert of the Geological Survey, has taken a prominent part in the movement for federating the engineering organizations of the United States. As chairman of the Joint Conference Committee of the national engineering societies, Mr. Humphrey presided over the preliminary session of the initial meeting of American Engineering Council, at Washington, and made the opening address.

Dr. W. L. Goodwin, formerly Dean of the Faculty of Applied Science at Queens University, Kingston, Ont., has been appointed principal of the schools of instruction for mining prospectors to be established at Cobalt, Sudbury, and other centers in northern Ontario.

Sir Douglas Mawson, leader of the Australasian Antarctic expedition, 1911-1914, has been appointed professor of geology and mineralogy at the Adelaide University, Australia, where he has been lecturer since 1905. Sir Douglas, who was born in 1882 at Bradford, Yorkshire, England, conducted a geological exploration of the New Hebrides in 1902-1903, accompanied Sir Ernest Shackleton on his Antarctic expedition in 1908, and was knighted on returning from his own expedition in 1914. Besides a number of home distinctions and decorations Sir Douglas is a gold medallist of both the Chicago and the American Geographical societies of the United States.

Bradley Stoughton, secretary of the American Institute of Mining and Metallurgical Engineers will spend Thanksgiving week and the week thereafter in the Lake Superior district. While in the district, Mr. Stoughton, will meet the members of the Institute in the various towns at subscriptions dinners, at which organizations will be formed which will afford more direct communication between the mining engineers of the district as a unit and the headquarters of the Institute. This organization would also afford the members of this district as a unit an opportunity to influence national affairs through the newly formed federated American Engineering Societies. Such organizations are being formed all over the country.

OBITUARY

Chester A. Thomas, mining engineer of San Francisco, and formerly manager of the American Smelters Securities Co., died at Dawson, Yukon Territory, on Nov. 11, of heart failure.

Mr. Thomas had been revisiting Alaskan sections familiar to him during the years he was in charge of the Guggenheim interests there. Later he also had charge of Guggenheim interests in California and Arizona. Mr. Thomas left San Francisco last August and soon after his arrival in Dawson he suffered a breakdown in health. He was a veteran of the Spanish-American War, a member of the Bohemian Club of San Francisco, and had been elected to membership in the A. I. M. E. in 1902.

Curtis Holbrook Lindley, of San Francisco, Cal., eminent authority in mining jurisprudence and chief counsel of U. S. Food Administration in 1917, died at San Francisco on Nov. 20. Judge Lindley had just returned from Arizona, where he had been acting as counsel and attorney for the Tom Reed Gold Mines Co. in its apex suit against United Eastern Mining Co. This was the last of many important mining law contests in which he played a leading part. He was born in Marysville, Cal., in December, 1850, was graduated from University of California, and had been honorary professor of jurisprudence there since 1900. Judge Lindley's most important published work is the "Treatise on American Law Relating to Mines and Mineral Lands," the highest authority in its field in this country. This great work has already seen three editions (last in 1914-15). His eminence in mining law made Judge Lindley a valued member of A. I. M. E. He was a member, also, of the California Academy of Sciences, and of several clubs.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Federal and Hecla Settle Apex Litigation Out of Court

Under the terms of the settlement of the apex litigation between the Federal Mining & Smelting Co. and the Hecla Mining Co., operating near Burke, in the Cœur d'Alene district, Idaho, the Hecla company pays the Federal $450,000 for title to the Russell and Mono Fraction claims and a release of all claims against it for trespass. Announcement of the settlement has been officially made by both companies. The Russell and Mono claims are under lease to the Marsh Mines Consolidated, and it was while prosecuting development work under the lease that Marsh discovered what was claimed to be the apex of the "east vein" of the Hecla within the lines of the Russell claim. Suit was instituted by the Federal company against the Hecla in the Federal court to establish its title to the vein and to recover the value of all ore removed by Hecla, nominally placed at $6,000,000. An array of talent, legal, geological and engineering, was engaged by both companies, and the stage was set for another of those long-drawn-out controversies which have marked the history of mining in the West and particularly in the Cœur d'Alene district. The Federal took over the work started by Marsh and continued the shaft on the vein to prove by physical demonstration that the vein within the Russell claim and the "east vein" of Hecla were identical. At the same time Hecla was occupied both underground and on the surface making similar showing that the vein had its apex within the Hecla lines. The Russell shaft had been sunk 370 ft. and the dip had carried the bottom within the Hecla side lines, leaving about 600 ft. to go to connect with the Hecla workings, if the Federal theory was correct, when both companies suspended work on the same day. No official announcement was made regarding a settlement until Nov. 12, when the terms of the settlement were made public as stated above. At the same time it was announced that the Hecla company had purchased from the Federal the Old Tiger-Poorman group for the sum of $300,000, although it is understood that this deal was entirely independent of the litigation settlement. This property joins the Hecla on the north, and while it was abandoned many years ago by the Federal on account of the increased expense of mining after having been developed to a depth of 2,200 feet by shaft, it is known that much ore was left in the mine which will be accessible from the Hecla workings, and is regarded as a valuable acquisition.

Following the filing of the suit by the Federal company against the Hecla in the Federal court, the Marsh company entered the case as an intervenor to protect its rights as lessee of the ground in controversy. It appears from a statement from the Marsh that the company was ignored in the negotiations and final settlement. In the official statement issued by Federal and Hecla immediately following the settlement, this paragraph occurs: "The Federal company will endeavor to make an adjustment of such claims as the Marsh company may have by virtue of its lease of these claims from the Federal. Failing to make such adjustment, the Marsh company will, of course, be at liberty to continue the litigation on its own account." The Marsh lease is for ten years and runs until July, 1926, about five years and a half. The transfer of the Russell and Mono claims does not affect its rights under the lease, and it is privileged to continue work under its terms. While it may be assumed that in settling with the Federal, the Hecla company concedes the trespass and the apex contention of the Federal, as a matter of fact, so far as the public knows at least, no such concession has been made. It would seem, therefore, that March is confronted with the necessity of proving its rights in the courts.

WEEKLY RÉSUMÉ

By paying the Federal Mining and Smelting Co. $450,000 for title to two mining claims in litigation the Hecla Mining Co. settled the suit of these two companies out of court and ended what promised to become a long-drawn-out apex controversy. According to a ruling of the Commissioner of Indian Affairs, minor and otherwise incompetent Indians owning lead and zinc lands in Ottawa County, Okla., may lease their land for any period approved by the Secretary of the Interior, Competent Indians may lease for a term not longer than ten years. Interstate Commerce Commission authorized special ore freight rates, which will enable the Bunker Hill smelter to bid for British Columbia ore. The Nickel Plate mine of the Hedley Gold Mining Co. is closing down at Hedley, British Columbia, because of the high cost of producing gold. Hoover addresses Washington A. I. M. E. members and calls attention to the advantage of Washington as engineering society headquarters. Bituminous Coal Stabilization Committee concludes in its report that the bituminous industry is inefficient and points to the co-operation necessary to remedy this condition.

Commissioner of Indian Affairs Regulates Leases by Indians Owning Zinc-Lead Lands

Minor and otherwise incompetent Indians owning lead and zinc lands in Ottawa County, Okla., may lease their lands for any period of years approved by the Secretary of the Interior, but competent Indians may lease for a term not longer than ten years, according to regulations recently established by Cato Sells, Commissioner of Indian Affairs.

The regulations were announced by Sells after a recent visit to the Tri-State field. It is expected that local protests will be made against his ruling with reference to lands already under lease, which is to the effect that, though it is believed many of such leases may be and will be renewed, it will be within the power of the Secretary of the Interior, when he finds such renewal would not be to the best interest of the Indian land owner, to refuse renewal and advertise the lease for sale at public auction.

It is provided that royalties belonging to the owner of the land must be paid to the superintendent of the Quapaw agency by the 15th of each month. Also, the superintendent is required to forward to the Indian commissioner a list of all outstanding lead and zinc mining leases covering restricted lands of all minor or otherwise incompetent Indians, executed prior to the dates when such Indians were declared to be incompetent. A list of outstanding leases executed by competent Indians where such leases are for a longer period than ten years, must also be furnished.

These reports are expected to show just how far development has gone on these leases, the purpose being to bring such lands within the operation of the new regulations. On leases offered by sale under the new regulations, the royalty to be paid by the lessee shall be 10 per cent of the gross proceeds of all lead and zinc ores extracted from the leased premises. On leases not offered for sale at public auction, royalty shall be not less than 10 per cent and in some cases may exceed this amount. Publication in a newspaper for four weeks is required before an Indian may lease his land, after which public auction will be held. Bids must provide for a fixed royalty and a bonus. At least 25 per cent must be paid at the sale, the remainder to be paid in three yearly installments. All bids may be rejected if not acceptable to the acting authority.

Bunker Hill Smelter After British Columbia Ore

Through the efforts of Frank M. Smith, managing director of the Bunker Hill smelter, the Interstate Commerce Commission has authorized the Oregon-Washington Railway & Navigation Co., the Spokane & International R.R. and the Canadian Pacific to make special rates on ore shipments from the mines of British Columbia to Bradley, Idaho, the railway station for the Bunker Hill smelter at Kellogg. This matter was taken up by Mr. Smith soon after becoming connected with the Bunker Hill company and the final favorable ruling of the commission is expected to result in diverting much British Columbia lead-silver ore to the Kellogg plant. Similar rates were authorized for the shipment of British Columbia ore to Utah smelters, but the shorter haul to the Bunker Hill will give that plant a decided advantage. This ore will be shipped in bond and the bullion derived from it used in supplying the export demand, although it is possible that it might be sold in this country at a profit in spite of the tariff on account of the adverse exchange rate to which Canadian money is subjected.

Nickel Plate Gold Closes Down Indefinitely

It has been officially announced that the Nickel Plate mine of the Hedley Gold Mining Co. is closing down. Only enough men are being retained to put the plant in such condition that it will be ready for the resumption of operations when the time comes. The management in a statement given publicly in British Columbia explained that during the war the mine was continued on a producing basis because the gold was needed, and after the armistice it was thought that economic conditions would so improve that it would be possible to pay dividends on the capital invested. This anticipation has not been realized. It is added that the shutdown is only temporary, that it will last probably for one year, and that the mine and plant will be in good condition to resume work when times improve. It is felt that under prewar conditions or even 20 per cent thereof "we can earn good dividends."

The closing of the Nickel Plate is to be regretted by reason of the effect on the mining industry of the province as a whole, and the prosperous little town of Hedley, B. C., has received a blow that it hardly can survive. The miners are leaving their families there while hunting work to tide over the winter, but they will move away as the breadwinners adjust themselves to the changed conditions.

Lake Iron Ore Shipments Slowing Down

Freezing weather at the head of the Lakes has caused a slow-down on ore shipments. The railroads have been compelled to deny cars for transportation to several shippers because of the fact that their dock space is already filled and that the ore, if accepted, must stand in the cars awaiting dumping at docks and then be thawed out by steam.

Ore shipments were delayed and one boat was wrecked by a severe storm, which swept Lake Superior last week. After a subsidence of the storm thirty-eight boats arrived in the Duluth-Superior harbor in less then ten hours. There were approximately one hundred thousand tons of coal among the cargoes that came in and this can be used to good advantage.

Although most Mesabi Range mines have either begun their winter work or are preparing for it a few of the mines are shipping. Decrease in shipments of ore from Minnesota state-owned mines is shown in the state mine report for the week ended Nov. 13, the tonnage shipped being 124,409 tons. Indications are that in spite of the coal and car shortage which hampered work to some extent this season the total shipments from the Mesabi Range will compare favorably with previous years.

It is estimated that 3,000,000 tons will go forward from the Lake Superior docks in November. This will bring the total shipments for the year to 56,000,000 tons. The season's shipments will bring the grand total of production for the Lake Superior district over the billion ton mark for the first time.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Hoover Addresses Washington A. I. M. E. Members

Points to Advantages of a Headquarters in Washington and Work of Engineering Societies

The hope that the headquarters of the American Institute of Mining and Metallurgical Engineers eventually would be transferred to Washington was expressed by Herbert Hoover in the course of an address before the Washington chapter of that organization, which gave a luncheon in his honor Nov. 19. He spoke of the national capital as being the center in which the moral strength of the newly formed Federated American Engineering Societies should be concentrated, in close touch with the Federal Government and able to act on the occasion of any emergency.

Just prior to the luncheon, Mr. Hoover had been elected president of the Federated American Engineering Societies. He pointed out that the United States is undergoing great economic changes and that the national service organizations are realizing opportunities for service. Their influence can develop an economic system without crushing individualism.

With regard to the societies of engineers, he pointed out that engineers are particularly qualified for public service, since they are accustomed to separate facts from the distortions which often surround them and correlate them in a way which enables the public to have at its disposal correct basis information.

Bradley Stoughton, in the course of his remarks at the luncheon, expressed the opinion that the federation of engineering societies is one of the big things of the century in engineering.

E. S. Carmen, of the American Society of Mechanical Engineers, congratulated the mining engineers on having furnished the president of the Federated American Engineering Societies.

Coal Stabilization Committee Draws Important Conclusions

Causes of Inefficiency in Bituminous Industry and the Proper Relief Are Embodied in a Report

Preparations are being made by the Committee on the Stabilization of the Bituminous Coal Mining Industry of the American Institute of Mining and Metallurgical Engineers for active work looking toward the realization of certain conclusions drafted by Herbert Hoover. The conclusions are as follows:

1. That the bituminous industry functions inefficiently. Employment in the industry averages less than 220 days per annum, with a minimum district average of less than 200 days. From this flow a high daily wage, a considerable portion of the just complaints of labor and a higher cost of coal to the consumer.

2. The causes are very largely (a) intermittency in seasonal demand, (b) irregularity of car supply, and (c) the lack of storage facilities and incentive for their use.

3. The cure lies in:
   (a) The establishment of seasonal differentials in rates.
   (b) Increased transportation facilities and a more efficient and equitable distribution of cars.
   (b) Increased use of central and interconnected electric power plants.
   (c) Lower selling prices in dull seasons made possible by differentials in profits, rates, and wages.
   (d) Recognition by the larger consumers that they must provide adequate storage to be replenished in the dull season.

4. Such storage is feasible and can be made financially remunerative.

5. No adequate solution can be found, except through organized cooperation of operators, labor, railroads, and large consumers.

NEWS BY MINING DISTRICTS

Special London Letter

Coal Strike Off, but Industries Feel Its Effects—Banks Discouraging Loans —Scottish Spitsbergen Forms Subsidiary Undertaking

By W. A. DOMAN

London, Nov. 8—From a mining standpoint, little of importance has occurred during the last week. The coal strike has been called off, and work has been resumed. This does not mean that the vexed question of miners' wages is definitely settled, but that work will be continued on the lines suggested until the National Wages Board is established, and the whole matter thoroughly investigated. The influence of the dispute has permeated all branches of industry, and it is to this fact that the quietness of metal-mining business is largely attributable. With unrest in every direction, there is little encouragement to boards of mining companies to attempt to raise much-needed capital, for they fear but a meager response. Accommodation from the banks can be obtained only on very onerous terms, seeing that the amount of currency is limited, and credit is strictly rationed. The banks are doing their utmost to meet legitimate and pressing claims, but it would appear from their balance sheets that they have already lent pretty well to the extent of their ability.

Notwithstanding present conditions, one or two mining companies are about to try their luck. If they put forward attractive proposals they may meet with success, as money which during the period of depression has been invested in gilt-edged stocks will be made liquid on the prospect of higher returns. The Scottish Spitsbergen company, which owns a large coal area in Spitsbergen, claimed to have been more thoroughly tested geologically than any other property in the island, is about to form a subsidiary undertaking with a nominal capital of £1,000,000. This is interesting in view of rumors that Hugo Stinnes is endeavoring to get control of the mineral resources of the island through formerly neutral sources.

The Burma Corporation, which for years was an English registered company, has now been put on the file as an Eastern company with a capital of 180,000,000 rupees in 18,000,000 shares of 10 rupees each. Besides various technical advantages attaching to a locally registered undertaking, removal to the East affords a capital opportunity for interesting Indian investors.

With the further fall in the value of sterling in relation to the dollar, an attempt is being made once more to draw attention to African gold-mining shares. On the present occasion a greater degree of success is expected, for the movement is said to be a concerted one among the finance houses, which have taken shares at pretty well their own prices on the way down, though the profits which the mining companies are earning seem to warrant a higher level of quotations. A further favorable point is that for remittances from London to South Africa the banks are paying a bonus to the mining companies.

The premium is stimulating gold production elsewhere, and rather more activity is reported in West Africa. One mining company operating there—the Abbontiakoon—has greatly surprised its shareholders by declaring a dividend of 5 per cent, the first for some years. One or two abandoned properties are being subjected to renewed investigation, and if reports are favorable the capital required for opening out and equipment will be found.

Efforts are still being made to settle the dispute at the Rio Tinto. Some of the miners have returned to work, but others are withholding their services in the belief that the company can and should pay a higher scale of wages.

Mexican Letter

Government Fails To Take Over Coahuila Mines—Export Taxes for November Fixed

City of Mexico, D. F., Nov. 11—The order of the federal government to take over the coal mines in the State of Coahuila and work them on government account, because of the inability of miners to come to an agreement, was nullified by the failure of the government to get a sufficient number of skilled workmen to unwater the properties and start the plants. At this date the government has made no further efforts to take physical possession of the mines and situation has become decidedly acute. Lampacitas, property of Cia. Minerales & Metales; Agujita, of the same company, with a capacity of 35,000 tons a month; Rosita, belonging to the American Smelting & Refining Co., also with an output of about 35,000 tons; New Sabinas, an English property; Cloete and Rio Escondido, independent American mines, totaling about 30,000 tons monthly, are all under water, and it would be impossible to put them in operation short of several weeks, even if an agreement were reached. Agujita recently installed a 1,000,000 pesos modern plant, which has been seriously damaged by the strikers. As these concerns control the entire output of Mexican coal, and the smelters and founderies as well as many of the larger mining properties in north depend on them absolutely, the gravity of the situation may be understood. Coal is selling at the mines, or was before the strike, at $4.25 per ton. The owners insist that it is absolutely impossible to meet the demands of the strikers for 100 per cent advance in wages, this on top of several advances already made during the last eighteen months, and operate their plants. The probability is that no settlement will be reached until after President Obregon is installed Dec. 1.

The Treasury Department has fixed the following export tax of minerals and bullion for the present month. The prices are in Mexican currency, and by kilograms.

Gold bars	93.12
Gold concentrates and ores	106.67
Copper matte, over 50 per cent, carrying more than 300 g. of silver and 5 g. of gold (per ton)	2.548
Copper matte, over 50 per cent, carrying less than 300 g. silver and 5 g. of gold (per ton)	1.174
Lead bars	0.510
Lead ore and concentrates	0.680
Lead, refined	1.887
Tin bars	2.264
Tin ore	0.241
Zinc bars	0.321
Zinc ores	0.2[illegible]
Antimony bars	0.3[illegible]
Antimony ores	0.265
Graphite	0.267
Graphite, refines	0.42[illegible]
Quicksilver	8.42[illegible]

CANADA

British Columbia

Dredging Interest at Cariboo Reviving —Premier Mine Finds Ore—Development and Exploring at Quatsino Sound

Salmon River—The Premier Mine, Portland Canal, is reported by H. A. Guess as having disclosed ore and a possibility of greater tonnage than has yet been proved. Winter shipments across the snow are planned and will be by caterpillar tractor hauling sleds as soon as the trail freezes hard. Water-power plant is expected in operation within a month, and the new cyanide mill will be in running order early in 1921.

Vancouver Island—The Consolidated Mining & Smelting Co. proceeds with the development of its Vancouver Island properties. On the Sunloch group, Jordon River, diamond drilling is in progress. At Quatsino Sound considerable exploratory and development work still is under way. The company is experiencing no difficulty at present in finding the labor needed for the work in hand. This changed condition in labor supply is common to the mining camps of the entire province.

Cariboo—New York interests are said to have been favorably impressed by reports of engineers on the Barkerville field and are expected to begin dredging operations in that section. The Imperial group of claims, Prosperpine Mountain, on which a shaft has been sunk 21 ft., is reported to have shown up a vein carrying values averaging $17 to the ton.

Vancouver—Fifty gold bars, valued at over $500,000, have been shipped from the Dominion Assay Office here

to Ottawa. This represents the takings of the year up to date. Water shortage has hindered lode and placer mining in British Columbia and Yukon Territory during 1920.

Trail Smelter Receipts

Ore received at Trail Smelter, during the week ending Nov. 14, 1920, amounted to 8,187 tons, gross, and was derived as follows:

	Gross tons.
Bluebell, at Riondel	208
Emerald, at Salmo	31
Josie, at Rossland	220
Krao, at Ainsworth	21
North Star, at Kimberley	128
Paradise, at Athalmer	41
United, at Ainsworth	11
Company mines	7,527

Ontario

Porcupine—A block of claims 14 miles square, situated in the sand plains of Mountjoy Township west of Timmins, have been taken over on option by English interests. The heavy overburden makes surface prospecting almost impossible, but drilling is being actively carried on. Five diamond drills are in operation under the direction of E. Loring, engineer in charge.

A report by R. C. Fielding on the Davidson Consolidated addressed to the chairman and directors of the General Mines Investment (1920) Ltd., of England, in connection with the proposed sale of a controlling interest, estimates the tonnage, including "probable" ore disclosed by the work done, at 350,000 tons, averaging $11 per ton extractable. Working costs under normal conditions are estimated at $4 per ton.

The McIntyre is now doing a considerable amount of development on a new vein reported cut by diamond drill some months ago. Work is being carried on at the 1,375-ft. level. A dividend of 5 per cent, payable Jan. 1, 1921, to shareholders of record of Nov. 19, has been declared. This will bring the total payments up to 65 per cent of their capital issued. It is understood that on account of the power shortage in Porcupine, the Dome and the McIntyre have been forced to turn their recently imported Cornish mines on to hand steel work.

Boston Creek—Work has been started on the Hughes-McElroy property containing approximately 360 acres held under option by Henden's Trust, Ltd., of London. Frank C. Loring is consulting engineer.

At the Miller Independence a systematic exploration of the 500-ft. level is being carried on at three points. A vein encountered on this level by crosscutting 250 ft. from the main shaft is being followed up.

West Shining Tree—The injunction asked for by Hamilton B. Wills & Co. to restrain the Wasapika Gold Mines from transferring its shares to the Wasapika Consolidated has been dismissed by the court, and the distribution of stock will take place.

At the Atlas, where the proved-up mineralized zone has been considerably extended, a 4-drill compressor will be installed.

UTAH

Good Supply of Carbonate Zinc Ores—Park City Shipments Lower—Daly Mine Being Developed—Ontario Silver Opens New Orebody

Salt Lake City—The plant of the Utah Zinc Co., between Salt Lake City and Murray, is rapidly approaching completion. This company will take carbonate zinc ores from surrounding mining camps, and relieve to some extent the situation created by the high freight rates, which prevent the shipment of other than the highest-grade zinc ores from Utah to the only market at present open at eastern and midwestern points. There is still no local market for sulphide zinc ores. The electrolytic zinc plant of the Judge Mining & Smelting Co. at Park City treats sulphide ores from its own mine, but no custom ores and is closed down for the time being. The Scranton mine, at North Tintic, under lease to J. W. Wade and associates of the Utah Zinc Co., is producing 15 tons daily of high-grade lead-free zinc ore. In general, there is a considerable tonnage of carbonate zinc ore in the Tintic district relatively free of lead. As the Utah Zinc is not equipped for the treatment of zinc ores carrying lead, this district will be largely drawn on for ores. It is stated that the company has already purchased and stockpiled at its plant a considerable tonnage of ore, a part of it from the Chief Consolidated at Eureka, and some from the Scranton. Other Tintic properties with available ore of the kind required are the Bullion Beck, May Day, and Lower Mammoth.

CALIFORNIA

Bunker Hill Stockholders Protest Assessments—Airplane for Transportation of Supplies Feasible

Amador City—Much interest and dissatisfaction has been evidenced of late in matters pertaining to the Bunker Hill mine at Amador City. The failure to locate pay ore as early as expected and consequent inability to keep the mill profitably employed has resulted in a number of assessments being levied. Dissatisfied stockholders took exception to the directors of the company disposing of the bulk of their stock and claimed that a meeting should be called to elect a new board of directors. A stockholders' meeting was called by N. W. Hyler, O. D. Rolphs and other heavy stockholders without waiting for the secretary of the company to call such meeting. When the stockholders intending to hold the called meeting arrived at the mine in a body on Nov. 5, they were informed that the secretary and members of the board of directors would not participate in the meeting in any way, claiming that such meeting was illegally called and that any action taken would not be expressive of the wishes of a majority of the stockholders. Messrs. Hyler and Rolphs and their attorneys insisted that they had more than a majority of the stock represented in person or by proxy and demanded that the secretary produce the records of the company. Upon refusal of this demand the stockholders withdrew from the office and held a conference on the log pile near by. Later the incumbent board were informed that a new board of directors had been duly elected but the demand to turn the property over to the new board was refused. The old board insisted that indebtedness which they had incurred for the company must be met before they would be willing to resign and then only with the sanction of the stockholders at a properly-called meeting. A meeting of stockholders is now advertised for Nov. 22.

Grass Valley—The water is being lowered steadily at the Idaho-Maryland mine and is now down below the 1,300 level. The condition of the canyon shaft is better than was to be expected and little repairing is necessary to put it in shape for mining. A large new Taylor electric pump is being installed at the 1,000-ft. level and a huge sump is being sunk to care for the accumulation of water that will permit the pump to work only part of a day keeping that level clear of water. This pump will be augmented with other pumps at the 700 and 400 levels. Exploration work is going on at the 1,000, 700, 400 and 300 foot levels, driving in different directions with the idea of exploring the country to the east, particularly the old Eureka workings, where rich ore was taken out in the early days. Leasers are going to work in the 400 levels and it will be but a short time now before the mill is dropping its stamps on the ore that will come from the old stulls in the upper workings.

On Nov. 13 an airplane made a test of the feasibility of serving a circuit of mines in this region with light supplies and mail, a project which has been discussed by local men for some time. With Pilot Eldredge at the wheel and carrying two passengers the plane made a circuit of approximately 60 miles over a mining region, landing just 51 minutes from the time of starting. Heading first for Colfax the plane passed over the following places where mining is being conducted: Morning Star, Iowa Hill, Birds' Flat, Little York, You Bet, Red Dog, Nevada City and Grass Valley district. Most of these places are off the railroad and on poor roads, and it is estimated that it would require eight hours to reach them with the most powerful automobile. The cost of fuel and oil for the trip was calculated at $3.18. It is stated that it will be possible to deliver machinery and small parts, thus preventing the shutdowns which at present always accompany breakage of machinery parts.

Sutter Creek—With thirty stamps dropping on good ore and indications pointing to the raise from 3,900 to the 3,700 level being in ore all the way, the outlook is extremely bright at the Central Eureka. The mill bins are full of ore and since Nov. 8 thirty stamps have been constantly falling. Some station

timbers of the 2,300 level South Eureka failed and allowed rock to drop into the shaft. The water column was broken and stopped the operation of the 2,700 South Eureka pumps. The broken timbers have been replaced and the break will not interfere with mining operations in the Central.

NEW MEXICO

Jim Crow Contest Closed—85 Mine Opens Fine Ore—Lepidolite Coming From Taos County

Hatchita—The Durango Mining, Milling & Exploration Co. is pushing development work on the old American mine. A new pumping plant has been installed and the property unwatered. Work on the lower levels is exposing some good orebodies carrying lead, zinc, silver and iron, with small amount of gold. Two cars of ore were shipped to the El Paso smelter on Nov. 10. Edward Rockman is superintendent in charge.

Santa Fe—The Latawana Mining Co., with a capital of $300,000, has been incorporated by C. F. Wilson, Eva Wientage, and R. P. Fullerton, all of Santa Fe.

The Montclaire Mining Co., of Delaware, has amended its articles to increase its capital stock to 2,000 shares at $10 par and 20,000 shares of common stock without nominal or par value. F. C. Wilson, of Santa Fe, N. M., is agent.

Interests associated with Drachenfels & Co., of New York, have taken an option on a large deposit of lepidolite in southern Taos County about 40 miles north of Santa Fe. Work has already started, and the crude ores will be shipped to the grinding plant at Wheeling, W. Va. This ore is to be used as a constituent of a so-called unbreakable "glass."

Lordsburg—Sinking on the main shaft of the 85 Mine has reached 1,006 ft. A drift has been started upon the 950-ft. level that has opened a strong vein of fine ore; 75 carloads were shipped to the Calumet & Arizona smelter at Douglas, Ariz., during October. The contest on the Jim Crow claim has been settled by the Warner interests, original owners of the 85 property, paying the bare court expenses of the contestants, thereby clearing up the title of the whole 33 claims that were sold to the Calumet & Arizona Mining Co., last June.

The Great Eagle fluorspar mine has started foundation work on the 200-ton concentrator which will be installed on their property. This work will be under the direction of Frank Groh. A three-compartment Hartz jig with other equipment has arrived and will be hauled out at once. Mining work will be under the immediate direction of James Bell. General Manager Alfred Roos will make his headquarters at this camp, directing work upon their other properties from here. Few shipments, except of acid grade spar, will be made until the equipment is installed.

For the same interests Mr. Roos has just taken possession of another spar deposit near the southern border of New Mexico, 25 miles north of El Paso, already establishing a camp under the charge of R. J. Monahan of Tucson. Two large veins, a mile long, are being prospected.

OREGON

Almeda Mine to Install Flotation

Galice—The Almeda mine, owned by the Almeda Mines Co., with head office at Portland, Ore., will soon resume operation. The mine has been inactive since 1916, except for general development work and repairs. The company has been sampling and testing the ore to determine the most practical methods of ore treatment and announce that oil flotation gives the higher percentage of recovery in values. It will erect a reduction plant within the next few months. The ore in this mine contains copper, gold, silver, lead and a little zinc. The deposit occupies a zone of faulting along a contact between dacite porphyry and argilite, being confined to the former. The argillite or slate has been assigned to the Galice formation of the Jurassic period by means of fossils found in the mine.

The Almeda mine is more fully developed than any other mine in southern Oregon; this is due in part to the fact that it is remarkably well situated for systematic development, being in the narrow but traversable canyon of Rogue River which gives a natural transverse section of the lode to a depth of at least 500 ft. The development consists of over 6,000 ft. of underground work. Drift adits at five different levels are supplanted by a vertical shaft reaching a depth of 500 ft., with levels at each 100 ft. They open the deposit for 1,000 ft. horizontally and 800 ft. vertically.

The present reduction equipment consists of a 100-ton matting furnace, erected in 1908. The mine is equipped with three gasoline engines of 175 hp. and two air compressors having a capacity to run 23 drills, as well as an engine at the shaft to operate the hoist.

The starting up of the Almeda mine and the reopening of smaller mines, both placer and quartz, look favorable for a general resumption of mining in the Galice district. The most important resumption of placer mining in the district will be the Old Channel Hydraulic Mining Co., who control a large area of "high level" placer deposits near Galice.

IDAHO

Coeur d'Alene District

The east drift from the bottom of a winze, 300 ft. below the Moonlight tunnel through which the property is being developed, shows practically a full face of lead-silver ore of fair milling grade, according to an announcement by A. C. Bixby, manager of the Ajax Mining Co. The Ajax is near Burke and joins the famous Hercules on the east, presumably having the same vein.

A rich strike of scheelite has been made by the Kennan Mining Co. on Poney gulch, about ten miles north of Wallace, consisting of eight inches of ore that is estimated to carry 80 per cent tungsten. The shoot is found in a quartz vein five feet wide that averages between $5 and $6 in gold. Besides this rich shoot there is much scheelite scattered through the quartz. A. B. Ward is in charge of the property and the control of the company is held by Col. Chester T. Kennan, E. J. Roberts and others of Spokane.

The Jim Blaine Silver Syndicate, which owns a group of twenty-five claims covering the triangle formed by the east and west forks of Pine creek, has started a crosscut tunnel which will be extended 1,500 ft. to cut several veins which have promising surface showings. The tunnel is a short distance below the Nabob mill and half a mile from the proposed railroad.

The Nabob Consolidated Mining Co., control of which is held by the Stewart Mining Co., is now operating its 150-ton mill full time. The mill is on Pine creek, about six miles from the railroad, and two motor trucks are used for delivering the concentrates for shipment, the two trucks handling ten tons a day. The ore is both lead-silver and zinc, the mill making a satisfactory separation and recovery of each.

ARIZONA

Jerome-Del Monte Assessment Work Progresses — Rich Ore Found on Mineral Creek—High School Students Trained in Assaying

Globe—The output of the Arizona Asbestos Association approximates two tons a day of sorted crude material, this shipped from Rice station on the Arizona Eastern R.R. to the Johns-Manville Co. in New York. The mine is in the Ash Creek section, forty miles north of Globe. Transportation is difficult, and in rainy weather burros have to be used to get the product down to the Fort Apache-Rice road. The labor is mainly Mexican.

J. S. Hubbell, a pioneer prospector, has found rich gold-silver ore near the head of Mineral Creek. The Old Dominion also has reduced its working force.

The Globe High School is doing assaying for local miners and prospectors. This new departure will be under charge of A. C. Swinson, assistant in the department of vocational education, and is intended primarily as training for the students.

Miami—Inspiration has further decreased production, shutting down another 4 units of its mill which now runs 10 units, and suspending all Sunday work. About 150 men have been dropped from the payroll. Most of the men are foreigners and single.

Kingman—The Gold Ore mine at Gold Roads is drifting on its 650 level toward its No. 1 shaft, under which it is expected to cut a large body of commercial ore. In shallower openings this ore body was developed along 100 feet and showed value of $40 in gold. The ore

shoot is only one of several that have had partial development.

Oatman — United American at Oatman has crosscut five feet of good ore on its 665 level. The ore is believed to be a continuation of that found on the 400 level of the Tom Reed.

Jerome—Jerome-Del Monte is building a road from the Verde valley to its camp and will charge this work against its annual assessment development. Thomas Woods, president of the company, has come from Boston to supervise construction. He states that the company has no immediate intention of resuming mining development.

Stockholders of the Jerome Superior company have applied to the Arizona Corporation Commission for an investigation of the company's management. A hearing has been called at Los Angeles, Cal., where much of the stock is held. A reorganization will be attempted.

U. V. Extension has appealed to the Interstate Commerce Commission for a rehearing on the subject of coal rates from Gallup to Clemenceau. The same $2.50 a car for switching done by it for the Santa Fe lines at a time when the United Verde smelter at Clarkdale was closed.

MONTANA

Anaconda Production Half of Normal—Davis-Daly Driving a Raise to Surface from 1,700 Level—F. M. & S. Secure Neihart Interest

Butte—Closing of the Poulin, East Gray Rock and Alice properties, silver-zinc producers, has served to emphasize further the depressed condition of the zinc market. Anaconda is continuing its copper production at slightly under 50 per cent of normal, but there is little guarantee that this rate of output will continue.

Development work at the Colorado mine of the Davis-Daly company has been suspended, but a raise is being driven from the 1,700-ft. level to the surface for airshaft purposes. Production is at 70 per cent of capacity. The output of silver ore at the Hibernia is normal. Its new 500-hp. boiler plant is installed.

Output at Granite Mountain mine is at the rate of 70 per cent, according to the local office of the North Butte company. Development work is being slowed down.

Neihart—The Neihart silver mines have been closed temporarily, according to the announcement of the president of the company. It is necessary to complete some financial arrangements before proceeding farther with the mining and treating of the ore. The Guggenheims have become interested in the Silver Dike property, which covers ten claims. The deal has been completed through Frederick Burbridge, president and general manager of the Federal Mining & Smelting Co.

Development work is progressing on the Tuolumne Copper, Crystal Copper, and Butte-Plutus properties.

NEVADA

The Ely District

At the Ruth mine of the Nevada Consolidated Copper Co. the orebody opened up on the 700 ft. level on the contact of the lime and porphyry, proved to be 150 ft. long, 50 ft. wide and 60 ft. high, averaging over 7 per cent in copper content. Across ten feet lying next to the porphyry the ore carried values of 12 per cent copper, while small areas averaged 18 per cent of copper value with some gold and silver. The orebody is a secondary enrichment of the pyritic mass on the limestone side of the lime-porphyry contact. Drilling from the surface is already under way to prospect for such other similar bodies as may be present and a drill is now being designed for installation underground. When completed, this equipment will be used on the 700 ft. level of the mine to explore the downward extension of the orebody already opened up on the contact. The milling plant of the company at McGill is still being operated, although at greatly reduced capacity. The tests for flotation treatment have proved satisfactory.

The Pioche District

Pioche—The Black Metals Mining Co. have opened up a body of high grade carbonate ore on the 300 ft. level of the Day mine along the fissure. Muck samples of the broken ore assayed 29.7 oz. in silver; 15.7 per cent of lead and half of one per cent in copper content. Twenty-five tons of this ore have been broken down and while the extent of the discovery remains to be proven, a large tonnage of good ore is now in sight on that level.

The Hamburg Mines Co. has a car load of silver-lead ore ready for shipment. This ore will not be shipped under the present freight rates, according to Manager Pitts but will be left there till a more favorable tariff on ores is put in effect. Development work is being continued on the property although operations are being hampered by the heavy fall of snow in the Highland district.

The Silver Prince Consolidated Mining & Smelting Co. shipped a car of ore from the property at Mount Irish, near Hiko, this week. The lot was shipped through the agency of the Pioche Assay Office to the plant of the American Smelting & Refining Co. at Salt Lake City. According to R. P. Jones, superintendent of the property, additional shipments will be made soon should the conditions of the road permit the use of motor trucks throughout the winter months. High-grade ore has been struck in the main fissure opened up by the incline shaft on the Rosario mine, assays from this vein show 51.3 oz. of silver to the ton with 22.5 per cent lead, and a small amount of copper. Increased work will be done in the Hiko district as a result of the successful operation of the company in opening up ore of shipping grade.

COLORADO

Much Assessment Work Under Way—King Soloman Co. at Work—Vanadium Corporation Laying Off Men

Sawpit—The Vanadium Corporation of America has shut down its reduction plant and has laid off most of its miners. It is reported that the company cannot market its product from this district in competition with foreign vanadium products, which are richer than those mined in the United States, and it appears that steel men are giving the foreign product preference.

Utah Junction—The Ferro Alloys Co. is operating two of its furnaces on manganese ore from Mexico and chrome ore from its Wyoming property. The company is now in the market for local ore running high in manganese and low in iron and silica. The silica should not exceed 5 per cent. The company will test ores free of charge for producers operating in Colorado, New Mexico, and Wyoming. Nelson Franklin is general manager.

Montezuma—The King Solomon Mining Co., of Montana, is developing the old Dominion property, and has recently opened a pocket of high-grade ore carrying gold, silver, copper, and lead. The assay value of the material is over $250 a ton. James H. Myers is president and general manager.

Other properties that have recently been reopened in the district are the Bell, and Denver mines, and the Penn concentrating mill is in operation. There is a labor shortage in the camp, and it is reported that good miners are in demand at wages ranging from $5 to $6 per day.

Ouray—Recent developments seem to indicate that a good deal of substantial mining will be done here this winter, in spite of the general depression.

The Hidden Treasure silver-lead mine, which has done little for a long time, is to be operated. A company, unusually well financed and managed, is to operate the property. Development will begin promptly, and in all probability a mill will be built next year. Mining machinery is being bought in Ouray. E. R. Baur is at present in charge in Ouray.

Unusually well authenticated rumor says that the Camp Bird, drifting west from the main crosscut tunnel out under the zone of the big gold ore bodies above, has encountered a very large shoot of silver ore which has shown substantial dimensions already. The product of drifting is being kept in a special ore-dump outside. Milling may be resumed by next spring.

The test runs at the Gold Crown mill in Ouray by C. R. Wilfley and Delta associates have given interesting results and will probably result in the formation of a stock company to operate the Pony Express silver mine. A semi-oxidized silver ore was treated with good metallurgical results by simple flotation, although failure by this method with such ore was predicted.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Further Fires Reported—Mont B. Lawsuit Settled—New Hoisting Records Established

Several expensive fires have occurred in this district in the past fortnight. The Otis L. mill, southeast of Commerce, was completely destroyed on the morning of Nov. 12. The loss of about $50,000 was partly covered by insurance. Origin of the fire is unknown. It was owned by Otis L. White of Joplin, and it is understood it will be rebuilt on a smaller scale. The mine had been in successful operation for several weeks previous to the fire.

The Georgia concentrator, located northwest of the town of Picher, was burned on Nov. 15, with an approximate loss of $75,000, partly covered by insurance. The mine formerly was known as the Tiger No. 1 and had been owned by Carthage, Mo., investors. It was sold several months ago to Georgia people, who had been operating it. An odd circumstance was that the mill caught fire twice on Sunday, the day previous to its burning, both times the fire being extinguished.

The Skelton Lead & Zinc Co. lost its mill shaft No. 8 on Nov. 13, but by hard work the mill, known as the Lucky Kid, was saved.

Rolla Experiment Station will take up improvements in mill concentration.

Webb City—A quarter of a million dollars in cash was turned over to W. A. Rhea of Carthage this week by receivers in the Mont B. mining case, for five years a notable mining suit in this district. An appeal to the U. S. Supreme Court for a new trial was recently turned down and the long legal fight was at an end. When the Ananias Mining Co. failed in 1911 Rhea, the former superintendent, leased the land it had been working and other additional lands between Carterville and Webb City, and in the fall of 1913 began to accumulate a pile of zinc ore. At the time the war started in 1914 he had in excess of 5,000 tons, and inside of a year he had profits in excess of $330,000. Some of the former members of the Ananias company, however, filed suit against him, alleging that they were still interested in the property, never having signed away their interest. They obtained judgment to this effect in the district Federal court, but lost in the U. S. Circuit Court of Appeals.

Picher, Okla.—Hoistmen of this district have been engaging in informal contests for new records recently. On Nov. 9 Charles Howard and "Mike" Dougherty, hoistman and hooker, respectively, for the Eagle-Picher Lead Co.'s No. 9 mine, hoisted 909 cans, 1,250 lb. capacity each, in one 8-hr. shift. The distance lifted was 270 ft. This record had been beaten in 1919, but on Nov. 15 N. D. Wolf, hoistman, and L. Baccus, hooker, of Howe Mining Co., sent up 1,034 cans, of 1,250 lb. capacity, in an 8 hr. shift, the hoisting distance being 264 ft.

ARKANSAS

New Manganese Properties Starting—Southern Hill Planning Large Washer—Outlook Improving

Batesville—Interest continues in manganese mining in the Batesville field and the tonnage is increasing. A number of new properties have started up. W. A. McCurry has started operations on a tract near Penters Bluff and is making a fair production of boulder ore. The Eureka and Southern Hill properties have been consolidated and extentive improvements in equipment for the Southern Hill is planned. One of the largest washing plants in the field is contemplated for that place. Stanley Hanford, who has been operating the Rogers mine, has also opened up a property near Pfeiffer. He shipped 200 tons of ore last week that averaged 40 per cent metallic manganese.

J. R. Wilson, in charge of the Ball mine near this place, is already equipped with a modern washing and concentrating plant and is encouraged by the experimental work he has been doing. Besides the log washers this plant is equipped with rolls, rougher and cleaner jigs and tables. With this equipment a considerable part of the silica in the ore is eliminated.

The field began to recover from the slump caused by the armistice about May 1, and operations have slowly increased since that time. The production since that time has been roughly estimated at 10,000 tons. The outlook for near year seems promising, but prices are the big factors. If they hold operations will continue and increase.

MICHIGAN

The Copper District

Hancock Consolidated Dam Complete—New Baltic Bottoms in Vein—Mohawk, Michigan and Wolverine Cut Wages

The construction of the concrete dam at the 53d level of the Hancock Consolidated Mining Co.'s property has been completed and all activities both underground and on surface have ceased. Resumption work will depend entirely on the metal market and cost of supplies, and at this time seems to be a remote contingency.

The New Baltic shaft of the Arcadian Consolidated Copper Co. is bottomed at the 700 ft. level. It is in the vein, which appears to be as well mineralized as where tapped in the upper levels. It is now proposed to keep on sinking to the 750 level before cutting a plat.

The last few tons of coal are being removed from the old Union Coal dock at Dollar Bay, preparatory to abandoning this equipment. This dock was erected about 25 years ago by the Tamarack Mining Co. to serve all the then existing Bigelow mines. It was included with other Tamarack property purchased by the Calumet & Hecla some five years ago. All coal for the Calumet & Hecla and subsidiaries will in the future be handled by the large plant at Hubbell which is equipped with the most modern coal handling machinery.

The Mohawk Mining Co., the Wolverine Copper Mining Co. and the Michigan Copper Mining Co. have announced a general cut in wages and salaries of 15 per cent effective Nov. 16, 1920. The management also announce that they will bring production up to the normal pre-war rate as rapidly as possible. Their output has been subnormal for a number of years, due to labor shortage. They are now operating at about 80 per cent of maximum but should rapidly reach 100 per cent, as the Calumet & Hecla group of mines are reducing production, thus releasing labor that will be available to these mines.

MINNESOTA

Cuyuna Range

Crosby—All producers on the Cuyuna have suspended shipments, owing to the freezing weather, with the exception of the Bonnie Belle mine at Ironton, operated by the Marcus Fay interests, which is an all-rail shipper to the Zenith Furnace Co., Duluth. Several of the operators have not yet completed their season's contracts, and with an ease-up of congestion at the docks or a mild spell in the weather, some of these may make further shipments before navigation is closed.

Ironton—Orders have been received from the American Managanese Manufacturing Co. to close down their Cuyuna-Duluth mine for the winter season. This action comes as a surprise, as stock-pile trestles were being constructed and preparations made for continuous operation this year.

Mesabi Range

Hibbing—The Rogers Brown Ore Co. are driving a drainage drift from the present drainage shaft to connect with a new shaft which they are sinking on on the south side of their pit. This drift will allow all pumping to be done by the present installation of pumps in the old drainage shaft. The progress of the drift has been delayed by the encountering of large quantities of water. From this new shaft all underground development will take place as at present, most of the ore is mined by open-pit methods.

Chisholm — The Oliver Iron Mining Co. has started two diamond drills at the Duncan mine. Work has been started on the development of the Frazier pit. At present tracks are being laid to the approach of the pit and it is contemplated to sink a drainage shaft and drive drainage drifts this winter, preparatory to stripping next summer.

Nashwauk — The Hill Trumble mine of the Cleveland Cliffs Iron Mining Co. have completed their shipments from their washing plant and open pit. The steam shovels are now busy stripping to uncover additional ore for next season.

Virginia—Properties of the Oliver Iron Mining Co. in this district received notice to increase their shipments the first part of last week.

THE MARKET REPORT

Daily Prices of Metals

Nov	Copper, N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
18	14.35	36.00	37.00@37.25	6.00	6.00	6.05
19	14.25	35.00	36.00@36.25	6.00	6.00	6.00@6.05
20	14.00@14.25	35.50	36.50@36.75	6.00	6.00	6.00
22	13.85@14.00	35.25	36.25@36.50	5.65	5.65	5.95
23	13.85	35.00	36.25@36.50	5.50	5.50	5.80
24	13.60@13.85	35.00	36.25@36.50	5.50	5.50	5.80

*These prices correspond to the following quotations for copper, "delivered": 14.50, 14.40, 14.15@14.40, 14@14.15, 14, and 13.75@14c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Nov.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
18	83⅛	83⅜	94	246½	249⅝	32⅞	32¼	35⅜	36⅛
19	81¼	81¼	93	239½	243¾	32½	31¼	34¼	35½
20	....	....	...	..	....			...	
22	78½	79	90	231	234	30¾	29¾	33½	34⅞
23	78½	79	90	230¾	234⅜	29	29	33½	34⅞
24	78½	79	90	231	235	28¾	29	33⅜	34¾

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Nov.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Nov	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
18	346	99⅛	78	50⅜	22	348	99⅛	74	47¾
19	344	99⅛	76⅛	49⅞	23	350	99⅛	73⅜	47⅛
20	345	99⅛	75	49	24	347½	99⅛	72	46¼

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Nov. 24, 1920

Almost a total lack of demand from consumers, coupled with the necessity of selling on the part of producers and traders, has had the inevitable result of continuing the decrease in metal prices. In fact, the downward tendency has been even more noticeable the last week than before. At the current prices of copper, lead, and zinc, many producers are refusing to sell, and the metal is obtainable only from certain interests who are willing to reduce prices sufficiently to tempt buying. Naturally, practically no business is being done by others, so that these sales fix the market regardless of other quotations, which are purely nominal and which are likely to vary over a wide range on the same day.

With the Thanksgiving holiday tomorrow, and with the market as weak as it is, practically no business is likely to be done before Monday.

Copper

Not for some time have sales been as small as during the last week. Consuming demand has utterly vanished. One or two inquiries have been made for second-quarter delivery next year, but producers do not care to go so far ahead, and, in fact, many producers will not consider business for any delivery at less than 14.50@14.75c. delivered. Some second-hands have been selling small amounts at 14.25c. delivered. On Monday, one fairly large lot, for these times, was sold for delivery early in the year at 14c., and yesterday another lot at the same price, so that we consider the 14c. price to have been established. In fact, large lots of spot metal could be obtained today for 13.75c., and in London American copper was today offered f.a.s. New York at considerably under this figure.

Note—The quotation for New York Electrolytic Copper for Nov. 17 was incorrectly stated, in our issue of Nov. 20, as 14.35@14.60. The correct quotation for Nov. 17 is 14.35@14.50.

Lead

Following the market trend, the American Smelting & Refining Co. again reduced its official price of lead late Monday afternoon, Nov. 22, from 6.50 to 6c. New York and St. Louis.

Lead has been very weak, with business insignificant, as is bound to be the case with a rapidly falling market which shows no signs of stopping. Those who customarily buy carloads are buying in five-ton lots. Larger consumers, in general, have stocks sufficient to carry them over the year-end. The prospect of the Broken Hill production of 7,000 tons per month, which will begin in February, has had a depressing influence, particularly in London, where about three-quarters of this metal will be marketed. Here, the statistical position continues good, which is the most that can be said. The market is not burdened by any large stocks such as exist in copper, and producers are generally in a good financial position, owing to recent prosperity. Producers of chemical lead are particularly independent at present prices, and exact considerable premiums for small orders. Should inquiries of any size come into the market, the premium would rapidly fade, as some plants can easily shift over to the production of chemical lead at no extra expense.

Zinc

With the further decline in London, expected support for the domestic market has been lacking, and the decline of close to five points a day, on an average, continues. The forced selling of a few hundred tons a week is largely brought about by the necessity for cash by the smaller producers.

Tin

A definite change has come about in the tin situation. The bankrupt metal which was pressing on the market seems to have disappeared. A large tonnage is reported to have passed into the hands of one consumer. With tin in stronger hands, the decline in London was met by firmness here, and it is unlikely that the New York spot price will continue much longer under the import cost. Sellers of forward tin are hard to find.

Banca tin has almost disappeared from the market and electrolytic is now held at a slight premium over Straits. Chinese No. 1 is somewhat scarcer, but offerings of this grade are still being made.

Straits tin for future delivery: Nov. 18th, 38.50@39.00c.; 19th, 37.25@37.75c.; 20th, 38.00@38.25c.; 22d, 37.75@38.00c.; 23d, 37.50@38.00c.; 24th, 37.50@38.00c.

Arrivals of tin in long tons: Nov. 20th, Singapore, 75; 22d, London, 100; 23d, China, 150.

Silver

The New York "Foreign Bullion" official quotation of 72c. on the 24th is the lowest figure since March 27, 1917, when the price was 71⅜c. Continued weakness in China exchanges is responsible for the sagging market. If still lower prices are reached, it is probable that India will become a buyer.

Gold

Gold in London: Nov. 18th, 117s. 2d.; 19th, 118s. 4d.; 22d, 117s.; 23d, 115s. 10d.; 24th, 117s. South African gold in excess of the requirements of the British and Indian treasuries is coming to this country and serves to make possible a further expansion of credit rather than to increase the gold reserve against outstanding notes. Previously during the year exports have been considerable. Between Jan. 1 and Nov. 10, total gold imports amounted to $333,836,965, whereas our gold exports were $297,300,783.

Foreign Exchange

The decline in European exchanges seems to have been arrested, and a much stronger tendency has been observed during the last week. On Tuesday, francs were 6.19c.; lire, 3.84c.; and marks, 1.44c. New York funds in Montreal have advanced to a premium of 13⅛ per cent.

Mexican Dollars—Nov. 18th, 59⅜; 19th, 58⅜; 20th, 57⅜; 22d, 56⅝; 23d, 56¼; 24th, 55.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c. Outside sales reported at lower prices than quoted above.

Antimony — Chinese and Japanese brands, 6c; market very quiet; W. C.C. brand, 8¼@8½c. per lb. Cookson's "C" grade, 12½@13c. Chinese needle antimony, lump, nominal at 5½c. per lb. Standard powdered needle antimony[1] (200 mesh), 9c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.55 per lb., 500-lb. lots, and $2.57 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40@$1.50 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.00 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100 lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$85 per oz. Dull.

Platinum—Firm at $85 per oz.

Quicksilver—Market quiet; $58@$60 per 75-lb. flask. San Francisco wires $55. Weak.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 60@65c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 70@75c.

[1]**Manganese Ore**—45c. per unit, seaport; chemical ore (MnO_2) $55@$65 per gross ton, lump; $75@$85 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 55@65c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

Tungsten Ore—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $6 f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.25@$4.50, in New York.

Uranium Ore (Carnotite)—$2.75@$3 per lb. for 96 per cent of the contained oxide (U_3O_8). Ores must contain a minimum of 2 per cent U_3O_8.

Vanadium Ore—$2 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 20—Zinc blende, per ton, high $47.30; basis 60 per cent zinc, premium, $36; Prime Western, settling, $45@$35; buying $37.50@$35; fines and slimes, $32.50@$30; calamine, basis 40 per cent zinc, $35. Average settling prices: Blende, $45.20; calamine, $38.62; all zinc ores, $45.05.

Lead, high, $104.05; basis 80 per cent lead, buying, $55; settling, $110@$55. Average settling price, all grades of lead, $76.26 per ton.

Shipments for the week: Blende, 9,427; calamine, 181; lead, 1,876 tons. Value, all ores the week, $575,910.

It is requiring no concerted effort now to get operators to shut down the mines. One after another is closing down as fast as the business can be satisfactorily adjusted.

A reaction toward heavier buying was initiated this week, with the decline to $35 basis, one concern taking 1,000 tons $37.50 and 3,400 on $35 basis. Another bought 1,500 tons $35 basis.

Platteville, Wis., Nov. 20—No quotations are available for lead and zinc ore. The market is demoralized. Only one roaster, the National, made shipments of finished blende during the week. Further curtailment of overhead expense and reduction in wages are being tried, to avert a complete shutdown of mines still in operation. Shipments for the week: Blende, 291 tons. Shipments for the year: Blende, 58,812; calamine, 2,534; lead, 4,428; sulphur ore, 1,342 tons. Shipped during the week to separating plants 2,177 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $8@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $22.50 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

ical or enameling purposes, $60; lump, $17, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$18 per ton carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c. The higher lubricating grades sell for 11@40c., according to carbon content.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned—$36.50 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20@$1.40; No. 4, $2@$3; No. 3, $4.25@$5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45@$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $240 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1½-in. disks, No. 1, $1.60 per lb.; No. 2, $1.30. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $35 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike. Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60@$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 13@14c. per lb.; sulphide, powdered, 16@17c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225@$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 16@17c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $150, freight allowed; $145, f.o.b. seaboard bases; English, $145@$150, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $65, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $160.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 75@90c. per lb. of contained tungsten, f.o.b. works. Foreign, 70c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 24½c. per lb.; wire, 19c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Lead Sheets—Full lead sheets, 10½c.; cut lead sheets, 10¾c. in quantity, mill lots.

Nickel Silver — Unchanged at 35¾c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 22¼c.; sheathing, 22¼c.; rods, ⅜ to 3 in., 19¼c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@$50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55@$60.

Iron Trade Review

Pittsburgh, Nov. 23, 1920.

Operations at the independent steel mills continue to decrease rapidly. Many of the larger and smaller independents are operating at 60 per cent or less. The almost universal decrease in operations is not what was expected a few weeks ago, by reason of the independents being so variously situated as to the volume of business on books, but it now seems that those with the larger quantities of business were subject to correspondingly more cancellations and postponements. As to the Steel Corporation, it is of course operating as formerly up to the limit of fuel and car supplies.

A moderate improvement over the present stagnation in markets is expected after the turn of the year.

Pig Iron—On a 500-ton sale, foundry iron has declined $1 to $39, Valley, and further inquiry would probably develop lower prices. In basic, the offerings of steel works formerly using all their output themselves is a factor. Basic has been offered at $35, Valley, and bessemer at $37.50, with little or no tonnage taken, representing declines in the week of $4.50 and $3.50 respectively.

Semi-finished Steel—The market is too inactive to develop definite prices. The nominal quotation of $55 has yielded to definite information that $50 could be done by buyers. Sheet bars, nominally quoted by mills at $60, are understood to have been sold by one independent at the Steel Corporation price of $47.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $10@$12; foundry, $8@$10.

The Effect of Imported Lead

Unusually Large Amounts of Foreign Origin Have Arrived Recently, Whereas Exports Have Dropped—Lead Production Costs Lowered by Cheaper Fuel—Importance of the Resumption of Operations at Broken Hill—Demand for Lead Dull

ONE of the chief causes for the recent decline in the price of lead from 9c. in August to 5½c. toward the end of November is the surprisingly large amount of lead that has been lately imported into the United States. The table of movements of lead to and from the United States given below has been prepared to show exactly how the foreign commerce in lead has varied during the first nine months of the year.

In the first half of 1920, the largest quantities of imported lead came, as is ordinarily the case, from Mexico. In August heavy imports of pig lead bars and old lead from Europe set in, and though an unusually large amount for that class of material, the quantity was more than doubled by similar imports in September. The table clearly brings out the rapid increase in lead imports.

At the same time, exports of lead have materially fallen off. Earlier in the year they averaged about 5,000,000 lb. monthly from foreign and domestic ores. In August and September they had dropped to about 700,000 and 2,260,000 lb., respectively. These figures are all the more significant when comparison is made with the record of previous years. Thus in 1919 a total of 141,813,127 lb. of lead was imported, of which pigs, bars, and old lead accounted for only 10,214,753 lb. In 1920 in the months of August and September alone, more pig, bar, and old lead was imported than in 1918 and 1919 put together. Pre-war importations of pigs, bars, and old lead averaged about 3,190,000 lb. annually.

That the heavy importations of lead have altered the complexion of the market there can be no doubt, but their effect can also be overestimated, as the lead industry is singularly free of surplus stocks, and there is no overproduction in the trade. In fact, it would appear that production this year will be smaller than that of last year.

The drop in lead prices is somewhat cushioned by the general drop in the price of some commodities which go to make up the cost of production. Coal in particular, for which one large operator in southeast Missouri paid $8 per ton, has dropped to $5, and as the smelters in this district use about three tons of coal per ton of lead produced, the saving amounts to almost half a cent. However, high freight rates are working to the detriment of lowered costs. The Rocky Mountain lead producer is hardest hit by the high rates, and considering the effect of the increased charge on the materials entering into the manufacture of lead and the transportation of the product, in all probability about ¾c. is added to the cost of production.

One serious indication in the industry is the decided drop in the demand for certain lead products for which the sale has been at times very brisk. Paint consumption continues good, but lead pipe, lead cable, and battery lead consumption has dropped about one-half. A revival of building construction upon a scale which is necessary to relieve the acute housing shortage will undoubtedly help the lead market considerably. A little lead is accumulating, but the closing down of several properties both in the United States and Mexico will tend to keep the surplus as low as possible.

The settlement of the protracted Broken Hill, Australia, strike which began in May, 1919, introduces another factor in the lead situation, and although Broken Hill lead is not expected upon the market before February, it is well to realize the strength of lead production from that part of the world. The following table gives the production of New South Wales for the ten years ending 1919, and as the Broken Hill district is by far the largest producing area, the figures may be considered representative of Broken Hill production:

	Lead Produced Within Australia in Short Tons	Lead in Lead Concentrates Exported From Australia in Short Tons
1910	94,818	85,035
1911	94,966	111,795
1912	101,811	92,736
1913	106,432	117,903
1914	99,925	88,173
1915	101,090	9,819
1916	128,438	16,428
1917	138,006	6,181
1918	155,306	3,178
1919	80,175	2,425

Australia is one of the world's chief lead-producing countries, ranking second or third in importance (its position cannot be accurately placed because of the unusual conditions of the past five years); in 1913 it ranked fourth, and the table illustrates how independent the continent has become of foreign smelting services. The Broken Hill Associated Proprietary, Ltd., possesses one of the largest lead smelters in the world, with an annual capacity of 175,000 tons of pig lead. The Sulphide Corporation, Ltd., Cockle Creek, N. S. W., has a lead refinery of 60,000 tons' annual capacity.

The supply of Australian lead may force the market down, although there is a possibility of Spanish and Australian producers being so placed that they will be able to control the European market. In such an event, Mexican lead must also be considered, as it could be marketed in Europe as well as here.

The London market on Nov. 16 and 17 took a pronounced drop from £34½ to £32 for spot metal. There had been an unwarrantedly high premium on prompt metal, which did not reflect the true condition of the London market. Too great a disparity was beginning to appear between the levels of the London and New York markets. At 5½c., New York lead is quoted at the lowest price so far this year, although it is still above the average pre-war price of 4.65c. per lb.

MOVEMENTS OF LEAD TO AND FROM THE UNITED STATES IN 1920
(In Pounds)

IMPORTS

From	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Mexico (a)	6,510,325	8,344,892	3,132,378	10,616,142	8,413,133	8,148,155	8,386,023	5,873,237	15,595,399
Canada (a)	544,358	331,139	1,141,974	809,928	208,880	1,040,480	458,079	745,237	576,477
Others (a)	329,506	400,557	7,375	3,454,068	260,154	362,687	2,474,125	21,085	4,223,665
Pigs, bars, and old	566,023	810,605	563,031	962,474	3,170,707	1,152,304	2,305,038	(b)7,403,826	(b)17,125,245
Totals	7,950,212	9,887,193	4,844,758	15,842,612	12,052,874	10,703,626	13,623,265	14,043,385	37,520,786

(a) Lead in ores, base bullion (b) Mainly from England.

EXPORTS

Lead from domestic ores	457,645	427,156	961,101	776,601	364,086	517,710	171,202	188,057	773,879
Lead from foreign ores	2,134,520	5,855,399	4,894,156	5,894,164	4,785,752	3,331,146	574,595	509,504	1,493,600
Totals	2,592,165	6,282,555	5,855,257	6,670,765	5,149,838	4,048,856	745,797	697,561	2,267,479

COMPANY REPORTS

Consolidated Interstate-Callahan Shuts Down

Lead, Zinc: Idaho

The report of operations of the Consolidated Interstate-Callahan Mining Co. for the third quarter of the year 1920 follows and indicates a deficit for the period:

Net value of shipments	$320,076.25
Miscellaneous receipts	1,849.22
Total income	$321,925.47
Production costs, expenses, taxes, etc.	339,310.79
Loss from operations	$17,385.32
Cost of improvements	10,986.49
Deficit for the period	$28,371.81

There were 50,379 tons mined and 36,441 tons milled of an average ore content of 12.27 per cent zinc, 6.62 per cent lead, and 2.43 oz. silver. Total zinc in zinc concentrates shipped was 6,875,296 lb.; lead, 3,607,242 lb.; silver, 61,190 oz. Cost of mining, crushing and sorting was $4.646 per ton mined; cost of milling and flotation royalties per ton milled, $2.306 per ton.

During the third quarter of the current year shipments of zinc and lead-silver ore and concentrates were 1,770 dry tons less than for the preceding quarter, this falling off being accounted for by the continued scarcity of miners, which condition obtained until the last half of September. During the month of October this condition showed a marked improvement, and as a result shipments during last month were 600 tons higher than the monthly average of the quarter ending Sept. 30. Mining and milling costs have remained practically unchanged during the period.

The company has completed the purchase of an additional amount of Killbuck Mining Co. stock, giving total holdings of approximately 80 per cent of the outstanding capitalization of this company. The development work on the Chicago-Boston property has been vigorously prosecuted, the shaft having been completed to the 400-ft. level, and the crosscut is well under way to intercept the orebody which was encountered 200 ft. above. Work on the Nipsic crosscut is progressing rapidly, as is also the work on the No. 8 and No. 10 levels of the Interstate-Callahan mine, but it has not yet reached the point where the full extent and value of these orebodies have been definitely determined.

Owing to labor troubles at the plants of the Grasselli Chemical Co., the purchasers of Interstate-Callahan zinc product, and that company's request that zinc shipments be suspended for an indeterminate period, the general manager was instructed to suspend milling operations and shipments on Oct. 31. Until shipments are resumed, mining and developing operations, as outlined above, will be continued with a reduced working force.

Lena Goldfields, Ltd.

Gold: Siberia

The tenth annual report of Lena Goldfields, Ltd., a British corporation operating in Siberia, reflects in its accounts for the year ended Sept. 30, 1919, the disorganized state of affairs in that vast region. No accounts were received from Russia during the fiscal year, the postal service between Petrograd and London being closed. The issued capital remains at 1,405,000 shares of £1 each, the full amount authorized. The assets of the company increased in value during the year by £154,895 8s. 11d., bringing them to £759,275 8s. 8d. At the same time rouble assets diminished by Rs. 4,673,649.99 to Rs. 41,705,397.18. There were purchased 45,000 shares of Altai Mines, Ltd., for £1,122,616 13s. 4d., representing 45 per cent control of that property.

An account "Loss on Exchange," amounting to £496,691 16s. 2d., was made to adjust the sterling values shown in previous balance sheets to the latest ascertainable nominal rate for the rouble. In the absence of an accurate report, C. W. Purington forecasts the gold output of the Lenskoie mines for 1919 at about 245,000 troy ounces, from 600,000 cu.yd. of drifting gravel. In May, 1919, there were said to be 1,500 men working on the property, 50 per cent being Russian, 25 per cent Chinese, and 25 per cent Korean.

Utah Copper Has Large Deficit

Copper: Utah

The fiftieth quarterly report of the Utah Copper Co., covering the third quarter of 1920, states that the gross production of copper contained in concentrates for the quarter and the preceding quarter was 24,740,734 lb. and 28,697,127 lb., respectively. In addition to the above, there was produced a total of 59,277 lb. of copper contained in precipitates shipped from the mine, and 531,206 lb. in precipitates from the leaching plant. The net production of marketable copper derived from this gross output for the quarter after allowing for smelter deductions was 24,103,161 lb., as compared with a net production of 27,793,114 lb. for the quarter ended June 30, and of 26,057,667 lb. net for the first quarter of the current year.

During the period there were treated at the Arthur plant 1,497,900 dry tons, being 69,300 tons more than the preceding quarter. The average grade of the ore was 1.0786 per cent copper and the average recovery was 76.57 per cent, as compared with 1.2130 per cent copper and 82.80 per cent, respectively, for the second quarter. The decrease in production and the lower percentage of recovery were because of the lower copper content in the headings. The low headings were due to the large quantity of very low-grade ore necessarily shipped from the intermediate and upper steam-shovel levels.

The average cost per pound of net copper produced, including plant depreciation and all fixed and general charges, but excluding Federal taxes, and without credit for gold and silver or miscellaneous income, was 17.156c., as compared with 13.697c. for the previous quarter, calculated in the same way. The value of the gold and silver in the concentrates totaled $178,683, and the miscellaneous income, including Bingham & Garfield Ry. Co. dividend, amounted to $403,167. These items combined are equal to 2.414c. per net lb. of copper produced, which, being deducted from the operating cost above stated, results in a net cost of 14.74c. per lb. The following tabulation shows the financial results of operations for the quarter, as compared with the previous quarter:

	Third Quarter 1920	Second Quarter 1920
Net profit from copper production only	$329,022	$1,254,033
Miscellaneous income, including payments for gold and silver	581,850	736,312
Income from Nevada Cons. Copper Co.	250,125	250,125
Total net profit	$502,953	$2,240,470
Disbursements to stockholders	2,436,735	2,436,735
Net deficit	$1,933,781	$196,265
Loss		

The earnings for the quarter are computed on the basis of 15.971c. for copper, as against 18.209c. for the previous quarter. The low carrying price is due to the small sales of the metal made during the period and the increase in the amount of copper unsold and carried at 13.5c. per lb. The total net income for the nine months of the year to Sept. 30 inclusive was $5,614,013, or $3.45 per share. A quarterly distribution of $1.50 per share was made to stockholders on Sept. 30.

A daily average of 18,362 tons of ore and 2,325 tons of other freight was transported over the Bingham & Garfield Ry., making a total of 20,687 tons per day, as against 19,068 tons per day for the previous quarter. This increase was due to heavier shipments of ore from the Utah Copper mine.

MINING STOCKS

Week Ended November 20, 1920

Stock	Exch.	High	Low	Last	Last Div	
COPPER						
Adventure	Boston	60	53	*53		
Ahmeek	Boston	50	43	45	Sept '20, Q	.50
Alaska-B.C.	N. Y. Curb					
Allouez	Boston	20	18½	19	Mar. '19,	1 00
Anaconda	N. Y.	45½	37	38	Aug. '20, Q	1 00
Ariz. Com'l	Boston	8	6	7	Oct. '18,	50
Big Ledge	N. Y. Curb	⅞	⅝	⅝		
Bingham Mines	Boston	9¼	9⅛	9⅛	Sept. '19, Q	25
Calumet & Ariz.	Boston	51	44	44	Sept. '20, Q	1.00
Calumet & Hecla	Boston	251	248	249	June '20, Q	5 00
Canada Copper	N. Y. Curb			20		
Centennial	Boston	9	8	8	Dec. '18, SA	1 00
Cerro de Pasco	N. Y.	35½	30	31	Sept. '20, Q	1.00
Chief Consol	Boston Curb	⅜	⅜	⅜	Nov. '20, Q	10
Chile Copper	N. Y.	13⅛	12½	12½		
Chino	N. Y.	22	19½	20	Sept. '20, Q	37½
Columbus Rexall	Salt Lake	*36	*34½	*36		
Con. Ariz	N. Y. Curb			⅞	Dec. '18, Q	05
Con. Copper M	N. Y. Curb	2¼	2	2¼		
Copper Range	Boston	30	26	27	Sept. '20, Q	50
Crystal Copper	Boston Curb	*60	*48	*50		
Davis-Daly	Boston	6½	5½	5½	Mar. '20, Q	25
East Butte	Boston	9	7½	7½	Dec. '19, A	50
First Nat'l	Boston Curb	*80	*70	80	Feb. '19, SA	.15
Frankl'n	Boston	2¼	2¼	2¼		
Gadsden Copper	N. Y. Curb			*70		
Granby Consol	N. Y.	22½	19	20	May '19, Q	1 25
Greene Cananea	N. Y.	23½	19½	20	Aug. '20, Q	50
Hancock	Boston	3⅜	3	3		
Houghton	Boston Curb			*45		
Howe Sound	N. Y. Curb.	2	2½	2	Oct. '20, Q	05
Inspiration Con	N. Y.	38	31½	33	Oct. 20, Q	1.00
Iron Cap	Boston Curb	7	5	7	Sept. '20, K	.25
Isle Royale	Boston	21	18	18½	Sept. '19, SA	.50
Kennecott	N. Y.	20½	19	19½	Sept. '20 Q	50
Keweenaw	Boston	1⅝	1 7/16	1½		
Lake Copper	Boston	2½	2½	2½		
La Salle	Boston	2	1½	2		
Magma Chief	N. Y. Curb			*71		
Magma Copper	N. Y. Curb	23⅛	22½	22½	Jan. '19, Q	50
Majestic	Boston Curb			*12		
Mason Valley	Boston			1½		
Mass Consol	Boston	3	2½	2½	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	4	3⅜	3½		
Miami	N. Y.	17⅛	16½	16	Nov. '20, Q	.50
Michigan	Boston			3		
Mohawk	Boston	51	43½	43½	Nov. '20, Q	1 00
Mother Lode (new)	N. Y. Curb.	5½	5⅜	5⅜		
Nevada Con	N. Y.	10½	8	8½	Sept '20, Q	25
New Arcadian	Boston			2½		
New Baltic	Boston Curb			3		
New Cornelia	Boston	17	12½	12½	Aug '20,	.25
Nixon Nev.	N. Y. Curb			*5		
North Butte	Boston	11	10	10	Oct. '18, Q	.25
North Lake	Boston			*25		
Ohio Copper	N. Y. Curb			3/16		
Ojibway	Boston	1⅜	1⅜	1⅜		
Old Dominion	Boston	20½	17	17½	Dec. '18 Q	1 00
Osceola	Boston	28	23	23	June '20, Q	.50
Phelps Dodge	Open Mar.	†175	†150		Oct. '20, Q	2.50
Quincy	Boston	41½	37	37	Sept. '20, Q	1.00
Ray Con	N. Y.	13	10	10	June '20, Q	.25
Ray Hercules	Boston Curb			*61		
St. Mary's M. L.	Boston	33	29	29	June '20, K	2.00
Seneca Copper	Boston	18½	16½	17⅜		
Shannon	Boston	1⅛	1	1	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	6½	5⅛	5½	Jan. 20 Q	25
South Lake	Boston			2		
South Utah	Boston	*8	*5	*8		
Superior Copper	Boston	4	3½	4	Apr. '17,	1.00
Superior & Boston	Boston	2½	2	2		
Tenn. C. & C.	N. Y.	9	7½	7½	May '18, I	1.00
Tuolumne	Boston	*42	*40	*42	May '13,	.10
United Verde Ex.	Boston Curb	*27	*17	*25	Nov '20, Q	.50
Utah Consol	Boston	4½	3½	3½	Sept '18,	.25
Utah Copper	N. Y.	54	49⅝	51⅛	Sept. '20, Q	1.50
Utah M. & T.	Boston	1⅛	1	1	Dec. '17,	.30
Victoria	Boston			1¾		
Winona	Boston	*50	*40	*50		
Wolverine	Boston	10½	10	10	Jan. '20, Q	.50
LEAD						
Heca Mining	N. Y. Curb.	4⅛	4⅛	4⅛	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14	13½	13⅜	Sept '20, QX	50
Stewart	Boston Curb			*13	Dec. '15,	.05
Utah Apex	Boston	3	2⅛	2½	Nov. '20, Q	.25
ZINC						
Am. Z. L. & S.	N. Y.	8½	7	8	May '17,	1.00
Am. Z. L. & S. pf.	N. Y.	34½	33	34	Nov. '20, Q	1.50
Butte C. & Z.	N. Y.	5½	4½	5	June '18, I	.50
Butte & Superior	N. Y.	12½	10½	10½	Sept. '17,	1.25
Con. Interst. Cal.	N. Y.	8	6½	7½	June '20, Q	.50
New Jersey Z.	N. Y. Curb.	152	155	155	Nov '20, Q	4.00
Success	N. Y. Curb.	2½	1½	2	July '16,	.03
Yellow Pine	Los Angeles			*85	June 20, Q	.03

Stock	Exch	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	⅜	1½	1½		
Alaska Juneau	N. Y.	1⅛	1⅛	1⅛		
Carson Hill	N. Y. Curb			22½		
Cresson Consol G	N. Y. Curb	⅛	⅛	⅛	June '20, Q	.10
Dome Ex.	Toronto	*46	*46	*46		
Dome Mines	N. Y.	12	11½	11⅝	Oct '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡		*73	Sept '20, Q	.02
Goldfield Con.	N. Y. Curb.	*8	*7	*8	Dec. '19,	05
Hedley	Boston			41	June '19,	10
Hollinger Con.	Toronto	5 58	5 47	5 58	Nov '20, X	.05
Homestake	N. Y.	50	49	50	Sept. '19,	.50
Kirkland Lake	Toronto	*45	40	*41		
Lake Shore	Toronto	1 02	1 02	1 02	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	1 92	1 89	1 90	Sept '20, K	.05
Porcupine Crown	Toronto	*21	*21	*21	July '17,	.03
Portland	Colo. Sprgs	‡		*60	Oct. '20, Q	.01
Reorganization	N. Y. Curb	*4½	*3⅛	4	May '19,	.05
Silver Pick	N. Y. Curb	*¼	*5	*5		
Teck Hughes	Toronto	6	*¼	*¼		
Tom Reed	Los Angeles	1 45	1 39	1 40	Dec. '19,	02
United Eastern	N. Y. Curb.	2	⅞	⅞	Oct. '20, Q	15
Vindicator Consol	Colo. Sprgs.	‡		*18	Jan. '20, Q	.01
West Dome Consol	Toronto	*5½	*5	*5		
White Caps Min.	N. Y. Curb.	*7½	*5	*7		
Yukon Gold	Boston Curb			1½	June '18,	02½
SILVER						
Arizona Silver	Boston Curb	*28	*18	*23	Apr '20, M	03
Beaver Con.	Toronto	*34	*32	*32	May '20, K	.03
Conagas	Toronto	2 35	2 35	2 35	Nov '20, Q	.12½
Crown Reserve	Toronto	*20	*20	*20	Jan. '17,	.05
Kerr Lake	Boston	3½	3	3	Oct. '20, K	12½
La Rose	Toronto	*28½	*26	*30	Apr. '18,	02
McKinley-Dar.	Toronto	47	*47	*47	Oct. '20, Q	03
Mining Corp.	Toronto	1 65	1 60	1 63	Sept '20, Q	.12½
Nipissing	N. Y. Curb	8⅛	8	8⅛	Oct. '20, QX	50
Ontario Silver	N. Y.	4	3½	3½	Jan. '19, Q	50
Ophir Silver	N. Y. Curb	1⅛	⅞	⅞	Jan. '12,	.10
Peterson Lake	Toronto	*11½	*11½	*11½	Jan. '17,	01½
Temiskaming	Toronto	*29½	*25	*25½	Jan. '20, K	04
Trethewey	Toronto	*25½	*21½	*23	Jan. '19,	05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*1	*1	*1		
Barnes-King	Butte	‡		1 11	Aug. '20, Q	.05
Bost. & Mont.	Boston			*63		
Cashboy	N. Y. Curb.	*8½	*6½	6½		
El Salvador	N. Y. Curb	⅞	⅝	⅝		
Jim Butler	N. Y. Curb	*18	*16	*17	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*6½	*5	*6	June '16,	05
Louisiana Con.	N. Y. Curb.	1/32	1/32	1/32		
MacNamara M.	N. Y. Curb.	⅛	3/32	⅛	May '10,	02½
N.Y. Hond. Rosar.	Open Mar.	11½	10½		Oct. '20, QX	50
Tonopah-Belmont	N. Y. Curb.	1⅛	1 3/16	1⅛	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1 3/16	1	1 3/16		
Tonopah Ex.	N. Y. Curb	1⅛	1⅛	1⅛	Oct '20, Q	.05
Tonopah Mining	N. Y. Curb.	1⅛	1	1⅛	Oct. '20, SA	05
West End Con.	N. Y. Curb.	1⅛	1	1⅛	Dec. '19 SA	05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*19	*16	*18	July. '20, M	.01
Consol. M. & S.	Montreal	21	20½	20½	Oct. '20, Q	.62½
Daly Mining	Salt Lake			2 40	July '20, Q	10
Daly-West	Boston	4⅛	4½	4	Oct '20, Q	.25
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q	.10
Electric Point	Spokane			*14	May '20, SA	.03
Fed. M. & S.	N. Y.	8	6⅛	6⅛	Jan. '09,	1.50
Fed. M. & S. pf	N. Y.	31	29½	29½	Sept '20, Q	1.75
Florence Silver	Spokane			*25	Apr. '15,	.01
Grand Central	Salt Lake			*37	June '20, K	03
Iron Blossom	N. Y. Curb	*23	*23	*23	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake			3 82	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*10	*9	*10		
Prince Consol.	N. Y. Curb	1/32	1/32	1/32	Nov. '17,	02½
Rambler-Cariboo	Spokane			*8	Feb. '19,	.01
Ray Con.	N. Y. Curb	*5½	*4½	*5		
South Hecla	Salt Lake	70	70	*70	Sept '19, K	.15
Stand. S. L.	N. Y. Curb	⅜	⅜	⅜	Oct. 17,	05
Tamarack-Custer	Spokane	2 40	2 00	2 20	Dec. '19, K	.03
Tintic Standard	Salt Lake	3 77½	3 27½	3 77½	June '20, Q	10
Wilbert Mining	N. Y. Curb	*3	*2½	*3	Nov. '17,	01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	15⅜	14⅛	14⅜	Mar. '19,	.50
Internat'l Nick.pf	N. Y.	83	82	83	Nov '20, Q	1 50
QUICKSILVER						
New Idrin	Boston	2½	2	2	Jan '19,	25
TUNGSTEN						
Mojave Tungsten	Boston Curb			9		
VANADIUM						
Vanadium Corp	N. Y.	51	41½	45	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	85	82	83	Oct '20, Q	1 50
Asbestos Corp. pf.	Montreal	95	93½	94½	Oct '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S. & R.	N. Y.	53½	42	44	Sept. '20, Q	1 00
Am. S. & R.pf.	N. Y.	88½	86½	86½	Sept. '20, Q	1.75
Am. Sm. pf. A	N. Y.	75	75	75	Oct '20, Q	1.50
U. S. Sm. R. & M.	N. Y.	47	41½	44½	Oct. '20, Q	1.50
U.S.S.R.& M. pf.	Boston	44	41	42	Oct. '20, Q	.87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly. SA, Semi-annually. BM, bimontbly. K, Irregular. I, Initial X, includes extra

Notable Machinery Exhibit at Denver Convention Of American Mining Congress

THE exhibit of mining and milling equipment that featured the convention of the American Mining Congress held at Denver Nov. 15 to 20 was, in its way, one of the best displays of the kind ever assembled. All available space, including the lobby and ballroom, on the ground floor of the Albany Hotel, was utilized, and the sidewalk outside was also ingeniously made use of to provide room for a large number of booths. The prominence and accessibility of the exhibit insured that the public, and in Denver this means the mining public, gave it due attention.

Several new things were displayed. A feature of the exhibit of the Ohio Brass Co. was a new electric arc welder of the dynamotor type, designed for 250-v. mine service and for 600-v. rail-

EXHIBITS OF CHARLES A. SCHIEREN CO. AND THE MINE & SMELTER SUPPLY CO.

way or mine service. The apparatus is an adaptation of the Wilson Welder & Metal Co.'s plastic arc system of electric welding. It is designed for delivering constant uniform current at the arc, regardless of the wide trolley voltage fluctuations met with in service. The metallic arc method of welding, which has proven most suitable for rail bonding, is used. The machine is designed for all kinds of shop welding, heavy and light. It is light enough to be handled by the ordinary bonding crew. The dynamotor unit, which is handled separately from the truck, weighs 370 lb. and the truck 275 lb. The machine is so designed as to be readily adjusted to any track gage.

The Denver Rock Drill & Manufacturing Co.'s display, of which a view is shown, gave prominence to the new Model 250 "Waughoist." This was mounted on the column seen at the extreme left of the accompanying cut. Another machine stripped of its casing may be seen on the table in the center. Both machines were operated from time to time for demonstration. This hoist weighs 325 lb., has a capacity of 3,000 lb. and uses 60 to 100 lb. air pressure. Its speed is 72 ft. per min., with a 1,000-lb. load at 60 lb. pressure; 95 ft. per min. at 80 lb. and 104 ft. per min. at 100 lb. The drum will hold 800 ft. of ½-in. steel cable; 500 ft. of ⅝-in. steel cable and 400 ft. of ¾-in. steel cable.

The same display also included several stopers, one of them being the new Model 75 self-rotating wet stoper; also five drifting machines, featuring the "Turbro," with independent rotation and hammer action. The new No. 90 combination auger sinker and the No. 95 dry rock sinker were also featured. A Sinclair portable tractor compressor, a Sinclair sharpener, and a Model 8 Waugh drill sharpener with dolly, dies and punching machine were also displayed.

Hendrie & Bolthoff Manufacturing & Supply Co. showed an Allen Vibrating Screen of the wet type. This consisted of three superimposed screens, making three finished sizes and an oversize and capable of handling 150 to 200 tons per 24 hours. About ¼ hp. is required to operate. The wet screen has a slope of 30 degrees against one of 12½ to 15 degrees for a dry screen, the latter being good for 15 to 20 tons per hour. The display also included a 22-hp. Vulcan electric hoist, a G. E. arc welder, a Universal crusher and a Beaudry "Champion" power hammer.

One of the largest exhibits was that of the Stearns Roger Manufacturing Co., of Denver, agents for Ingersoll-Rand, as well as for "Duriron" products. The display included a Model 5H Little Tugger hoist of 2,000-lb. capacity, as well as the older Model 1H Little Tugger of 1,000 lb. capacity. The new 1-R No. 50 sharpener with machine type pin-punch attachment was also exhibited. "Duriron" products, such as pumps, blowers, fan valves, and fittings, all made of this non-corrosive metal "Duriron," were shown. "Duriron" is thought to have possibilities as a material for making flotation machine impellers. A Stearns Roger overhung ball mill was also shown. This has a rough cast drum of hard white iron used without liners. The chief feature of this mill is the short length of the drum, which is one-half the diameter, thus giving a quick discharge. This mill is designed for closed circuit operation.

The Colorado Iron Works, of Denver, showed an interesting model, about 3 ft. long, of a Lowden dryer. The manufacturers claim that this is the only machine that will successfully handle without dust loss flotation concentrates and other extremely fine materials which form a sticky mass when wet. An Akins laboratory flotation and aëration machine was also displayed. This machine, the makers state, makes use of an entirely new principle in aëration and diffusion with a separate and accurate froth regulation for each cell. A 30-in. Akins classifier, capable of handling 100 tons of 48 mesh per 24 hours, was also to be seen. This is used for separating sand from slime and for dewatering and counter-current washing of granular material. An interesting model of an M-Z mine car was displayed. This is an automatic swivel dump car without any of the locking mechanism projecting from the body to be jammed or broken. This feature, it is said, will eliminate 75 per cent of the repairs on mine cars. A Colorado diaphragm pump, of a special type for handling thick pulp, was included in the exhibit. This has a straight line motion, adjustable stroke,

improved and accessible valves and other features. A special worm-gear reduction set, used on Portland filters, was also displayed.

A Butchart flotation machine was displayed by the inventor, W. A. Butchart, of Denver. This is a horizontal impeller machine, the action of which is based on a minimum of agitation and a maximum of aëration, resulting, it is claimed, in low power consumption and simplicity. A standard Butchart table was also shown.

The Crandall Packing Co., of Palmyra, N. Y., manufacturers of all kinds of packing, displayed samples of their many products. These included flax packings, pump valves, asbestos brake lining, valve discs, hose, waste, belting, matting and other products.

The Mine & Smelter Supply Co. had one of the most attractive booths in the exhibit. The varied nature and wide assortment of their stock of mining and milling equipment and supplies was well indicated by their display. Their booth, together with some of its attractive attendants, is shown in the accompanying illustration.

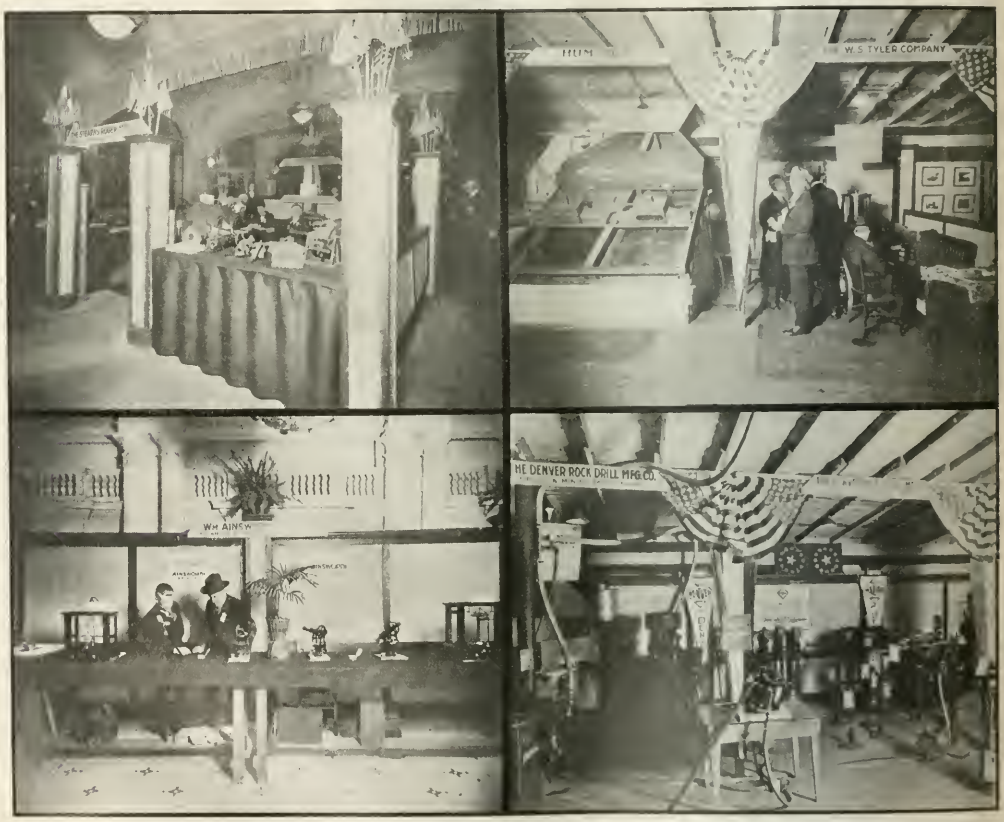
Brunton pocket transits, Ainsworth transits, together with Ainsworth precision balances, featured the display of William Ainsworth & Sons, which is to be seen in one of the cuts on this page.

Many other companies were represented by exhibits. The Hardinge company had its customary display of a 20 x 5-in. Hardinge mill and a glass model used for demonstrating the action of the balls and particles of ore that takes place within the mill during crushing. As usual, this interested many.

The Dorr Company showed models of the Dorr agitator, thickener and classifier. Their display was prominently located close to the spot where all delegates registered. Supplies for the assay office and laboratory, including mufflers, crucibles, scorifiers and the like, featured the exhibit of the Denver Fire Clay Co. Of all the displays that of the E. I. du Pont de Nemours company, showing mining explosives, had the most prominence, being situated in the center of the hotel lobby. This exhibit included "Minefab" (for covering concentrating tables and other purposes), ventilating tubing, high explosives, ivory pyralin, blasting accessories, "Fabrikoid" and flotation agents. The Hercules Powder Co. was also represented by an exhibit of explosives, blasting supplies and flotation oils. Its display included an educational exhibit of the raw materials going into explosives.

The W. S. Tyler Co., of Cleveland, Ohio, made its presence known by the aid of one of its 6-ft. unit Hum-mer electromagnetic vibrating screens. The vibration of this screen is produced by electromagnetic means, the intensity being readily controlled by varying the distance between armature and magnet. This display also included a Ro-tap testing sieve shaker and samples of wire cloth.

Charles A. Schieren Co.'s booth is shown in one of the accompanying illustrations. "Duxbak" waterproof leather belting was one of the features of this display. Adjoining this was the exhibit of the National Fuse & Powder Co., of Denver, part of whose booth may be seen in the cut on the preceding page.



W. S. TYLER CO.'S EXHIBIT SHOWN ABOVE OCCUPIED ONE OF THE BOOTHS ON THE SIDEWALK OUTSIDE OF THE ALBANY HOTEL

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Volume 110 New York, December 4, 1920 *Number* 23

Groping for the Light

THE discussions at the meetings of the Gold Conference in Denver disclosed clearly the mist that hangs in the minds of most persons concerning so complex a subject as the gold problem. Many of the speakers recited the decay of gold mining in various districts from which the speakers came, without analyzing how far this decay was due to the exhaustion of ore reserves by mining, and how far it was to be attributed to cost inflation brought on by the Great War. Certainly, no legislation can restore worked-out mines to vigor. Other speakers voiced the plaint that, during the war, the Government had urged the production of gold as a war necessity, and now should protect those enterprises which had so nobly and unselfishly rallied to the protection of their country. Of course this is bunk, and unconscious hypocrisy. The Government simply failed to put the gold industry on the black list, and Secretary McAdoo declared openly his recognition of the need for continued gold production. That any call was ever made that influenced the policy of gold producers in the least is not true.

But it was the economic and especially the monetary aspects that the conference was called upon to consider which proved to be of the tanglefoot variety. One gentleman wanted to know if it was not true that "Wall Street" was buying British gold for $27 an ounce and selling it for $32. Oh, you Wall Street! Naughty, naughty Wall Street! Even such a profound student of the problem as Gov. Boyle of Nevada was, it seems to us, unduly impressed by the theory of the "economists" that the rise of prices before the war was due to enormously increased gold production. The economists, like the rest of us, are groping for the light; and there were certainly other causes for the pre-war rise, notably the flow from the rural districts to the cities and the consequent decrease of production of raw materials per capita—if indeed the increased gold production was at all contributory in view of the also vastly increased volume of business. And in any case, the main inflation of prices, during the war, was certainly brought on by paper, and not by gold.

There was, in short, no clear conception as to the justification for the proposed measure—whether it was a war mineral relief measure, a measure designed to be protective of a domestic industry, a measure for the amelioration of the national currency, or one for the betterment of world economic conditions.

There is only one justification that can properly be urged upon Congress as an adequate reason for the passage of the McFadden Bill—that it is a relief measure to supply gold to help bolster up the dreadfully insufficient reserves on which rests the outstanding currency of the world: and this puts it upon a national and international basis. Believing it would have this effect, and be beneficial as a temporary measure, we support it.

Gold and High Prices

THE reason prices are so high, according to the opinion of a certain variety of common or garden economists, including several financial missionaries of current writers who undertake to educate the public through the popular magazines, is that we have so much gold. The gold reserve of the United States has doubled since 1913; also, prices have increased about 200 per cent since 1913. It is an economic axiom that the more the gold the cheaper it is, and the less it will buy; so that commodity prices rise. Therefore, the rise of prices since 1913 has been due to the vastly increased stock of gold. *Quod erat demonstrandum.* Throw away the gold, and prices of shoes and flour will fall. So runs the propaganda.

Well, let's see. Let us take the case of Austria. According to the London *Statist,* Austria's gold stocks fell from 51 million pounds in 1913 to 9 million in 1920. But prices, as the Viennese tell us, are fantastic. It takes a suitcase full of money to buy a drink, and a wagonload to buy a horse. In fact, prices are so high that they have gone beyond all rule and measure. In the case of Germany the country has also succeeded in keeping out the noxious cheap gold. Gold is not cheap in Germany: the stocks are somewhat less than they were in 1913. Yet it takes a thousand marks, or something like $240 par value, to buy a pair of shoes.

Nor is gold in other countries proving itself so common as to be cheap, or a thing to be reduced in the future. The gold reserves of France, according to the *Statist,* are 50 per cent greater than they were in 1913; even in Italy they are around 20 per cent larger. Yet all parties agree that the trouble with France and Italy is that they have not enough gold; that if they had more the franc and the lire would be worth more, and prices would come down.

The real determining factor as regards the relation between cheap money and high prices is evident, and was pointed out in a previous editorial. It is true that abundant money produces high prices for commodities, but in the world today—the whole world, practically—the cheap money is mainly paper. Prices of commodities will tend to decrease as the ratio of paper to gold reserve or "cover" decreases; and this can be accomplished by reducing the paper, or increasing the underlying gold security, or both. The most expeditious way is to do both; in fact, for countries like France and Italy, which are in a desperate condition of inflation, the double remedy is imperative, and is being eagerly sought by the countries in question.

To apply this remedy to the disordered financial world an added beneficial factor would be the maximum production of new gold, in addition to the supply of existing gold. When the critical stage of the inflation fever is passed—if it does pass without the bankruptcy of a number of European countries—will be time enough

to consider the relation of the volume of gold to existing commodities, and its effect on their price. We doubt if there will be any too much. The wealth and population of the "civilized" world have increased rapidly in recent decades, along with the building up of the world's gold reserve.

Minerals Separation at Denver

THE Flotation Conference in Denver was an interesting one. We have purposely avoided commenting on it editorially till now, in order to get the proper perspective lent by distance. For the first time, perhaps, an association of mine owners, many of whom were licensees of Minerals Separation, met the officials of that company for discussion, outside of a court of law. As it was, the meeting partook too much of the nature of a court proceeding, because the Mining Congress side was presented by two able attorneys, Mr. Nye and Mr. Montague, and because Minerals Separation also chose for its representative an attorney, Mr. Cook, its chief counsel.

The grievances of the Mining Congress against Minerals Separation were presented vigorously by the attorneys of the Congress, and in scathing terms. The reply of Mr. Cook consumed the entire afternoon of one session, and was good-humored, conciliatory, but vague. He described in general terms the fairness of the American public, the broad and liberal policies of his own company, the wrongful and wicked slanders under which his company had had to suffer, and the annoying tactics of the opponents of the company, without getting down to brass tacks. When his opponents immediately took the floor, and at once informed him that he had contributed nothing definite to the discussion, he was plainly disappointed and angry, and informed the Congress in effect that he had been exceedingly generous with it, and if it wanted to fight, why, come on.

Doubtless some explanation may be found for this attitude in the sharp attack—perhaps unnecessarily sharp and bitter in opening a conference between two parties—under which his adversaries in the debate had forced him to smart. Mr. Cook, however, made one helpful suggestion—perhaps the most constructive suggestion made at the conference—that the American Mining Congress should appoint a committee to confer with Minerals Separation and have a frank understanding as to how far they could agree, and a clear definition of the points on which they disagree. We understand that this will be done, and believe it a step in the right direction. This and possibly a better and more friendly understanding of each other by the opposing parties, due to each having expressed its opinion of the other frankly, were the chief points of progress; but no real advance, we believe, was made toward a satisfactory settlement of detailed points of difference.

To an observer who here studied the problem without conscious prejudice, it seemed that the Minerals Separation problem is a new and important one in our economic history. It is not a patent problem at all. To Minerals Separation belongs the credit of having invented a new thing. This discovery is, that by the aid of a multitude of interlocking patents and contracts, each carefully fitted to the other so as to make a coherent structure, a perpetual monopoly may be created, and yet the organization be quite within its legal rights—unless indeed it be deemed to come under the Sherman Anti-Trust Law. Minerals Separation, to defend its patent rights, early had to lean strongly upon its lawyers, and—this is the house that Jack built. It is really an architectural success, but one that the mining industry will look upon with increasing disfavor, and that it will continue to seek means for demolishing.

Anything that approaches exclusive power and the arbitrary exercise of that power is repugnant to the American spirit, and cannot long survive, however firmly entrenched in law.

There are two ways out of it. The better way is for concessions to be made on both sides: and for Minerals Separation to condemn its new invention, which, however fascinating in the model, will not work long on an operating scale; on the other hand, for users of the essential Minerals Separation process to recognize its fair (rather than its legal) patent rights. The other—the less desirable—will be to fight it out, with all the hostile forces of attempted strangling monopoly on the one side, and bitter near-socialistic feeling on the other; in which case there is no doubt that Minerals Separation will ultimately lose in its main contentions, and have to foot its campaign bills as well.

Locating a Bureau of Mines Station

THE decision some weeks ago to place the new Southern Station of the Bureau of Mines at Tuscaloosa, Ala., came, it is believed, as a disappointment to the Bureau itself. Placing it at Tuscaloosa determines its principal work as on iron and steel problems, and the Bureau is already in possession of iron and steel stations, such as the one at Minneapolis, which is given over entirely to those investigations, and the expensive plant at Pittsburgh, originally at least intended as the main iron and steel station.

It had been hoped that the Southern States station would be assigned to the interests of non-metallic mining, to whose broad problems no experiment station has yet been devoted; and that in this connection the chemical phase of the Bureau's work would here be centralized. Special political influence, it is understood, namely the efforts of Senator Oliver and Representative (now Senator-elect) Underwood, of Alabama, finally attached the station to Alabama's chariot wheel; and the indications are that the Bureau of Mines is having difficulty in knowing just what to do with it now that it is there. The Bureau's own choice for a location, we believe, was in Tennessee, a favorable situation for work on non-metallic minerals: but the Tennessee statesmen were not sufficiently awakened to what was going on before the station had found its resting place on the broad bosom of the steel corporations operating at Birmingham.

It is difficult to visualize and state these problems nicely and justly; but if it is true that, from motives of the ever-present and sometimes necessary but always dangerous expediency, the Bureau felt obliged to trade its own conviction for the political support of the powerful Southern Democrats, the subsequent landslide of Election Day, putting these same powerful politicians very much on the away back row, must have led to some philosophical reflection by the Bureau chiefs on the uncertainty of politics and the vanity of all things earthly.

The Futility of "Cribbing"

NOT infrequently we note in current publications an article which seems strangely familiar, and, upon closer scrutiny, we find that it is in fact an abstract, excerpt, or material which is skillfuly rewritten but nevertheless can be recognized as having appeared originally in our columns. There is missing, however, the usual credit line, and to this we take exception.

It is our practice, and one which is followed in most publications, we believe, to credit sources of information when they can be obtained. In some instances, we admit, there is the possibility of omission, for it must be obvious that we cannot be held entirely responsible for the sins of plagiarism committed by our contributors.

Early in the year we announced that it was not our intention to follow a "scissors and paste-pot" policy, and pledged ourselves to present to our readers as much original material as possible. Realizing, also, that there is much general and technical information of interest that appears elsewhere, we have not hesitated to publish extracts from other periodicals, reports and the like, but in rational amounts, and we have been only too glad to give full credit where credit was due.

Certainly we are glad to see our "stuff" in print—even editors have their vanities—for it not only affords a personal satisfaction but offers suggestions as to possible ways of improving the service we wish to render.

We do not believe ourselves incapable of error, and, therefore, we welcome all reasonable criticism and are only too glad to rectify such mistakes as may appear in our columns. There seems to be no hesitancy on the part of our contemporaries to attribute to us such faults as we may make; therefore, we ask, why not full credit for other material that they reprint, even if a different phraseology is used?

The discernment of reprinted information which is not properly credited may not be visible to the average reader, but to one who has prepared material for publication the effect is usually evident, and the futility of "cribbing" quite apparent.

Stamping Out a Dread Disease

THE questions of dust abatement and proper ventilation in mines have been extensively investigated by the Bureau of Mines, other organizations, and the individual companies, and it is hardly necessary to state that where measures have been taken to secure these and other healthful conditions the spread of pulmonary diseases has been in a large degree prevented.

In the metal-mining and related industries the death rate from tuberculosis is stated to be higher than that for other workingmen, and this is particularly true at copper, silver, and lead mines. The reason for this large number of deaths and greater amount of sickness in the mining industry is apparent, as conditions surrounding most phases of mining are accompanied by considerable dust, particularly hard, sharp, flinty particles. These enter the lungs and set up an irritation that makes fertile soil for the development of the tuberculosis germ.

It is also true, in this connection, that over 80 per cent of the miners are between the ages of fifteen and forty-four, when tuberculosis is always most prevalent. According to statistics, every third man who dies between these ages dies of tuberculosis, so that the problem of preventing this dread disease in industry is not alone one of humanitarian value, but also that of saving man power and millions of dollars in wasted production.

In an editorial published on Nov. 2, 1918, referring to the use of respirators in mining, we said: "Dust prevention may properly be considered as much a part of the duties of a mining engineer as mine surveying. The mine office should be equipped with dust-sampling apparatus, and regular surveys of dust conditions should be made a part of the routine work of a mine where there is a conspicuous or dangerous amount of dust. There is no panacea for dust, but by intelligent application of the various methods of prevention that mining practice has evolved, its pernicious effects may be greatly lessened, if not eliminated." This, of course, refers particularly to the suppression of the dust evil, but the responsibility for other healthful conditions is also incumbent upon the mine manager, and much may be done by him and his associates, not only in the actual work of pulmonary-disease prevention but in the spread of propaganda concerning tuberculosis.

The National Tuberculosis Association and its 1,200 affiliated agencies are fighting a winning war against tuberculosis. They have clearly demonstrated that proper community organization will control the disease. It costs money to develop community organization. The sale of Christmas seals furnished the funds. From Dec. 1 to Dec. 11 this annual sale will take place. By buying and using liberally the seals and health bonds, any mining man will help not only himself but his community.

Eating With Foreign Knives

THE editor of *The Canadian Mining Journal* complains that food eaten by Canadians "is cooked by Pennsylvania coal in a stove made from United States ore and served on a platter that came from Europe, or Japan, maybe. It is eaten with a Sheffield or Connecticut blade, and the platter is washed with soap from Chicago."

We do not think the situation is as black as painted. Would it not be better to say, for example, that the food is eaten with spoons and forks, rather than knives, plated with Ontario silver on base metal made up of Canadian copper, British Columbian zinc, and Ontario nickel? Furthermore, the food, even if partly foreign, is paid for with Ontario gold or with credit secured by the export of Quebec pulpwood or Saskatchewan wheat.

With the domestic population profitably employed, it is no disgrace to purchase what someone else can produce more cheaply, provided the supply is adequate. In the case of coal, we admit, it is not.

A Case of Depreciated United States Paper Currency

THERE was related to us at the Mining Congress the recent instance, which we believe, from our sources of information, to be entirely authentic, of a Colorado dentist who a few weeks ago bought $2,000 worth of gold in twenty-dollar gold pieces, paying $22 an ounce. The explanation given was that he would have had to have gold notes in order to secure gold from the Mint, and that the Colorado banks were not paying out gold on any other notes. Therefore, this dentist paid $22 in United States paper currency other than gold notes, for $20.67 in gold. Are there other authentic instances?

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WHAT OTHERS THINK

Conserving the Rights of Inventors

In one of your recent editorials entitled "The Government Employee and His Discoveries," objections are raised to the Cottrell Bill, providing for the taking over and licensing of inventions of Government employees by the Federal Trade Commission, on the ground that Government employees who have aspirations to invent, will under the provisions of this bill become unduly favored individuals. You say:

"He would be in an enviable position—nothing to lose for the time spent in his researches, for the Government would support him comfortably and indefinitely, and everything to gain. We can imagine what a horde of hungry inventors, who have had experience of being on the losing side of the gamble, would apply for the government jobs."

The same sentiment is expressed by David Wesson in the discussion on the bill. Quoting from the *Chemical & Metallurgical Engineering* article to which you refer, he is reported as saying:

"In the first place, it is well established by decision and precedent under United States patent law, that inventions by an employee using information and facilities of the employer belong to the latter. This, of course, would put employees of our great U. S. Corporation in a separate and privileged class."

It may be proper to say at this time that the authorities will not support the statement of law put forth by Mr. Wesson. It is well settled that when an employer, even the U. S. Government, hires an inventor to make improvements and to invent, unless there is an express agreement whereby the employee undertakes to turn over to the employer any inventions he may make, as well as the patents based thereon, the only right that the employer acquires is an implied license to use the invention, or what is otherwise designated as a shop right.

On the other hand, if an employer suggests the main plan of an invention, any inventions ancillary to the main plan devised by the employee will inure to the benefit of the employer, and the employer's patent may be drawn to cover them. The employer and employee in such cases, however, stand in the relationship of co-operating inventors.

The ruling of the courts on the first proposition is in accord with a pronounced tendency, which they have always exhibited, to conserve the rights of inventors. It is not with a spirit of charity for the inventor that they have taken this position, but, after having weighed all the factors, they have decided that such a policy is in accordance with the purposes for which the patent system was founded.

Our patent system has had its great success owing to its liberality to the inventors, with the consequent stimulus to invention. Might it not be possible still further to stimulate invention by further liberality toward the inventor? At least, Thomas A. Edison seems to think so. In a hearing last year before the Congressional Committee on Patents, he authorized his representatives to say:

"You might say that if there is any possible way whereby the law would in actual practice work out so that the inventor would be protected from the capitalist either by the impossibility of alienating his interests or in that a fixed per cent should always be his in spite of himself, it would be of great value to the people of the United States. The United States has very little interest in having inventions operated almost wholly for the benefit of the capitalist. Their interest is in providing money for the inventor to permit him to continue to invent, which he certainly will do as long as he commands a dollar. This is a natural peculiarity of the inventive mind."

It was stated at the hearing that the idea of Edison was not to benefit the inventor, but to benefit the people by making it possible for the inventor to continue his experiments, thereby developing new inventions which would not be developed under the present system.

In reaching a decision on the merits of this bill, therefore, it is to be hoped that proper consideration will be given to the policies and objects of the patent system. Is the principle underlying the bill a correct one and will it stimulate invention? Bearing on this question, Professor Elihu Thompson, the celebrated inventor, has recently said:

"Publish an invention freely, and it will almost surely die from lack of interest in its development. It will not be developed, and the world will not be benefited. Patent it and, if valuable, it will be taken up and developed into a business."

Having decided that the objects sought to be accomplished by the bill are in general accord with the policy of the patent system, the next question to be answered is, Is the bill properly drawn? If it is not properly drawn to carry out these objects, redraft the bill.

The tendency for the discussion to drift off from the real merits of the bill on to questions of patent policy that have been considered as well settled, is unfortunate. It is with the object of directing attention to the necessity of intelligent consideration of the untried features of the bill that this communication is written.

Washington, D. C. JOHN BOYLE, JR.

Specie Payments

Recently you called attention to the inability of one of your editors to obtain gold coins at the bank to which he applied for them. You made the very pointed statement that if there isn't enough gold to enable it to be fairly distributed, the banks can at least assist in stimulating production. Of course, the reason that it is difficult to obtain gold at any bank in spite of the enormous amount of gold in the country is the relatively low percentage of metallic gold reserves to the amount of paper money in circulation, and no doubt it is the desire of those in authority to conserve all the gold possible. So long as faith in our present system is unshaken the present condition will work, but it is mighty fortunate for us that there are no countries that we are indebted to, for our currency would then surely reflect its depreciation. F. G. ADAMSON.

Expenditures of the Bureau of Mines

An Official Explanation of the Use of the Bureau's Appropriations, With Special Reference to Recent Editorial Comment—Question Raised Whether Metal Mining Is Not Receiving More Than Its Proper Share of Attention

By Dr. F. G. Cottrell, Director
Written for *Engineering and Mining Journal*

THE editorial in the *Engineering and Mining Journal* of July 24, 1920, pp. 147-48, relating to the work and organization of the Bureau of Mines, asked if the Bureau was expending perhaps an undue portion of its funds in the interest of safety and at the expense of economic mining and metallurgical investigations. In addition, an analysis of the Bureau's appropriations was given, and the belief expressed that certain phases of the industry were receiving undue attention at the expense of others.

Frankly, it is probable that the Bureau appropriations are not balanced from the point of view of many men engaged in particular divisions of the industry. For example, attention has been forcibly directed to the fact that the appropriation for carrying out the work in petroleum and natural gas, supposedly falling within the Bureau's sphere, is entirely inadequate in proportion to the importance of the industry. It is equally true that the Bureau recently has been urged to devote more time and money to research in fuel testing, economic mining problems and to problems in the metallurgical and chemical industries. However, to get a clear perspective from the Bureau's point of view, it is necessary to go back to the beginning and ascertain what the Sixty-first Congress specifically had in mind when in 1910 it created the Bureau of Mines.

Attitude of Congress in Establishing the Bureau

For many years prior to this, efforts had been made to have the mining industry represented by a department in Washington, which would function in a manner similar to that of many foreign countries which have a cabinet officer directing a department which represents the mining and mineral industry. Specifically, however, the matter did not progress toward completion until 1907 and 1908, when a series of mine disasters occurred in America which took such an unusual toll of lives that the public and Congress were thoroughly awakened to the necessity of creating a bureau which could help in making the mines safer.

Statistics were presented which showed that the death and accident rate in the mining industry in America was greater than in European countries. Reports and hearings before Congress brought out clearly that mine operators felt they did not have the knowledge which would help them avoid similar disasters, and, perhaps of most significance, they felt that the problems involved such sums for their solution and the results were of such importance to the mining industry in all parts of the country that a central Federal agency was the best means of carrying out the needed work. Thus, in the organic law creating and continuing the Bureau the investigations relating to the safety of miners and prevention of accidents were particularly emphasized.

For these reasons the appropriations for mine accidents have consistently been the largest single appropriations given the Bureau. As stated in the editorial, including the appropriation for mine rescue cars and stations, this amounts to 43 per cent of the total money received. It is, perhaps, natural that the public should associate this appropriation with the first-aid and mine rescue training and its attendant slogan of "Safety First."

Many Branches of "Mine-Accident" Work

However, the term "Mine-Accident Appropriation" is only an abbreviated term used for convenience to cover an appropriation which reads as follows: "For investigations as to the cause of mine explosions, methods of mining, especially in relation to safety of miners, the appliances best adapted to prevent accidents, the possible improvements of conditions under which mining operations are carried on, the use of explosives and electricity, the prevention of accidents and other inquiries and technologic investigations pertinent to the mining industry," and this in turn covers both the coal- and metal-mining industries.

Thus, out of this fund comes not only about $112,000 for expenses of mine rescue cars and stations and direct first-aid and mine rescue training and disaster work, but more than $297,000 in addition which is devoted to the expenses of testing and research into explosives and the use of electricity and mechanical appliances underground, ventilation, coal- and metal-mine dust, and their relation to the health and safety of miners; the operation and maintenance of the fifteen Bureau schedules of approval for explosives and safe equipment underground, and the extensive field and experimental mine investigations relating to the prevention of explosions from coal dust and gas. In short, this appropriation not only supports the basic investigations of the fundamental problems pertaining to the improvement of health and safety conditions in the whole mineral industry but investigations which have the widest economic importance. Safety in mining has a significance today which is inseparably linked with efficiency and economy.

Of the $154,000 appropriated for operating mine rescue cars and stations, $126,000 is spent for the regular work of training and the remaining $28,000 for investigative work on subjects relating to the health and safety of the miner, which studies can be best carried out by the personnel of the rescue cars. Thus, of a total of $563,000 appropriated for "mine accidents" and "operating mine rescue cars," $238,000 is spent in so-called regular first-aid and mine rescue training and stations and cars and $297,000 is devoted to the investigational work as just described.

Concerning the mining experiment stations, of which there are ten distributed in mining districts throughout the country, and for which there is an annual expenditure of $200,000, it is a fair question for dis-

cussion as to whether the industry is better served by this number of stations, each small in itself, and by reason of their location peculiarly in touch with local needs and industries, or by having an equal amount of money spent in the construction of a single central large station, where, as at the Pittsburgh station of the Bureau, a trained corps of specialists is available on any problem. It is a fact that local industries prefer to have their problems worked out locally. Furthermore, the distributed stations are far more closely in touch with the general industry than a central station could be. At the same time, as brought out in the editorial, there is the possibility of multiplying overhead expenses, of loose co-ordination and possible duplication of work at the several scattered stations. The Bureau is trying to avoid these faults by close liaison and supervision of the stations through the central office of supervisor of stations. The Bureau believes that the results of the last year justify the continuance of the work at the individual stations. Furthermore, it believes thoroughly that certain industries, as, for example, the coal industry, have enough great and general problems to justify the building up of central stations of a larger magnitude than those represented by the so-called "Foster" or "Mining Experiment Stations Act," which receive only $25,000 per year.

Fuel testing and petroleum are subjects so definitely defined as to offer little chance of discussion as to the purposes of their expenditure.

The editorial states that mineral mining, including both coal and metal mining, receives 10 per cent only of the appropriations. Again there may possibly be misapprehension due to the use of the abbreviated term "mineral mining." Actually, none of the mineral mining appropriation money is expended in coal mining. The full estimate of the appropriation reads as follows: "For inquiries and scientific and technologic investigations concerning the mining, preparation, treatment and utilization of ores and other mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development and conserving resources through the prevention of waste in the mining, quarrying, metallurgical and other mineral industries." This includes a broad field, recognizing the need for economic work in the whole mineral mining, metallic and non-metallic, ore dressing, and allied fields of the treatment and utilization of the metals and minerals contained therein. Thus, many ore-dressing, metallurgical and economic studies are supported from this fund.

"Mineral Mining" Does Not Cover Coal Field

There has been a prevalent idea that the Bureau of Mines spends more of its money in the coal industry than in the general mineral, metallurgical, and economic fields. Without discussing the relative merits of the question, an analysis has been made of the past year's expenditures of the Bureau of Mines in these fields, which shows approximately the following:

Expenditures chargeable to coal mining and combustion:

1. For mine accidents, including mine rescue cars and stations	$333,126
2. Testing fuel	142,510
3. Engineering experiment stations	5,000
Total	$480,636

Expenditures chargeable to mineral mining, ore dressing, metallurgy and to mining and preparation of earthy minerals:

1. For mine accidents, including mine rescue cars and stations	$142,892
2. Mineral mining	125,000
3. Engineering experiment stations	170,000
Total	$437,892

Thus, if fuel testing (which is mostly mechanical engineering) is deducted from coal mining, a larger amount was spent for work and investigations in the metal- than in the coal-mining industry, and the question may be raised whether metals are not receiving more than their share of attention. The answer to that question is that it is more expensive to investigate a number of subjects than it is one subject; the ore-dressing of the different metallic minerals offers more problems than the washing of coal, for example. Moreover, it is highly desirable to investigate problems in the area in which they exist, so far as possible, to maintain close contact with the industry, and it is less practicable to centralize investigations of metal-mining problems than it is of the coal-mining problems.

Altogether, the field functionally within the activities of the Bureau is broad, and there are many spots as yet cultivated not at all or only casually. If the work under way is or will be of value to the industry it is reasonable to suppose that funds may continue to be apportioned to the Bureau until all branches of mining and metallurgy shall receive their just dues.

Malaria Control

The methods followed by the American Bauxite Co. at its plant in Bauxite, Ark., for malaria control by anti-mosquito measures, as described in *Bauxite News* for October, 1920, are as follows:

The control measures employed consisted of draining and oiling all streams thought to influence the incidence of malaria by producing a sufficient number of mosquitos to become of sanitary importance. Areas were cleared and regraded or otherwise treated, so as to insure rapid run-off of normal waters. Such major obstructions were removed from the bottom of streams as would retard the normal flow of waters or prevent the formation of complete films during subsequent oilings.

In clearing the streams of obstructions, special efforts were made to remove all overhanging brush that by coming in contact with the normal flow of water could produce favorable places for the mosquito to rest and deposit eggs. As a rule it was necessary to remove the underbrush from one side of the stream only, as this was found to give free access to the water during inspection and oiling wherever practicable.

Narrow ditches were cut in the bottom of wide ditches so as to confine the receding water after heavy rains to narrow banks. New ditches cut for the purpose of draining known breeding places were constructed as narrow as possible, remembering that cattle are less likely to trample the bottoms of deep narrow ditches while in wide bottoms. Ditches where cattle are permitted to roam and small isolated areas due to hoof prints can often be seen in which mosquitos may breed without fear of being molested by any of their natural enemies. Mosquitos will deposit eggs in almost every conceivable artificial container, water barrels, cisterns, cans, cellars; in fact, any receptacle that will hold water.

Copper Losses in Slags

Investigation of Methods for Determining Amounts of Sulphide and Oxide Present—Analyses Of Characteristic Slags and Their Interpretation—Wisdom of Pouring Converter Slag Into Blast-Furnace Settlers

By FRANK E. LATHE
British America Nickel Corporation, Deschenes, Quebec
Written for *Engineering and Mining Journal*

FOUR ARTICLES published in technical journals during the last ten years have given the results of investigations to determine the condition in which copper exists in slags. Considering them in order of publication they are:

1. Thomas Kiddie, *Jour. Can. Min. Inst.*, 1911, Vol. 14, p. 487. Using dilute sulphuric acid as a solvent, Mr. Kiddie determined the copper in the oxidized condition in a number of slags, and concluded that, at least under the conditions investigated, this constituted more than half of the total copper.

2. Frank E. Lathe, *Eng. and Min. Journ.*, 1915, Vol. 100, pp. 215, 263, and 305. In my investigation I followed to a large extent the lines laid down by Mr. Kiddie, for although the limitations of the sulphuric-acid method for oxidized copper were recognized, this appeared to be the best reagent of the purpose. The results obtained on Granby and Anaconda slags were similar to Mr. Kiddie's, most of the copper being soluble in acid.

3. C. G. Maier and G. D. Van Arsdale, *Eng. and Min. Journ.*, 1919, Vol. 107, p. 815. Messrs. Maier and Van Arsdale made a careful microscopic examination of slags, and also treated finely pulverized samples with 1 per cent silver-nitrate solution. The copper dissolved by the reagent they called suspended sulphide copper, and that insoluble was believed to be dissolved sulphide. Oxides and silicates they considered to be absent.

4. C. G. Maier and G. D. Van Arsdale, *Chem. and Met. Eng.*, June 16 and 23, 1920, Vol. 22, pp. 1101 and 1157. This was chiefly the results of an investigation to determine the effect of magnetite on slag losses. Magnetite was found to increase the losses due to sulphide flotation by attached gas particles. The authors reaffirmed their faith in the silver-nitrate method for determining suspended sulphide copper, and again assumed that copper oxides or silicates were absent under ordinary smelting conditions.

On account of the contradictory conclusions reached in the above investigations I decided to begin another series of experiments, using new methods, and including a sufficient variety of slags to cover most of the conditions commonly met in copper smelting. To the results of these experiments I have added various observations made since the publication of my previous article.

First I wish to acknowledge the courtesy of those companies which have provided samples for these experiments and have consented to the publication of the results obtained. In no degree are my remarks intended to imply a criticism of the practice of any company, nor with the facts at hand could a fair criticism be made, for a slag loss which might indicate admirable practice under one set of conditions frequently would not be permissible under those prevailing in another district.

The method for determining oxidized copper in ores using sulphurous acid as solvent was developed by Messrs. van Barneveld and Leaver,[1] of the U. S. Bureau of Mines, and is highly satisfactory. This reagent completely dissolves oxidized copper, whether present as silicate, carbonate, or cuprous or cupric oxides, but does not under any condition attack the sulphides. As distinguished from the sulphuric-acid method, here the presence of metallic iron, frequently introduced in pulverizing samples, does not interfere with the solution of the copper, for metallic copper, which might be precipitated by it, is itself soluble in sulphurous acid. Neither do ferric compounds have any effect, for if these go into solution they are immediately reduced by the reagent.

As already noted, Messrs. Maier and Van Arsdale claim that silver nitrate, acting on finely pulverized slags, dissolves only the sulphide particles which were suspended in the molten condition.

Assuming, then, that these two methods were all that was claimed for them, it seemed possible to determine directly both the oxidized and suspended sulphide copper, and if the total of these was less than the gross amount of copper present, the difference must occur in another chemical combination or physical condition—probably as true dissolved sulphide. These methods were therefore made the subject of a careful and painstaking investigation.

My experiments on the sulphurous-acid method fully confirmed the results obtained by Messrs. van Barneveld and Leaver. The reagent does readily dissolve oxidized copper, but has no action whatever on the sulphides. As for the limitations of the method, its originators noted that very fine pulverizing of samples was required to insure complete solution of the copper in a reasonable time. To this slight disadvantage I would add two more serious ones, at least as applied to slags. First, the 3 per cent solution of sulphur dioxide recommended does not thoroughly decompose all slags, especially if these have been air-cooled. Second, in the presence of considerable iron sulphide either the oxidized copper is incompletely soluble or copper already dissolved is afterward precipitated as sulphide. Both of these disadvantages tend toward low oxide results.

THE SILVER-NITRATE METHOD

Upon trying the silver-nitrate method of Messrs. Maier and Van Arsdale I was much disappointed at the results obtained. It was claimed[2] that silver nitrate would completely dissolve the copper sulphide which was in the molten slag as suspended matte particles, but that it would not attack dissolved sulphide, oxides or silicates. The presence of metallic iron was said to be detrimental. Taking these points one by one I found: (1) That silver nitrate does usually dissolve copper sulphides, but not in all combinations. (2) That the assumption that copper sulphides dissolved in the

[1] *Eng. and Min. Journ.*, 1918, Vol. 105, p. 552.
[2] *Eng. and Min. Journ.*, 1919, Vol. 107, p. 815.

molten condition will not be attacked is not justified, as such sulphides would probably not be equally soluble in the solid slag, and might therefore be found in the latter as small sulphide particles, readily soluble. (3) That cupric oxide is slightly attacked by silver nitrate. (4) That cuprous oxide is readily attacked, though it does not appear to be completely soluble. (5) That the presence of metallic iron is not detrimental, except in consuming more of the reagent.

When silver nitrate was tried on slags peculiar results were obtained. Some yielded only traces of their copper to it. On the other hand, one converter slag, in which nearly 60 per cent of its copper was soluble in sulphurous acid, nevertheless yielded 90 per cent of it to silver nitrate. It was evident that part of the copper was soluble in both reagents, and as the sulphide had been proved to be insoluble in sulphurous acid, it followed that the silver nitrate must be dissolving oxidized or metallic copper. That the latter was not present in appreciable quantity seemed probable from the fact that the sample had been passed through a 200-mesh screen without any appearance of metallics. Moreover, metallic copper is not found in converter slags in quantity except in the unusual case of an overblown charge. After many experiments I was therefore compelled to abandon the use of silver nitrate as unreliable. It is worthy of note that this was also done by Wanjukov[3] in his elaborate series of experiments.

Effect of Hydrofluoric Acid

As was noted before, sulphurous acid does not completely decompose all slags. The addition of a sufficient amount of hydrofluoric acid would decompose the silicates, so the effect of a combination of sulphurous and hydrofluoric acids was thoroughly investigated. Results showed that under the conditions of the experiments the only action of the hydrofluoric acid was to break up the silicates and liberate some copper for possible solution by the sulphurous acid. Even chemically precipitated copper sulphide is not attacked by a copper only one gram was taken for the experiment, and where decomposition appeared to be slow a further addition of 5 c.c. of hydrofluoric acid was made. After filtration of the residues, which contained all the copper sulphide, the sulphur dioxide was boiled out of the filtrates, and copper precipitated therein by hydrogen sulphide, being afterward determined by the electrolytic method.[4]

As in the original sulphurous-acid method for ores, under ordinary conditions results will be sufficiently accurate, and such difficulties as may be found, e.g., the presence of much iron sulphide or incomplete decomposition, tend toward low rather than high results for oxidized copper. In no instance are copper sulphides attacked.

Slag Analyses

The results of the experiments are shown in Tables I, II and III, for blast-furnace, reverberatory-furnace and converter slags, respectively. For the sake of comparison the copper soluble in sulphurous acid alone is also given, though it should be clearly borne in mind that this does not usually represent the total oxidized copper, owing to poor decomposition of the samples. It is believed that the copper soluble in hydrofluoric and sulphurous acids represents closely the total of oxide, silicate, and metallic copper in all samples analyzed.

An examination of Table I shows that both the actual amount of oxidized copper and the percentage of that to the total vary greatly. With a high percentage of sulphur on the charge and no oxidized copper present, as at Nickelton, Trail, Anyox, and Ducktown, the amount of oxidized copper in the slag is almost negligible. At Douglas and Globe, on the other hand, partly oxidized ore is smelted to a high-grade matte, and the conditions are not sufficiently reducing to eliminate all the oxide, although the low percentage of sulphide copper indicates efficient settling.

Matte concentration at Ducktown considerably increased the amount of oxide in the slag, but did not

TABLE I. BLAST-FURNACE SLAGS

Sample No.	Company	Location of Plant	Nature of Charge	Per Cent Total Cu	Per Cent Cu Soluble in H_2SO_3	Per Cent Cu Soluble in HF and H_2SO_3, "Oxidized Copper"	Per Cent Oxidized to Total Cu
1	British America Nickel Corp.	Nickelton, Ont.	Heavy sulphide ore containing nickel as well as copper	0 05	0 00	0 015	30
2	Cananea Con. Copper Co.	Cananea, Mex.	Little oxidized copper	0 33	0 055	0 135	41
3	Con. Mining & Smelting Co.	Trail, B. C.	Heavy sulphide ore	0 255	0 02	0 03	12
4	Granby Con. M. S. & P. Co.	Anyox, B. C.	Heavy sulphide ore	0 145	0 025	0 025	17
5	Granby Con. M. S. & P. Co.	Anyox, B. C.	Matte concentration	0 295	0 025	0 015	7
6	Old Dominion Copper Co.	Globe, Ariz.	Some oxidized copper	0 38	0 13	0 25	66
7	Phelps Dodge Corp.	Douglas, Ariz.	About 1% Cu in oxidized condition.	0 42	0 14	0 34	81
8	Tennessee Copper Co.	Ducktown, Tenn.	Heavy sulphide ore	0 22	0 03	0 02	11
9	Tennessee Copper Co.	Ducktown, Tenn.	Matte concentration	0 44	0 025	0 155	35

combination of these reagents, although in experiments on this material precautions had to be taken to avoid oxidation by the air during filtration.

The general method followed was to treat two grams of the sample, ground through 200 mesh, with 100 c.c. of a 3 per cent solution of sulphur dioxide and 10 c.c. of hydrofluoric acid in a stoppered bottle at room temperature and with occasional agitation—continuous until the silicates had sufficiently decomposed not to stick to the bottom. Decomposition was nearly complete in twenty-four hours or less, but the treatment was continued for from five to ten days. There was some action on the glass bottles, but this merely increased the consumption of acid. Of certain samples high in do so at Anyox, on account of the less strongly oxidizing conditions there. The sulphide loss in both operations noted increased considerably over that normal to ore smelting, no doubt partly because of the composition of the slag and the grade of the matte, but also indicating that when so much copper is present on the charge, careful attention should be paid to the settling facilities.

Under the more uniform conditions of reverberatory smelting one would expect less variation of oxidized copper content than in blast-furnace practice. Sufficient samples were not available to prove this point, although the Anaconda and Phelps Dodge slags gave similar results, showing that three-quarters of the total copper present is in the oxidized condition. Regarding the

[3] *Metallurgie*, 1912, Vol. 9, pp. 1 and 48.

[4] *Eng. and Min Journ.*, May 1, 1920, Vol. 109, p. 1010.

Cananea slag, both the low total copper and smaller percentage of oxidized copper are accounted for, in part at least, by the lower grade of the accompanying matte, which averages 15 to 20 per cent.

The results obtained with the slag from the furnace treating converter slag at Anaconda are peculiar. Although the total copper is considerably higher than in ordinary reverberatory smelting, the oxidized copper is not, which shows that the conditions for the reduction of the oxidized copper (see also No. 15, Table III) were better than those for the separation of the sulphides. It is probable that in this instance gas flotation of sulphides, as observed by Messrs. Maier and Van Arsdale[5] in the presence of magnetite, was responsible for a considerable loss. To retain such a slag in the furnace until much of the gas had escaped and the accompanying copper sulphide had settled might be metallurgically possible but commercially inadvisable, owing to the reduced tonnage of the furnace.

Converter slags show a wide variation in their oxidized-copper content. This is attributable to a number of different factors, of which a few may be mentioned. The chief factor is the protective effect of iron, which oxidizes in preference to the copper, although the periods of oxidation overlap somewhat. From this it follows that, other things being equal, the average converter slag produced at a plant treating low-grade matte will contain a lower percentage of oxidized copper than the slag from one treating high-grade matte. The figures in the second-last column of Table III show that this is actually so, and that the variation is considerable.

Nickel, like iron, has a protective effect on the copper,[6] so that the slag produced even while a copper-nickel matte approaches white metal will not contain much oxidized copper, the nickel slagging first. Some of the variation is probably due to different samples representing different parts of the blow, as detailed information regarding the samples analyzed is usually not available. It is only another phase of the protective effect of iron, already mentioned. Although no samples from straight copper converting were available to show this, Nos. 16 to 18 of Table III illustrate the regular but moderate increase of oxidized copper during the progress of the blow in copper-nickel converting.

The amount of magnetite formed, the kind of flux used, and the temperature and composition of the slag produced are all factors which doubtless have some influence on the condition as well as on the amount of copper in the slag.

Pouring Converter Slag Into Settlers

The practice of pouring converter slag into blast-furnace settlers seems to be increasing. When one can thus dispose of a troublesome intermediate product without raising the copper content of the blast-furnace slag by more than a few hundredths of a per cent, the temptation to do so is strong. The practice is justified by some metallurgists on the theory that the copper is present as sulphide of metal, and will therefore settle if given a chance. Others[7] believe that much of the copper is in the oxidized condition, and that therefore settling alone cannot recover it; and from the results given in Table III it will be seen that this opinion has usually sound foundation in fact. It must be remembered, however, that when converter slag is poured into a settler it falls through the lighter blast-furnace slag to the surface of the matte, and, particularly if the matte be of low grade, the chances for the reduction of some oxidized copper are good. Further investigation of this point is desirable.

The difficulty in calculating the actual loss in pouring converter slag into blast-furnace settlers is increased by the above-mentioned tendency of the heavy converter slag to settle to the surface of the matte and thus find its way out of the settler only very gradually, so that its influence is felt over a long period of time. A method I have used of calculating the actual loss will now be illustrated by an example.

The Mond Nickel Co.[8] has given the following figures

TABLE II. REVERBERATORY SLAGS

Sample No.	Company	Location of Plant	Per Cent Total Cu	Per Cent Cu Soluble in H_2SO_3	Per Cent Cu Soluble in HF and H_2SO_3 "Oxidized Copper"	Per Cent Oxidized to Total Cu	Remarks
10	Anaconda Copper Mining Co.	Anaconda, Mont.	0.35	0.155	0.24	69	
11	Anaconda Copper Mining Co.	Anaconda, Mont.	0.37	0.14	0.30	81	
12	Anaconda Copper Mining Co.	Anaconda, Mont.	0.60	0.105	0.24	40	Converter slag furnace.
13	Cananea Con. Copper Co.	Cananea, Mex.	0.145	0.03	0.07	48	Low-grade matte produced
14	Phelps Dodge Corp.	Douglas, Ariz.	0.29	0.115	0.24	83	

TABLE III. CONVERTER SLAGS

Sample No.	Company	Location of Plant	Per Cent Total Cu	Per Cent Cu Soluble in H_2SO_3	Per Cent Cu Soluble in HF and H_2SO_3 "Oxidized Copper"	Per Cent Oxidized to Total Cu	Remarks
15	Anaconda Copper Mining Co	Anaconda, Mont.	4.88	2.76	3.85	79	
16	British America Nickel Corp.	Nickelton, Ont.	1.23	0.065	0.06	5	Beginning of blow, Ni present
17	British America Nickel Corp.	Nickelton, Ont.	1.46	Undet.	0.10	7	Middle of blow, Ni present
18	British America Nickel Corp.	Nickelton, Ont.	0.845	0.045	0.25	30	End of blow, Ni+Cu, 70 to 80 per cent
19	Cananea Con. Copper Co.	Cananea, Mex.	1.54	0.085	0.565	37	
20	Con. Mining & Smelting Co.	Trail, B. C.	1.97	0.45	0.88	45	
21	Granby Con. M. S. & P. Co.	Anyox, B. C.	2.56	0.205	1.045	41	
22	Old Dominion Copper Co.	Globe, Ariz.	3.61	0.30	2.40	67	
23	Phelps Dodge Corp.	Douglas, Ariz.	3.53	0.97	2.21	63	
24	Tennessee Copper Co.	Ducktown, Tenn.	1.09	0.135	0.77	71	

[5] *Chem. & Met. Eng.*, June 16 and 23, 1920, Vol. 22, pp. 1101 and 1157.

[6] First suggested to me by Ivar Holé.

[7] John W. James, *Eng. and Min. Journ.*, 1914, Vol. 97, p. 1114. Lathe, *Eng. and Min. Journ.*, 1915, Vol. 100, p. 266.

[8] Report of the Royal Ontario Nickel Commission, p. 451.

regarding its practice of pouring converter slag into settlers:

	Cu	Ni	Fe
Blast-furnace slag	0.17	0.22	26.6
Converter slag	0.7	1.3	45.4
Settler slag (b. f. + conv.)	0.20	0.29	29.9

According to the micrographic work of Messrs. Maier and Van Arsdale,[9] the amount of iron sulphide suspended in slags is small, so I shall assume for the purpose of this calculation that the iron settled from the mixture of blast-furnace and converter slags may be neglected. The settler slag may then be considered as simply a mixture of the other two with a portion of the copper and nickel removed. Let

x = per cent blast-furnace slag in settler slag,
$100 - x$ = per cent converter slag in settler slag.

Then, considering the iron content of each,

$$26.6x + 45.4(100 - x) = 2{,}990,$$

whence the settler slag consists of 82.5 per cent of blast-furnace slag and 17.5 per cent of converter slag.

Now, of the 0.20 per cent Cu in the settler slag, 0.17×0.825, or 0.14 per cent, belongs to the blast-furnace slag, so that 0.20 — 0.14, or 0.06 per cent, belongs to the 17.5 per cent by weight of converter slag, giving the settled converter slag alone a copper content of 0.34 per cent. This indicates that 0.36 per cent of Cu has been settled, a recovery of 51.4 per cent. Similarly, it may be shown that 0.63 per cent of Ni belongs to the settled converter slag alone, a recovery of 51.5 per cent.

Instead of calculating the proportions of the two slags, it is of course better to use the actual weights, if these are available over a considerable period of time. In making such a calculation two points should be remembered. First, that the samples of slag taken at the furnace spout have not had the opportunity of settling that they would have had if they had gone through the settler. To be correct, the assay of the blast-furnace slag when settled alone should be used instead of that of the spout sample. Second, if the converter slag were resmelted in the furnace, the copper content of the blast-furnace slag would also be increased somewhat. The calculation, nevertheless, shows how much lower the actual recovery is than one might suppose from the low assay of the mixed slag.

Some Practical Applications

In Table IV are given some analyses of slags produced at the Grand Forks plant of the Granby company which show how the determination of oxidized copper may be used as a check on furnace conditions. All the oxide determinations were made several years ago by the sulphuric-acid method, and my experiments since then with sulphurous and hydrofluoric acids indicate that the results given are slightly high, but they are certainly comparatively and, I believe, approximately correct.

TABLE IV. EFFECT OF VARIATION IN BLAST-FURNACE CHARGES UPON THE COPPER CONTENT OF THE SLAGS PRODUCED

	Copper			Per Cent of Oxidized to Total Copper					Approx. Temp. of Slag in Deg. C.
No.	Total	Oxide	Sulphide		SiO_2	Fe	CaO		
1	0.19	0.12	0.07	63	47.0	13.3	22.2		1,275
2	0.215	0.155	0.06	72					1,275
3	0.205	0.115	0.09	56					1,225
4	0.41	0.175	0.235	43					1,175
5	0.22	0.05	0.17	23	41.7	21.9	19.0		1,225
6	0.21	0.07	0.14	33	40.1	24.3	18.8		1,225
7	0.24	0.09	0.15	38	38.6	26.2	17.8		1,225

[9] *Eng. and Min. Journ.*, 1919, Vol. 107, p. 815.

Explanation of Table IV

Sample 1. Slag produced in normal smelting operations, the charge consisting wholly of a calcareous ore containing a small amount of chalcopyrite and pyrite, but no oxidized copper.

Sample 2. The result of addition to the regular ore charge of about 25 per cent of an ore containing a little oxidized copper, resulting in more oxide in the slag.

Sample 3. Similar conditions to No. 1, except that the furnaces were run with lower coke, resulting in a colder slag containing the ordinary amount of oxidized copper but more sulphide.

Sample 4. A very abnormal slag from a furnace in bad condition. It was so cold as to prevent satisfactory settling of matte, prills of which were plainly visible to the naked eye in the chilled slag. Oxidized ore was again on the charge, with consequent increase of oxidized copper in the slag.

Sample 5. Same ore charge as No. 1, but with 30 per cent of its weight of 10 to 12 per cent matte. The larger amount of sulphur present prevented the oxidation of much copper. The higher specific gravity of this slag allowed a less perfect separation of matte particles than under the more favorable conditions of No. 1 to 3, with resultant higher sulphide.

Samples 6 and 7. Similar conditions to No. 5, except that these charges contained converter slag in the proportion of 10 and 20 per cent respectively. Only a part of the oxidized copper in the converter slag was reduced in the furnaces, a little being carried through into the blast-furnace slag and raising the oxidized copper content of that in proportion to the amount of converter slag added.

Condition of Copper in Slags

Enough has already been said of the widely varying proportion of oxidized copper to the total copper content. It may be added, however, that copper oxide need not be expected in slags as a separate constituent, visible to the naked eye, or even under microscopic examination of the solid slag. It will naturally combine, as do the other bases, to form complex silicates, in which no one constituent can be determined except by chemical means.

The determination of suspended sulphides, as distinguished from those chemically dissolved, can best be made indirectly, by means of the copper-gold ratios of the matte and accompanying slag. The calculation is based on the assumption that only the suspended sulphide carries gold into the slag. To illustrate such a calculation, suppose that the matte has 45 per cent Cu and 15 oz. gold per ton; the slag, 0.30 per cent Cu and 0.02 oz. gold. The matte has thus one ounce of gold for each 3 per cent of copper, the slag one ounce for each 15 per cent, indicating that only 3/15, or 20 per cent, of the copper in the slag carries its normal amount of gold, or, that 20 per cent of the copper is present as suspended sulphide. It is of no importance whether the suspended sulphide is in the form of original matte particles or of pure copper sulphide left after oxidation of the accompanying iron sulphide.[10] The iron may be oxidized, but the gold will be concentrated in the remaining copper sulphide.

Chemically dissolved sulphide remains for consideration. In my previous experiments, using sulphuric acid as solvent for the oxidized copper, I found no indication of its existence, the sum of oxide and suspended sulphide (calculated from the gold content) corresponding with the total copper in the slags. But as my recent work indicates that the former results for oxidized copper were slightly high, it is probable that a little dissolved sulphide was present even in the low-

[10] Maier and Van Arsdale, *Eng. and Min. Journ.*, 1919, Vol. 107, p. 819.

iron slags on which experiments were made. Iron sulphide is certainly soluble in slags, especially in those of high iron content, and it is altogether likely that copper sulphide also dissolves to some extent, although in most operations the loss of copper in this condition is the least important of the three mentioned. It may be expected to increase in slags high in iron and zinc, especially if these be low in silica.

Possible Improvements in Present-Day Practice

Blast-Furnace Slags.—It is customary to place immediately below the furnace spout one large settler, the overflow from which goes to waste. Although the necessity for matte storage may require a settler of large size, it will often be found that two or more smaller ones in series[11] will more effectively clean the slag; or the large settler may be followed by small ones. The fall of slag from one settler to another probably allows the escape of a certain amount of gas, which may have caused the flotation of matte particles. Such a treatment is especially desirable when analyses show that the percentage of sulphide copper in the slag is high, as may be true in matte concentration or in other cases with a high percentage of copper on the charge to the furnace.

If the oxidized copper in the slag be high, some may be reduced by the addition of coarse pyrite to the second-last settler of a series. This was done at the Grand Forks plant of the Granby company with some success. The coarse pyrite added settles to the matte, and the sulphur driven off by heat stirs up the slag and has an excellent chance to reduce oxides. The lower-grade matte produced in this way also has a tendency to cause the precipitation of dissolved sulphides, if present.

Reverberatory Slags.—Owing to the presence of oxidized copper in the charge, and the comparatively neutral atmosphere in reverberatory smelting, the loss as oxide or silicate is likely to be high. To reduce this loss to a minimum I know of no method more promising than that suggested to me some years ago by E. J. Carlyle, and described in my previous article.[12] I repeat it here, as I am confident that the saving secured by this means would many times repay the cost of the experiment. Mr. Carlyle thought that if a wall of refractory material were built across a reverberatory furnace near the skimming end, high enough to keep back the main body of matte, but low enough to allow the slag to flow over it, pyrite could be charged through the roof between this wall and the skimming door, thus bringing about a material reduction in the copper content of the slag. A separate tap-hole could be provided for the low-grade matte as well as a side door behind the dam for the removal of floaters. Such a practice would not involve radical changes in construction, and would appear to be of general application in reverberatory smelting. The low oxide copper in the Cananea slag (No. 13, Table II) is an indication of the great possibilities of this method.

If converter slag forms a large proportion of the charge, the sulphide content of the slag may increase, as at Anaconda (No. 12, Table II). In such results, if the loss be due to sulphides floated by gas bubbles, the low-grade matte treatment may reduce magnetite introduced in the converter slag, and consequently bring down the sulphide loss, as well as reducing the oxides. To lower the sulphide content a succession of small settlers might also be effective, as suggested for blast furnaces. In all such instances the amount of settling which can be done outside the furnace is dependent principally upon the degree to which the slag has been superheated before leaving the furnace.

Converter Slags.—Metallurgically speaking, it may be wasteful to pour converter slag into blast-furnace settlers, but one cannot say that such a practice is never justified. As in all other industries, smelting and converting are governed by commercial considerations, and these must be the deciding factors. This much may be said, however: In most plants possessing both converters and blast furnaces, at least a part of the converter slag is resmelted, and when this is done the slag to be poured into settlers should as far as possible be that produced in the early part of the blow, when oxidized copper is at a minimum. If the suggested modification of reverberatory furnaces should, upon trial, prove commercially successful, that would appear to be the logical outlet for whatever converter slag is not required for fluxing purposes.

[11] Lathe, *Eng. and Min. Journ.*, 1915, Vol. 100, p. 270.
[12] *Eng. and Min. Journ.*, 1915, Vol. 100, p. 307.

New Process Saves Coal Otherwise Lost in Ash

The Gruson Werk, a branch establishment of Krupp, has developed a new process for saving unburned coal out of combustion residue which, so it is claimed, is much simpler and quicker than the methods formerly known, which are based on the different specific gravities of coal and clinker. The new process makes use of the magnetic qualities of the oxides of iron into which the sulphurous pyrites are transformed by the burning and which are retained in the clinker. The basic principle of the process is the fact that owing to the contents of ferro-oxides, the clinker responds to electro-magnetic action, whereas the coal does not.

Production of Minerals in Mexico

The average Mexican monthly production of copper has reached 4,681,020 lb., according to reports of the Bureau of Mexico, of the Department of Industry, Commerce, and Labor. The average monthly production of gold, according to the same authority, is now 1,965 oz. and of silver 170,824 oz. At the present time there are in Mexico 60,569 denounced mining claims, 2,017 of which were denounced prior to 1892. Taxes are being paid on 30,990 claims, and 3,867 claims are now being worked. Metals extracted in Mexico are smelted in Monterrey, Aguascalientes, Torreon, Chihuahua, San Luis Potosi, Velardena, Saltillo, Boleo Teziutlan, Mapimi, Matehuala, and Mazapil.

Iron Ore in Victoria, Australia

Mount Nowa Nowa, at the head of Lake Tyers, Gippsland, Victoria, is stated in a recent *Melbourne Age* to be the richest and largest repository of iron ore in Victoria. Recent exhaustive tests have justified this statement. A charcoal test of 14½ lb. of ore returned 11 lb. of pig iron, and the iron when tested has been adjudged to be of splendid quality. An unlimited supply of limestone, which is required for smelting purposes, as well as an ample supply of firewood, which will provide the stocks of charcoal required, are present in the district.

Effect of Erosion on Mineralized Areas In Northern Sonora

The Removal of Rock Material Has Lessened the Depth of Mineral Deposits in This Section To a Considerable Extent

BY GRAHAM JOHN MITCHELL
Written for *Engineering and Mining Journal*

THE extent to which erosion has degraded mineralized areas in northern Sonora, Mexico, is a factor to be considered when prospects in that region are examined. The millions of tons of rock débris washed down from the surrounding mountains and filling neighboring valleys impress even the most casual observer. An examination of these gravels shows rocks containing varying amounts of metallic minerals which formerly occupied veins and other types of deposits in the adjoining mountains.

Fig. 1 is a panorama looking west across the Moctezuma River valley from the Transvaal Copper Co.'s smelter at Cumpas, Mexico. The outline of the Paloma Mountains, the highest peaks of which are approximately six thousand feet elevation, can be seen on the right in the distance, with low hills in the foreground. The low benches in the immediate foreground are made up of material washed from the higher range and from other mountains to the north. These benches have been further dissected by the Moctezuma River and its tributaries.

The Paloma Mountains contain a variety of mineral deposits, principally copper, silver, and lead. The ore occurs in veins and brecciated areas in igneous rocks, chiefly andesite and granite. An examination of these mineralized areas shows them to be but the remnants of formerly more extensive deposits. What is left of the veins represents lower portions of ore formed at intermediate depths. In some of the copper ore in breccia, the ore does not outcrop, but is within a short distance of the surface. Such ore in breccia, in which tourmaline, molybdenite, chalcopyrite, and pyrite are characteristic, indicates deposition at greater depth and higher temperatures than the vein deposits. The depth to which mineral has been mined in this region is comparatively shallow, most of the mines showing decreasing values and extent of mineralization in deeper workings. The best ore has been found to range from the surface to approximately five hundred feet.

Photo by H. C. Beauchamp

FIG. 1. LOOKING WEST FROM TRANSVAAL COPPER CO.'S SMELTER, CUMPAS, MEXICO

The common mineral association in the vein deposits is chalcopyrite, pyrite, tetrahedrite, bornite and galena. In some deposits tetrahedrite and galena predominate, whereas in others chalcopyrite and pyrite are more abundant. In "breccia ore" chalcopyrite, tourmaline, and molybdenite are the prevailing minerals. Oxidation has developed some secondary minerals, such as covellite and chalcocite, from chalcopyrite and bornite, but the region as a whole is typically one of primary sulphide minerals.

Fig. 2 is a photograph of the maturely dissected region a few miles south of the central portion of

Photo by H. C. Beauchamp

FIG. 2. COPPER-TOURMALINE PROSPECT SOUTH OF ARCHIPELAGO MINE, SONORA, MEXICO
Mineralized breccia outcrops along creek in central foreground.

Paloma Range. Deposits of chalcopyrite and tourmaline are found in these hills in brecciated and silicified zones of andesitic rock, though such zones are small and scattered. Only a little surface work has been done, but very good specimens can be secured in which chalcopyrite and tourmaline form a crystalline aggregate cementing the breccia. This region, like that further north, has also undergone extensive erosion.

The fact that erosion has removed such large volumes of rock material from these mineralized areas, together with the knowledge that the remaining deposits are of the types formed at intermediate and greater depths and are only remnants or "roots," affords data upon which one may judge similar deposits in the region. Were it not for geological evidence disclosed in the developed mines of the district, deposits of the character indicated might be expected to extend much deeper. It is therefor apparent that erosion has removed a considerable volume of the mineral veins in the Paloma Mountain area, and such a condition will most likely be found to exist in other sections of northern Sonora.

Laws Regulating Mining Concessions in Serbia

By Capt. Gordon Gordon-Smith
Written for *Engineering and Mining Journal*

THE statutes governing mining rights and concessions in Serbia are clear and liberal in terms. The principal law is that passed by the Serbian Parliament in 1898. The following is a summary of its most important provisions:

The Serbian state is the owner of the subsoil of its territory. It disposes of the mineral wealth and lays down all the necessary regulations concerning prospecting and exploitation. (Article 15.)

Prospecting. The prospecting rights are of two kinds, the *simple* right and the *exclusive* right. The *simple* right lasts for one year but may be prolonged for two years. It is limited to the maximum territory of three communes. The *exclusive* right lasts also one year, but it is renewable each year according to its necessity. It may extend over an indefinite number of mining fields each of 500,000 square meters. (Articles 21 to 30.)

For one field of operations, the prospecting rights, either simple or exclusive, can be accorded to only one single prospector. The obtaining of the two rights is subject to the conditions that the prospector has the legal disposition of his property. In addition, for the exclusive right, it must be shown that the mineral deposits in question are worth examining. These rights are hereditary and transmissible. (Articles 25 and 26).

The minerals obtained by the work of prospecting cannot be treated or sold, except with a special administrative authorization. (Article 37.)

Mining Concessions. The state accords concessions for fifty years on a sufficient number of mining fields, of 100,000 square meters, which are delimited by a competent commission. To obtain a concession, in addition to possessing the necessary prospecting rights, proof must be furnished that the deposits are exploitable, that the prospector disposes of sufficient capital and that he possesses competency as a miner, and he must present a plan of the proposed work. (Article 40 to 46.)

The concessionaire becomes owner after fifteen years of uninterrupted working, but he continues to pay the mining taxes, and is obliged, as before, to observe the dispositions of the Mining Law. (Article 47.)

Duties of the Prospector and the Concessionaire. For the prospector, as well as for the concessionaire and the owner, the law imposes the following obligations: Regular work, the assuring of the general safety and the safety of the workmen employed, an annual report on the work done, and the plan of the work for the following year. It is forbidden to mine under public roads, buildings, cemeteries, and other public works. (Article 32, 76 to 81.)

Duly constituted mining companies must keep books and hold annual meetings of shareholders as laid down in the Commercial Law. (Article 74.)

The priority, after the conditions for prospecting or exploitations have been fulfilled, belongs to the first comer. (Article 39.)

All prospecting rights and all concessions lapse if the specified works have not been undertaken the first year or if they are interrupted for any cause not approved by the Minister of Mines, or in case of bankruptcy. (Article 144.)

Rights to Concessionaires. The concessionaires or owners of mines have the right to divide or unite mining fields or their working plants, to suspend work for a certain time, if difficulties are met, and later to resume work. (Article 68.)

The mining privilege covers all kinds of minerals found in the territory conceded. (Article 67.)

The concessionaire has the right of establishing for the use of his mines all the necessary installations and constructions, machines, buildings, foundries, workshops, warehouses, roads, bridges, railways, and like complementary appurtenances. He may abandon exhausted mining fields. (Article 68.)

The state will favor importation of machines, tools and materials as well as the exportation of mineral products. (Article 69.)

The concessionaire may purchase the neighboring properties, either by private agreement or by expropriation. (Article 52.)

In case of the death or bankruptcy of the concessionaire the competent Tribunal of First Instance appoints a curator for the mines and informs the Minister of Agriculture, Commerce and Industry. (Article 87.)

Funds for the Mutual Aid of Mine Workers. The assurance of mine workers is obligatory. There are two kinds of funds for miners: (1) a fund for invalids and pensions; (2) a fund for the families of the miners, in case of the sickness or death of the latter. The first fund is common to all the mines; the other is for each particular mine. For the first 3 per cent and for the second 2 per cent is deducted from the miner's wages. The concessionaires pay into these funds an amount equal to 50 per cent of the amounts paid by the workers. Miners who work regularly in the mines are exempt from all taxes on their wages. (Articles 103 and 104.)

Mining Dues. The exclusive right is subject to the payment of a fixed due of 10fr. per annum for each mining field of 500,000 meters. For the concession a fixed due of 12fr. per annum for each mining field of 100,000 square meters is levied, and a proportional due, equal to 1 per cent of the gross revenue of the mine. The Minister of Agriculture, Commerce and Industry may suspend the imposition of this proportional due in case the enterprise, at the start, does not make any profit. (Articles 108 to 111.)

Moving Pictures in the Mining Industry

Apart From Meeting the Demand for Entertainment at Mining Camps and Villages, There Is Growing Development of Film Presentation in Safety and First Aid, Interdepartmental Organization, Promotion, and Educational Work

Written for *Engineering and Mining Journal*

THE need for diversion and the innate desire in humanity for new forms of amusement are chiefly responsible for the great development of the moving picture. As businesses, both the making and the presentation of the finished picture have proved to be highly remunerative. The use of the movie film for educational purposes is developing, but not as fast, for the money returns are moderate.

Industry has also turned to the moving-picture film, and there is at present a greater and greater tendency to resort to this popular method of exposition where it is necessary to "put over" an idea to any considerable group of humans. It is decidedly in style to increase the interest in a lecture by using the moving picture as an accessory. Not so long ago, the stereopticon was generally accepted both for illustration as well as to popularize an otherwise dull subject. It is now difficult to "get a rise" out of even an intelligent audience by means of ordinary lantern slides, however good they may be. Jaded humanity wants its "movie." The necessary thrill must apparently come through the eye, although the practical showman makes considerable use of the ear of his audience as well.

The Movie in Promoting "Safety First"

The mining industry has not escaped the prevailing tendency, and is taking some of its "thrills" by the "movie route," although it is perhaps more conservative than other industries and has as yet only started. The U. S. Bureau of Mines was among the first to recognize the potent appeal of the movie. Under its direction, a number of educational films have been prepared and systematically loaned to educational institutions. The films have served a useful purpose in making possible a wider dissemination of knowledge of the mining industry. They have been exceedingly useful in visualizing different phases of the industry for mining students in the various colleges and universities of the country. As a means for bringing the "safety-first" principle to groups of miners and other workers, probably one of the most important educational methods is the moving-picture film. The larger mining companies can co-operate with the Bureau of Mines in the preparation of suitable films, but the relatively large expense and the requirement for systematic distribution where the film story will do the most good puts the burden of this work, as well as the expense, upon the Bureau of Mines.

The inculcation of the principles of Americanization, of proper living conditions, better work methods, the visualization of motion-study to workers, and the explanation of the operation of intricate machinery to the men who must either operate or repair such machinery are important fields for the moving-picture film. These subjects are educational and apply to the mining as well as to other industries.

Of more special interest to mining is the motion picture film applied to the needs of workers in advancing the lessons of "safety first" and "first aid." Elementary principles can be presented to large numbers simultaneously, and if accompanied by a concise and clear description, the result is better than can ordinarily be secured by other methods. Great care is essential in the preparation of the film, and the expense is justified, as a good film can be used in many different districts and repeatedly shown to the same audience. There will undoubtedly be a certain amount of standardization in such pictures, and in this as well as their preparation the Bureau of Mines is the most competent body to direct the work.

The introduction of new or highly specialized machinery into the mining field will undoubtedly be considerably facilitated by the use of moving-picture films, which can be used, first, more thoroughly to acquaint a prospective buyer with the machine; and, second, to instruct the men who may have to operate the machine in the details of its erection, operation, and adjustment. A complete "film story" showing the shop erection of a gyratory rock crusher, its dismantling and loading on a freight car, its removal and haulage to the place of erection, its final erection, and the adjustment and replacement of wearing parts would in itself be exceedingly interesting not only to the ordinary worker but to the engineer as well. A film story could be developed for almost any piece of machinery in a similar manner.

Engineers would be better acquainted with the erection and handling of heavy machinery if "film stories" on this subject were available. Considerable improvement in prevailing practice would necessarily result.

Danger in Use for Promotion Purposes

Who has not had an adventure with an inventor? Inventor, invention, and capitalist can be brought together by means of the movie film. Intricate processes as well as mechanical appliances can be explained accurately to capitalists and investors. This use of the movie film for promotion purposes has attained some recognition. Movie films have been taken of initial operations and the geological formations in Western oil-shale districts. It will not be surprising to hear that these films are being used actively in promoting stock sales. No special objection is to be made to the use of the movie film in the promotion of sound, legitimate enterprises, but there is danger that unsound and fraudulent projects may seek this persuasive avenue to the pocketbooks of the unwary.

It is not improbable that mining engineers will make occasional use of the movie film where important examinations are made in far-distant countries. Transportation and operating difficulties can be presented and made accurately known to directors, stockholders, and engineers. Topographical and surface obstacles that have to be overcome in plant construction can be made clear. Machinery manufacturers are also better able to appreciate the conditions to be met.

Dr. C. P. Berkey, professor of geology of Columbia University, says: "Many of the processes representing the operation of a successful mine are not very readily made clear to the non-technical board or untrained class. Nothing, of course, can wholly bridge the gap between these complicated operations on one hand and inexperience on the other, except actual contact with the work itself. But such contact is not always possible or expedient, whereas it often happens that a better comprehension of a problem or proposed change or special set of difficulties must in some way be given.

"It is usual to depend upon careful description and the imagination of the hearer to make this connection, but certainly with variable success. Perhaps at this very point the motion picture might be of special service in bridging the gap for inexperience. The imagination, unchecked by some better method than a description furnishes, sometimes pictures an impossible or a quite inadequate operation. In either case the chief object of the explanation may be lost. With a little true-to-life help in the form of a moving picture of the essential factors of the operation, however, not only may the case be made more clear but much time may be saved for all in reaching an adequate understanding."

Lieutenant William W. Hosp, an aviator, says: "Airscape views in 'stills' and moving pictures are playing a more important part every day in commercial and industrial developments by affording impressionable evidence of the association of objects, crossroads, river, bridges and buildings upon the ground and registering the advancement of large improvements."

In the larger mining companies there is a field for the moving picture in interorganization work that has for its major objective co-ordination and increased efficiency. The interrelation of the various departments of a large business organization, however far apart they may be in a geographical sense, can be presented to the separate groups by the "movie." Both the manager and his audience can visualize the business to increased advantage.

Examples of Mining and Industrial Stories

The New Jersey Zinc Co. is in an exceptional position for a mining company, in that it not only mines and dresses its ore, but also smelts and prepares various market products therefrom. A sales organization has been developed to dispose of its products. One of the products is zinc oxide, and to extend the use of this product among paint users a single reel film has been prepared which shows the various steps in its manufacture. The film has already been shown before forty organizations in different parts of the country. These organizations consist largely of paint superintendents, large users of paints and paint manufacturing materials. Requests for the use of the film have been numerous.

Bureau of Mines Petroleum Picture

The U. S. Bureau of Mines, at the recent annual convention of the Independent Oil Men's Association in Denver, exhibited a four-reel moving picture of the petroleum industry. The film had been prepared in co-operation with the Sinclair Consolidated Oil Corporation. Prospecting, production, refining, distribution, and ultimate use of petroleum were shown. A comprehensive view of the petroleum industry was thus obtainable which would have required several weeks of journeying and access to a number of plants. A moving-picture "story" of this kind, apart from its special interest to those in the petroleum industry, has considerable value in educating the public in the importance of the industry.

The Safety Committee of the U. S. Steel Corporation realized at an early period in the organization of its safety-first campaign that the moving-picture film was of special value in quickly and economically securing contact with the alien worker who could not easily comprehend the English language. In 1912, the first motion picture for the use of the Corporation was taken. It is entitled "An American in the Making." In addition to showing many safety devices, it also brought to its audiences the opportunities afforded the alien to better his condition. A second picture, "The Reason Why," was taken in 1917. It consists of two reels, 1,000 ft. each, showing safe and unsafe methods of doing work. A third picture taken in 1918 was entitled "Why." It is a continuation of the second picture. All three pictures have been shown to thousands of employees, and without doubt have well served the objectives of the safety committee.

The Province of Ontario, Canada, with the objective of making better known its resources, had a number of moving picture films made. These included the nickel industry, the Cobalt silver district and the Porcupine gold-mining district.

New Cornelia Operations Shown

The moving-picture film of the operations of the New Cornelia Copper Co., at Ajo, Ariz., will be remembered by members of the New York Section of the A. I. M. E., before whom it was shown, as a particularly good picture. It was complete in that it showed the open-pit mining operations, the transportation of the ore to the leaching plant, the charging, leaching, and discharging of vats, and the electrolytic deposition of copper. Housing and living accommodations were also included.

It is unnecessary to quote other examples. In the aggregate, there has been a moderate use of the moving picture in the mining industry. The expense for the preparation of a picture is relatively high, and unless a definite measure of value in return for the expense involved can be figured out in advance, only the serving of an exceptional purpose would lead to the preparation of a film. As an example, the cost of the 1,000-ft. picture prepared for the New Jersey Zinc Co. was approximately $2,000. Present prices are about $1.30 per foot, plus the cost of the operator. A positive cost 10c. per foot or $100 per 1,000-ft. reel. Another estimate of cost is $1.50 per foot, which is a minimum, the arrangements for any special lighting and operator being included in this figure.

Unimportant Rumanian Gold Deposits

The beds of the rivers rising in the Carpathians produce gold, but have as yet not been prospected. Grains of gold up to 2.35 carats have, however, often been found in the washings of the Oltul. In the district of Ramnicu-Valcea, Rumania, workings of an experimental nature were begun in 1912. The ore gives from 15 to 30 grams of gold per ton, and the known reserves of these bearings is about 3,000 tons. The deposits present only a scientific interest, as no serious work has been undertaken to determine their practical importance.

HYDRAULIC MINING ON BILLITON ISLAND, DUTCH EAST INDIES

Mineral Resources of the Dutch East Indies

Important Production of Tin, Coal, and Petroleum — Gold Mining Is Developing — Petroleum Exploitation Closely Controlled by Government — Prospecting Licenses and Concessions Granted and Are Not Completely Restrictive*

Written for *Engineering and Mining Journal*

TIN ore, coal, bauxite, and petroleum are the important minerals mined in the Dutch East Indies. The government tin mines are on the Island of Banka; the privately owned tin mines on the Island of Billiton. Tin was discovered on Banka in 1710. Mining operations were first carried on by the native population, but the Chinese entered into the locality and the primitive native methods were displaced by the "Captain of Chinese," Assing, who organized a stable industry by introducing several important technical improvements. Since that time Chinese have largely remained in control.

In the middle of the second half of the eighteenth century the annual production sometimes reached from 30,000 to 35,000 piculs, and probably the same quantity was exported by smugglers. In 1812, Banka was ceded by the Sultan of Palembang to the British, and the tin mines came under European supervision, although the Chinese remained in the industry. On the restoration of Dutch rule, the European control gradually extended.

In 1852 the Dutch government organized a "Bureau of Mines" to extend geological and mining investigations and to put the mining industry on its feet. When the bureau was established it included ten engineers, and since that time it has grown until it now has more than sixty chief engineers, ordinary engineers, and geologists, in addition to many assistants. Its headquarters are at Batavia. Each year a Year Book is issued, one part being devoted to administrative, technical, and statistical details and the other part to scientific articles.

In developing the Banka tin-mining industry, the government engineers introduced important improvements in tin-smelting furnaces, in drainage of open pits, and in stripping, until at present the industry has reached a high state of development.

Character of Banka Tin Deposits

Banka has an area of 12,240 sq.km. and a population of 100,000, three-eighths of the population being of Chinese origin. The exposed geological formations of Banka are granites and sedimentaries consisting of sandstone, quartzites, and shales of Paleozoic age. Strata are compressed into steep folds. The older rocks appear in the hills, the valleys and plains being filled with alluvial material. The tin ores are found in alluvial deposits along the northern and eastern coastal regions. Small veins of tin ore occur in the granite, but are not of commercial importance. The overburden is clay, sand, and gravel of varying thickness, the "pay" gravel ranging from 0.1 to 0.4 in. thick, in exceptional cases reaching a meter in thickness. The tin ore is from 2 to 4 per cent of the ore stratum, reaching in some cases as high as 10 per cent. It is mixed with pieces of sandstone, shale, and such uncommon things as fossils, shells, quartz crystals, topaz, monazite, and gold, as well as minerals ordinarily found in similar formations.

*Compiled from the Year Book of the Netherlands East Indies Exporters Directory and a bulletin of the Department of Agriculture, Industry and Commerce, Dutch East Indies Government.

Lead, copper, iron, manganese, and tungsten ores are found, but in extremely small quantities. The ore particles range from fist-size down to a finely divided powder. The clean ore from the sluices is reduced in simple blast furnaces, each mine having its own reduction plant. In three districts there is a central reduction plant. Preparations have, however, been made for a central plant to handle all of the tin concentrate produced on the Island of Banka.

Chinese coolies are employed, and a part of the actual mining is under government supervision. Introduction of modern machinery has decreased the amount of manual labor required. Banka tin is sold almost exclusively by auction in the Netherlands, every other month alternately at Amsterdam and Rotterdam. Small quantities, however, are offered at auction in Batavia. Since the war, however, most of the tin has been sold in Batavia. The product is shipped and sold by the Nederlandsche Handel Maatschappy, agents for the Netherlands Indian government. In 1910 there were 361 tin ore from Singkep is smelted in Singapore. The Singkep company produced 834 metric tons in 1914. Later information is unavailable.

The Coal Mines of Sumatra and Poeloe Laut

Two coal mines are operated by the government, the Ombilin and the Poeloe Laut groups. The Ombilin mines are in Sumatra above Padang, on the west coast. The coal was discovered in 1868, and mining began in 1892. The coal field is 9 x 10 km., the bed reaching a thickness of 23 m. Poeloe Laut is on the small island of Poeloe Laut, lying off the southeast coast of Borneo. Mining began by private enterprise in 1903, but in 1913 the government took over the work. The center of the coal-mining operations is Stagen. In 1914 the production from the Ombilin mines was 443,141 metric tons and from the Poeloe Laut mines 110,238 metric tons.

Gold is found in Sumatra, Borneo, and Celebes in beach, alluvial, Tertiary gravel, and vein deposits. In 1914 fifty-eight concessions had been granted for pros-

MAP OF NETHERLANDS EAST INDIES. IMPORTANT OIL FIELDS IN BLACK

mines; the total production being 270,170 piculs; in 1914 the production was 234,725 piculs.

The geological conditions and the occurrence of tin ore on the Island of Billiton are similar to those on Banka, but, in addition to the alluvial deposits, several tin veins are large and rich enough to be worked. The principal operating company is the Billiton Maatschappy. A concession was granted to this company in 1852, and in 1892 it was extended a further period of thirty-five years. The company receives five-eighths of the annual profits. The industry and operations, excepting the lode mines, are organized along lines similar to those of Banka. Chinese contract laborers dominate. In 1914 there were forty-seven mines operating, and the production reached 5,194 metric tons. In 1918 the output was 11,555 metric tons of tin and 5,253 metric tons of tin ore.

The Singkep Tin Co. is another private enterprise which is operating on the Island of Singkep, in the Rhiau Archipelago. A concession was granted to this company in 1889. The occurrence of the tin ore is similar to that at Banka and at Billiton, and mining operations are similar. In the hills the mines are operated through adits. Near Singkep tin ore is found in the bottom of the sea and is worked by dredges. All

pecting and working gold and silver mines, but alluvial mining and dredging have met with little success. Natives carry on desultory operations in certain portions of Sumatra and work the Tertiary beds by primitive methods. The important gold-mining companies are operating vein deposits. The greatest quantity of gold is produced in the residency of Bencoelen, Sumatra. Three gold mines are operating and in 1914 produced 2,108 kg. of gold and 9,910 kg. of silver, respectively, 60 and 30 per cent of the total production of these metals.

Description of Gold Area

The gold area is known as the Lebong district and is 75 km. north of Bencoelen. The best known mine is the Redjang Lebong. The formations are granite, slate, and limestone, with accompanying andesite, trachyte, and dacite. Veins are sometimes of important extent, in some cases strongly faulted. The gangue is finely banded quartz with small quantities of calcite. Sulphides vary in amount. Selenium is invariably present.

Treatment is by stamp and tube mills and cyanide after separating sands and slimes. Decantation and filtration are practiced. A second gold mining-district is in the northern peninsula of Celebes. There are

three producing mines. At the Totok mine the gold is found in white quartz forming pockets and stringers in metamorphic limestone. A third gold-mining center is in Central Sumatra, Padang. Development is, however, only in its initial stage.

Iodine is extracted from the hot springs of Java and is shipped to Europe as copper iodide. Wolframite, sulphur, and manganese in small quantity are also produced. Diamonds are found in the district of Martapoera, in the south and east division of Borneo. There is some activity in diamond mining, the production reaching 1,258 carats in 1914. Large-scale exploration in these minor minerals has as yet not taken place.

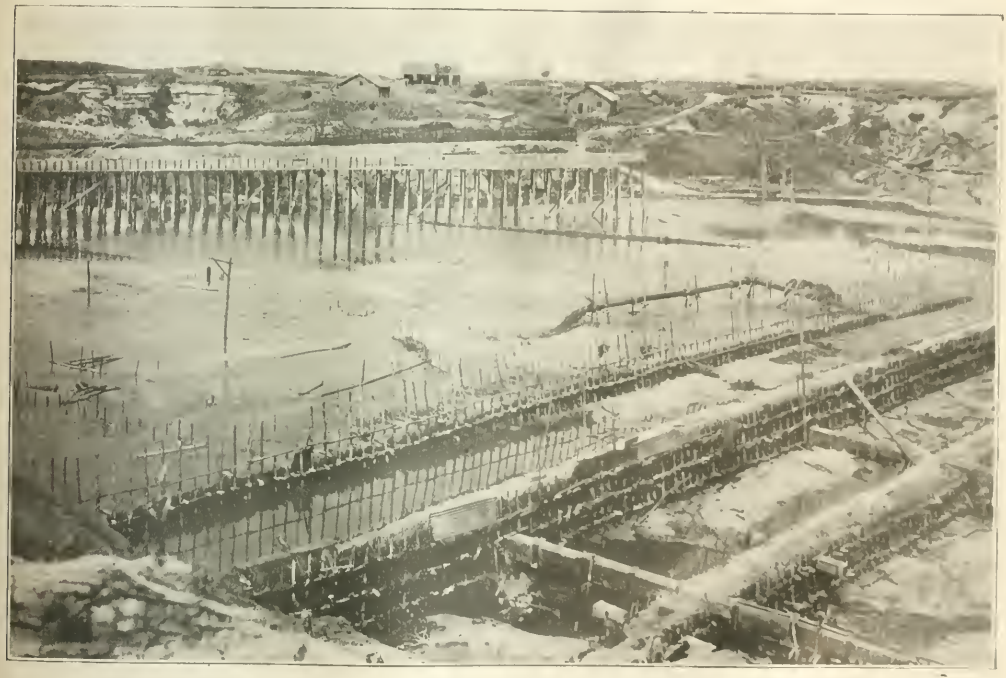
Petroleum Production

The centers of petroleum production are the Langkat and Perlak districts, in North Sumatra; the residency of Palembang, in South Sumatra; the residencies of Rembang and Sourabaya and the northeastern part of Java, the district of Koetei, in Borneo, and the Island of Tarakau. The oil-bearing formations occur in the Miocene and Pliocene of the Tertiary, the depth of the wells ranging from 200 to 600 m. The deepest well is 1,000 m., and is in East Java. Cable, steel-rod, and rotary systems of drilling are used. Refining of the crude petroleum is carried out at six establishments, respectively situated at Pangkalan Berandan (North Sumatra), Pladjoe and Bangoes Koening (South Sumatra), Tjepoe and Wonokromo (East Java) and Balik Papau (East Bornea). The products are benzine, kerosene, turpene, dieseloil and solaroil, liquid fuel, asphalt and coke, batching oil, lubricating oil and greases, paraffin-wax, and batils-wax. Gas in some instances carrying gasolene is encountered in drilling. Nearly all of the Sumatra crudes are especially rich in light products, and, generally speaking, contain little or no paraffin. The Borneo crudes vary considerably in composition, and it is no uncommon thing to find oils of an entirely different composition in the same field. The Java oils yield, as a rule, little benzine. Some crudes do not even contain kerosene; others are of a strong paraffin base.

History of Development

The Royal Dutch Company was formed in 1890 and completed its first well in 1890 in the district of Langkat. A refinery was completed at Pangkalan Berandan in 1892. The district in which this first oil enterprise was established was a tropical wilderness almost unpopulated. In 1900 the company drilled at Perlak and brought in several wells, all spouters. In 1910 the company acquired the Shanghai Laukat Co., which owned oil fields near Tandjong Poera, in the Langkat. Work was started in Borneo in 1901. In 1907 the Bataafsche Petroleum Maatschappy was formed by the amalgamation of the Royal Dutch and the Shell Transport & Trading Co. In 1905 the Royal Dutch extended its operations to Java, and in 1911 secured control of the Dordtsche Petroleum Maatschappy. The Bataafsche Petroleum Maatschappy is the dominant company now in the Dutch East Indies.

Most of the crude petroleum is transported by pipe lines to the refineries. The most important pipe lines are four and five-inch lines, 76 miles long, from Perlak to Pangkalan Berandan; two four-inch lines, 87 miles long, from Kamp Minyak to Pladjoe; a four-inch line, 141 miles long, from Melamoen to Pladjoe, and a five-



SLUICES FOR WASHING ALLUVIAL MATERIAL, BILLITON

inch line, 65 miles long, from Sanga Sanga to B. Papan (Borneo). Many smaller lines are in operation. Steel tanks are used for storage. Eight hundred whites, mostly Europeans, and 23,000 natives and Chinese are employed. Maximum production reached 13,000,000 bbl. in 1911.

The mining enactment of 1899 clearly distinguished between surface and subsoil rights. Prospecting licenses are required for exploration, and concessions for working mineral deposits. These are restricted to Dutch subjects, inhabitants of Holland or Netherlands East India, and to companies incorporated in Holland or Netherlands East India. Prospecting licenses are issued by the chief official of the province in which work is proposed, and are valid for three years. They can be twice extended for a further period of a year. The area is restricted to 10,000 hectares.

Discovery gives the holder of a license the right to a concession as soon as he has proved his discovery to the satisfaction of the Governor General. Concessions are for a maximum period of seventy-five years. The

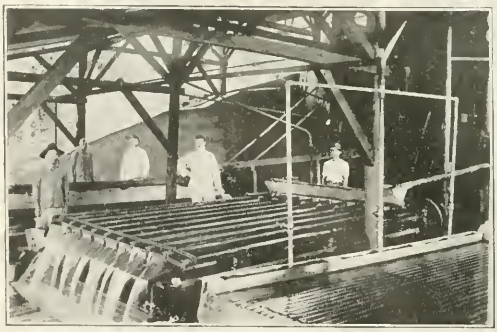


TABLE DRESSING OF TIN VEIN STONE AT KLAPPA KAMPIT MINE, BILLITON

maximum concession for working any kind of solid or liquid bituminous substance is 2,000 hectares in the islands of Java and Madura and a portion of Sumatra, 4,000 hectares in the remaining portions of the archipelago, and 1,000 hectares for any other minerals.

Prospecting license holders must pay to the government a fixed land tax of 1c. per hectare; concession holders, 10c. per hectare. In addition, the license holder must pay a royalty of 4 per cent of the market value of production obtained in the course of prospecting, of which amount a portion is free from royalty. Concession holders pay in addition to fixed land tax a royalty of 4 per cent of the gross proceeds. Mining regulations also provide for safe operation.

From a later publication it appears that prospecting licenses for petroleum are confined to an area not more than 25,000 acres, and several licenses may be applied for simultaneously. The holder of the license is compelled to prove diligent effort at the end of each year. Concessions are confined to an area of not more than 10,000 acres, the whole of which must be confined within one prospecting area, but several concessions may be granted within the same license after proving the existence of petroleum in commercial quantities. The legislation is not prohibitive to foreign interests, as foreign capital has established successful enterprises. Most of the petroleum mining has, however, been brought almost entirely under Dutch control.

Gold Mining in Venezuela and British Guiana

By KIRBY THOMAS.
Written for *Engineering and Mining Journal*

INTEREST has been revived in a new gold-placer district in southeastern Venezuela, which first became known to the outside world in 1915. It is about 250 miles directly south of the Orinoco delta on the border of British Guiana, and extends into British Guiana where the district is as yet entirely virgin. It is claimed that General Fernandez, one of the discoverers of the new district, took out over $300,000 of gold in three months, and other sensational strikes were reported.

Señor Quenza, a merchant of Calloa, the location of a famous gold mine of the same name, has a large concession for the new district and is directing operations there. So far, all the work has been done by natives, although some American engineers have made investigations.

The district is remote from main lines of travel. The itinerary advised is from Trinidad up the Orinoco to San Felix, and from there a three and one-half day mule-back trip to Calloa, from which point a two-day mule trip takes one to the Cayuni River. Here canoes are secured, and if lucky the remaining fifty miles to the objective is covered in one week.

The climate is reported to be bad. One engineer records in his report that "the mosquitos begin work at 5 p.m. to work all night." He also advises a formidable list of netting, and remedies. All food must be taken in from Calloa. The region is in the foothills of the little-known Usupamo Mountains. The labor available is mostly Trinidad negroes, speaking English.

According to the Department of Lands and Mines for British Guiana, the gold production of the colony covering a period of thirty years has been over $50,000,000, practically all from river and stream placers.

The great interior highland of British Guiana is comprised almost entirely of granite and metamorphic rocks, and the streams in this formation are nearly all gold bearing. On the Cayuni River the gold is exceptionally coarse and of great purity. Many nuggets of several hundred ounces have been produced. The gravel is shallow, from a few inches to six feet in depth, and easily washed by simple methods. Pay gravel is generally narrow, though sometimes up to 200 feet wide.

The Cayuni River has many rapids and is of little avail for transportation of supplies or materials. One of the main tributaries of the Cayuni River, the Yuruon, receives the waters of the Yuru River, which flows from the Venezuela highlands, in which is located the well-known Callao gold mine, which, under an American-British company, yielded upward of $20,000,000 in gold. These streams also drain the new rich gold-placer district in Venezuela.

Japanese Imports of White Zinc

The quantity and value of the imports of white zinc into Japan during the last five years are shown in the following table:

Years	Pounds	Value
1915	632,958	$52,133
1916	557,941	65,379
1917	97,026	5,143
1918	497,112	26,146
1919	1921 .2	220,995

Mining Engineers of Note

Arthur Thacher

A. I. M. E. members who have been fortunate enough to attend the annual meetings in New York need no introduction to Arthur Thacher, for his is a familiar figure, and it is doubtful if any one has shown a keener interest in the activities of the Institute than he. Mr. Thacher is at present on the Board of Directors of that body. Judged by modern-day standards, he may be regarded as one of the "old boys," but this, mind you, refers only to his membership of forty-four years in the Institute, for he would loudly disclaim any other allegation; and rightly so, for we know he loves a good story, can set the pace for many of the younger men on a sight-seeing trip, and in several other ways demonstrate the fact that despite his sixty-three years, he is as youthful as the best of them. His affability and conviviality have frequently been remarked upon, particularly by the newer members of the Institute. Concerning his membership in the A. I. M. E. it may be remarked that in joining that organization at the age of nineteen Mr. Thacher set an example which should serve as an excellent one for young mining engineers to follow. Arthur Thacher was born in Newtonville, Mass., on May 8, 1857, and was graduated from the School of Mines at Columbia College with degrees in mining and civil engineering in 1877. In December of that year he went to San Francisco and from there to Triumfo, Baja California, Mexico, for the Progreso Mining Co., which was operating the large silver mines that are still being worked. The treatment was dry crushing, roasting, and lixiviation. From there he went to New York. Since then he has been in most of the Western States. In 1887 he took up his permanent residence at St. Louis, and there assisted Prof. W. B. Potter in his private work and also gave lectures in metallurgy at the Washington University. In 1892 Mr. Thacher took charge of the Central Lead Co. in southeast Missouri, as president and general manager, and continued in that capacity until 1905, when the property was sold to the Guggenheims, who are still operating it under the name of the Federal Lead Co. For the next eighteen months he was connected with the Guggenheim interests under John Hays Hammond. In 1906 he entered the employ of the New Jersey Zinc Co. as Western manager of mines, and has since remained with that company. His principal work has been at the Wisconsin zinc mines of the New Jersey Zinc Co., where his interest has been largely with the treatment of the low-grade zinc ores, although he has also paid considerable attention to the low-grade lead ores of Missouri. In addition to the personal concern that Mr. Thacher has always shown in the progress of mining and metallurgy, he has also found time to interest himself with public affairs, and so we find that he rendered valuable service in 1899 as chairman of the Board of Arbitration for the New Orleans Drainage Commission and the National Construction Co. Were we to seek a friendly nickname for our friend it would be most fitting to dub him "Golden Rule" Thacher, for it is one of the strongest tenets of his industrial religion that the remedy for industrial problems lies in the simple application of the Golden Rule. It is not merely a theory with him, moreover, for he has substantial exhibits to demonstrate the practical expediency of the plan as he has practiced it, in cost-sheets showing a constant lowering of mining costs in mines under his charge, while operating costs in general were steadily mounting, and also in a record free from strikes. His cost reduction was not effected by cutting wages, for wages were steadily and voluntarily advanced from time to time, but by increased efficiency. Under the influence of the brotherly feeling engendered by the Golden Rule, his miners got unbelievably busy with the muck-stick. Such a doctrine as this is sorely needed in our mine operations of today, for it can do much to draw together the operator and employee, and by that means secure the best co-operative effort. More power to his gospel!

ARTHUR THACHER

Mr. Thacher is also a member of the Mining and Metallurgical Society of America and the St. Louis Academy of Science, and of the following clubs: Engineers', University, Round Table, Noonday, Country, and St. Louis, of St. Louis; Engineers' Club of Chicago, and the Rocky Mountain, of New York.

BY THE WAY

Commercializing the Weakness of Palladium

We suggest a profitable side line for the manufacturers of divining rods: Palladium, as is well known (by some) will glow to the point of ignition when exposed to alcoholic fumes. In this it resembles some animate bodies. In fact this property of palladium has been used in the manufacture of automatic cigar lighters. The value of a device containing palladium to Prohibition Enforcement Officers is, of course, obvious. The nearer they get to the source of supply, the warmer they would become, a literal interpretation of one of our childhood games. They could really be hot on the trail. An added advantage is that the palladium becomes as excited about wood alcohol as any other kind, so would play no favorites as to brands of liquor. We hesitate to make things easier for the said P. E. O., but we feel that those who manufacture divining rods should have a little encouragement after some of the mean raps we have given them. Also, of course, we are anxious to develop new uses for the metals.

A Problem in Commercial Algebra

A certain applicant for relief under the War Minerals Relief Act put in an item of expense for building a mill of something over $80,000. The Bureau of Mines accountants, on investigating the case, found that he had put the cost of the mill at something over $10,000 in making up his income-tax statement. Question: What was the cost of the mill, and why?

The Glories of Knowledge

The *Bornite Sentinel*, of the Davis-Daly Copper Co., publishes the following, which we reprint for the benefit of our Cousin Jack devotees:

An old-time Cornish mining captain in the Lake Superior iron country had a collection of minerals of which he was very proud. Some years ago a party of students from the Michigan College of Mines at Houghton came down to Cap'n Jan's mine on an inspection trip and were invited to his home for dinner. The boys arrived at the house before their professor, and Cap'n Jan was proudly showing them his specimens. "I suppose, m'son," he said to one of the students, "thee naws a mineral an' thee can tell 'er name right h'off, can thee?" "Well, Captain, I don't know if I can, but I've studied mineralogy some and know the majority of the common minerals," answered the youngster. "Let's see 'ow thee's learned, m'son. 'Ere, naow, 'ere's a bit o' mineral [holding up a specimen of iron pyrites], w'ot's this 'ere?" "Why, that's iron pyrites, Captain." "H'iron pyrites! Dam-me! I nawed I'd get thee, but did'nt think to catch thee firs' crack h'out o' tha box. W'ot's this then [holding up a piece of cassiterite]?" "Why, that's cassiterite." "Cassiterite! W'y dam-me, 'oo ever 'eard tell o' cassiterite? Thee's wrong m'son, thee's wrong. I be afeared tha bloody college h'edication 'as'nt 'elped thee one bit. 'Ere's tha professor naow; let's see if 'e naws w'ot is un. Professor, w'ot's this 'ere bit o' stone [holding up the piece of pyrites]? Tha boys don't seem to naw tha name o' this bloody rock at all. W'ot dost thee call un?" The professor did some quick thinking. He knew, as it was iron pyrites and would be easily seen to be that, that the boys had named it right, and therefore the Cornishman did not know the correct mineralogical name. "Why, Captain, that's *maundic* [The Cornish name for iron pyrites]." "Dam-me, w'ot's think o' that," cried the delighted captain, "I nawed bloody well thee would naw, an' these 'ere young chaps try to call un h'iron pyrites. Naow, 'ere Professor, [holding out the cassiterite] w'ot's this 'ere? She's a 'ard one, so take thy h'own time." "Well, Captain," the professor replied, "that's a bit of tin stone." "Professor, shake 'ands," shouted the Cornishman. "Dam-me, I wuz afeared w'en these 'ere young fellers did'nt naw tha names o' these minerals that thee wouldn't naw them h'either, but naow I see thee h'art an h'edicated man."

An Appeal

Conspicuous efforts are being made by New York druggists to market large quantities of epsom salts, or magnesium sulphate. This commodity is being offered in four-pound tins at an attractive price. But who wants four pounds of epsom salts all at once? Answer: Those who have avoirdupois. Bathe in it and reduce. Dissolve it in the bath, plunge in, dissport, and at last emerge, almost as stout as you were before but not quite. Continued treatment is bound to show results, if not in reduced weight, at least in the greater consumption of epsom salts. Remember, every little bit helps. Pity the poor producer of magnesite, left high and dry when the war tide went out, and go take a bath at once—in epsom salts.

How To Get a Gold Medal

Doubtless the Chile Copper Co. staff has now received its full complement of gold medals from the M. & M. Society. Pope Yeatman, on receiving his medal, gave most of the credit to his staff, including primarily Cappelen Smith; and Cappelen Smith gave most of the credit to Mr. Yeatman. Both, we believe, yield the main honor to the foresight and faith of Daniel Guggenheim. But it is not expected that Mr. Guggenheim will be honored with the medal just yet. The initiation of dividends on the common stock would be a suitable occasion. Our West Coast friends may well feel discriminated against because no medals have been awarded to the pioneers of the great enterprises of Alaska Gold and Alaska Juneau; but the passage of the McFadden bill may better their chances.

A Welfare Hint

We recently introduced our readers to the Marcy collar, bound to find favor with millmen. We now take pleasure in bringing to the attention of geologists and those interested in geology the latest Ide collar, known as the Moraine. This is not an advertisement. Space in these columns cannot be bought.

Handy Knowledge

Spectacles with lenses made of optical fluorite will enable one to see double, as in the days of old. According to a bulletin issued by the State Geological Survey Division of the University of Illinois, a specimen of fluorite for optical use must contain a portion at least one-fourth of an inch in diameter, free from flaws, and colorless or nearly so. There is no way, however, of getting the old sensation along with the old vision except the old-fashioned way.

CONSULTATION

United States Mining Laws

In the Nov. 13 issue of *Engineering and Mining Journal* reference was omitted in the article "United States Mining Laws" to Bulletin 94 of the U. S. Bureau of Mines, "United States Mining Statutes Annotated," by Judge J. W. Thompson, published in two parts and containing 1,772 pages, which covers the subject thoroughly and in a different manner from both that of the publication of the General Land Office and that of the late Judge Lindley, to which references are made. It may be obtained in cloth-bound form from the Superintendent of Documents, Washington, D. C., for $2.50.

The pamphlets of the General Land Office give a bare statement of the Federal Mining Law. "Lindley on Mines" is a compilation essentially for lawyers, and, although a standard work on the subject, its usefulness is limited practically to attorneys, its price is almost prohibitive to the ordinary miners or locators, and it is arranged without particular reference to the various sections of the mining code. The treatise of the Bureau of Mines seems relatively little known among mining men, and was prepared at the authorization of Dr. Holmes, a former director of the Bureau, in the belief that the development of the best mining law for the United States must necessarily be founded on a comprehensive and exact knowledge of existing laws. It contains every act of Congress relating to mining or the mineral industries.

"United States Mining Statutes Annotated" has the advantage that every section in the work—numbered the same as in the Revised Statutes of the mining law—is followed by simple and plain extracts from the decisions of the various courts, supplementing and making clear the statutory requirements.

As an illustration of the importance of its orderly arrangement, the following example is poignant: The question arises as to what constitutes the performance of annual labor on a mining claim to the extent of $100 in value. This is the simple requirement of Section 2324 of the Revised Statutes, but a person without experience in the performance of the annual assessment work, and without a reference to the holdings of the courts, would be at a loss to know the nature of the work to be performed, the time when, or the place where, such work must be done. By reference to page 233 of the bulletin, under the section containing the requirement, he would find twenty pages devoted to every phase of this particular subject.

Judge Thompson has stated that Bulletin 94 has become very popular with miners and prospectors and has continued since its publication to have a remarkable sale through the Superintendent of Documents.

The Bureau of Mines is publishing annotations of the mining statutes of the different states: California and Illinois annotations have already been published; Pennsylvania is in press, and the Colorado annotations and statutes are ready to be printed. All the bulletins mentioned are valuable additions to the mining library of the prospector, engineer, or other interested party.

Chemical Lead

"Will you kindly inform me what constitutes chemical lead; that is, what impurities are inadmissible in this grade of lead and for what it is chiefly used?"

Chemical lead is a "soft" lead used in sulphuric-acid chambers and processes using sulphuric acid. It usually contains a small percentage of impurities, copper and antimony, which serves to make it more resistant to the effect of acids. The production of chemical lead is dependent upon the presence of impurities in the ore from which it is made. There are no fixed specifications for chemical lead, and doubt has been expressed as to the most efficient composition of this material. Barrs has found an increase in the purity of lead corresponds with an increase in the power of resisting acid attacks, but recommends the addition of 0.02 to 0.05 per cent copper to insure maximum resistance.

During the war experiments were made by D. W. Jones to determine the best quality of chemical lead by heating chemical lead in sulphuric acid. The results of his experiments are recorded in an article, "Chemical Sheet Lead," published in the *Journal of the Society of Chemical Industry* for July 31, 1920. It was found that lead refined by the Parkes process without further treatment is unsuitable for use in many operations using chemical lead. To test the effect of impurities on the chemical properties of lead, additions of pure metal were made. It was observed that the presence of antimony in lead to the extent of 0.01 per cent renders it unfit for use as chemical lead and that some corrective agent is required to prevent the breakdown of such lead under sulphuric acid.

The effect upon the decomposition temperature of the addition of copper to a Parkes process lead was found to be most beneficial. Copper also counteracted the harmful effect of antimony. With between 0.02 and 0.03 per cent of copper and antimony there seems to be a rise of temperature of initial attack.

That zinc, when present in lead in even small amounts, is supposed to destroy the power of withstanding the corrosive action of acid was not borne out by the experiments. Mercury was found to have a deleterious effect upon the quality of chemical lead. Tin had a degrading influence, but as it is easily removed from lead by modern refining methods it is not usually found in lead in more than minute traces. Bismuth is decidedly injurious if present above 0.04 per cent, but the addition of small amounts of copper partially counteracts its effect. The poor chemical quality of some Parkes lead is ascribed to the effect of the proportion of bismuth and antimony contained in it.

Jones concludes that of the elements used for additive purposes there are only two which consistently exert a beneficial influence upon the chemical properties of lead—copper and sodium. Of other additions it may be said that they are injurious in effect, though in most instances not to the extent supposed. Antimony, if present in quantities which a commercial metal may contain, will effectively debar its use as "chemical" lead.

HANDY KNOWLEDGE

Repairing Broken Cam Shafts

BY GEORGE J. YOUNG

A considerable amount of discard material always accumulates about a stamp mill, and ordinarily it cannot be salvaged. The distance of most mining districts from iron-working centers has usually prohibited the marketing of scrap metal, and, as a consequence, such discard material represents a total loss.

The advent of the oxy-acetylene welding torch, the electrical welding outfit and thermit has greatly extended the possibilities of reworking scrap and salvaging broken parts. The matter is primarily a question of comparative costs. The distance of the plant from manufacturing centers determines the cost of freight and the time required for the receipt of repair parts. Both are important considerations. Where plants have favorable freight rates, there is often little justification for undertaking anything more than urgent repairs, as wages for skillful repair men are high. Nevertheless, it is important for at least one or more repair men to be maintained, and the minimum volume repair work should be done to keep such men comfortably busy. The time required for shipment of parts is often excessive, whereas the time for repair, though it may represent in money an excess over replacement by shipment, is so much less that repairs

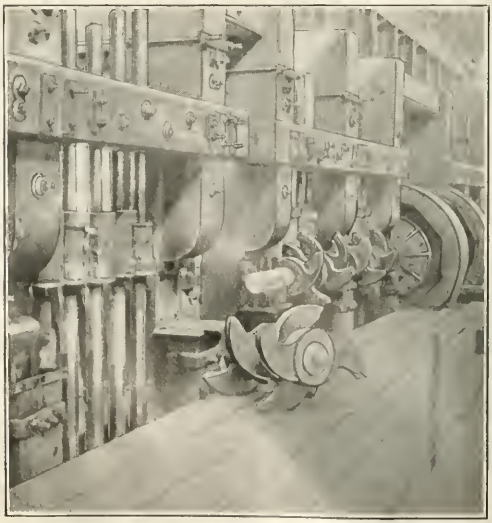


FIG. 1. BROKEN CAM SHAFT AT BELMONT MILL, TONOPAH, NEV.

are best made at the plant. A well-equipped plant necessitates the availability both of the portable welding outfits for small parts and minor repairs and thermit for heavy repairs.

At the mill of the Tonopah Belmont Development Co., which through the courtesy of the company I visited during the fall of 1919, cam shafts were being repaired instead of consigned to the scrap heap when broken. A single shaft is used for two batteries, and when broken represents somewhat over $300 in value.

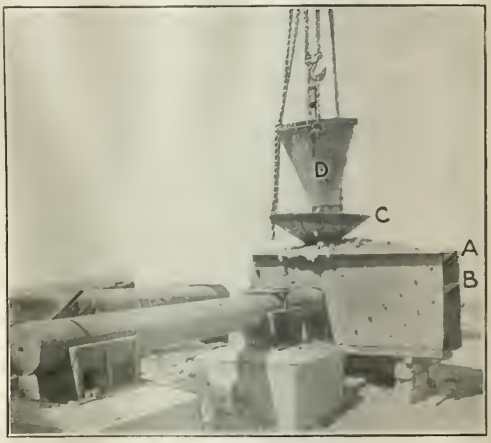


FIG. 2. READY TO IGNITE THE CHARGE OF THERMIT

Thermit is used for welding the broken ends of the shaft. A special stand consisting of four concrete pedestals each supporting an ordinary cam shaft box is used for the job. The broken ends are trimmed off and the shaft ends placed in the boxes, the ends of the shaft being brought within five-eighths of an inch apart. The shaft is then securely clamped at the two inner boxes, as shown in Fig. 2. The sheet-steel box shown in the figure is slipped onto the shaft before the shaft is set in the boxes. It is then bolted together. The illustration shows clearly the construction of the box.

Wax, softened by heat, is then forced into the space between the ends of the shaft and built up into a collar about three-quarters of an inch on each side of the ends. The weight of the container and wax is taken before and after use. All parings of wax are returned to the bucket, and the difference in weight represents the actual weight of wax used in filling the space between the ends and in forming the collar. In the specific instance two pounds ten ounces of wax were required. On the bottom of the box and the inclined steel partition fire brick is placed. Moulding sand is then rammed in, three wooden plugs being put in position. The lower one, horizontal, being so placed as to be tangent to the under side of the shaft, is called the torch hole, the middle inclined plug is the vent, and the upper one is the pour hole. These are respectively *E*, *F* and *G* in Fig. 3. Moulding sand is then thoroughly rammed about the plugs, and the box filled. While this is being done, partition *B*, Fig. 2, is out. The three plugs are then removed and an oil-compressed air torch is adjusted so that the flame passes through the lower

hole *E*. In this way the wax is burned out and the ends of the shaft are brought up to the highest heat obtainable.

In the meantime, the thermit change, 33 lb. thermit mixture for each pound of wax, is prepared and placed in the crucible, *D*. It requires about three hours for the torch thoroughly to heat the ends if it is working properly. As soon as the desired temperature is reached, the torch is removed, an iron plug placed in the torch hole, partition *B* placed in position and moulding sand rammed in back of the iron plug to keep it in position. A funnel *C* is then placed in position, the thermit charge ignited, and the pour made. The shaft is removed on the following day. When machined the junction of the broken shaft ends is hardly visible.

To facilitate handling of the shaft and thermit crucible, a small jib crane and chain block are conveniently erected near the pedestal blocks. The entire job required two men approximately one and a half shifts, or from sixteen to twenty-four hours' time. For

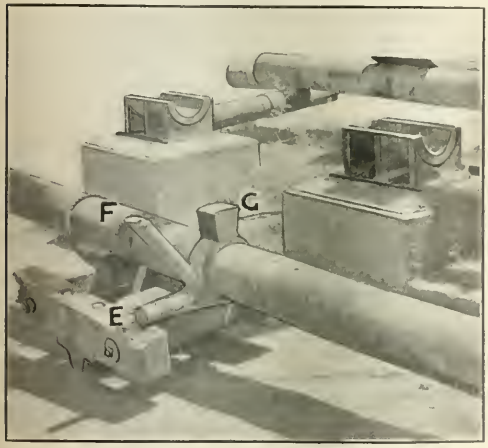


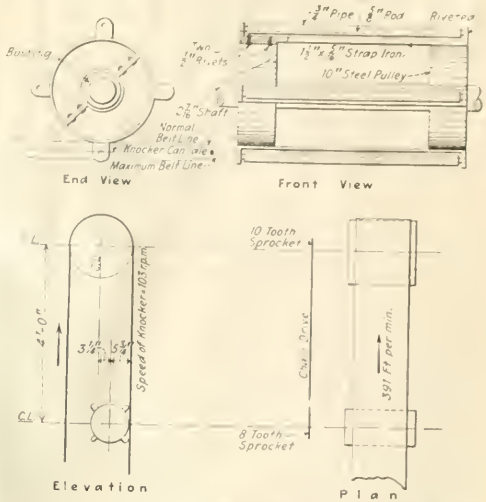
FIG. 3. THE CAM SHAFT REMOVED FROM BOX AND READY FOR MACHINING

success, the shaft ends must be perfectly aligned and the whole job carefully handled. Acknowledgment for the notes from which this article was prepared is made to F. J. O'Neill, who carried out the work described.

Knocker for Cleaning Conveyor Belt

By W. R. Canton

Upon starting the wet concentrating mill at the Replogle Iron Mine, near Wharton, N. J., some difficulties in handling the wet tailings arose. Drag classifiers delivered a product containing 24 per cent water to the belt conveyors. This product does not act like a dry material, and a large percentage adhering to the belt is dragged back on the return and some is thrown off at each idler. To eliminate this difficulty the knocker shown in the illustration was installed. Although the idea was not original, no data on the operation of this device were available. How hard to hit the belt and how often were points to be determined. A good sharp blow gave the best results. This was obtained by driving the knocker at 103 r.p.m. by means of a chain drive. This resulted in 412 strokes against

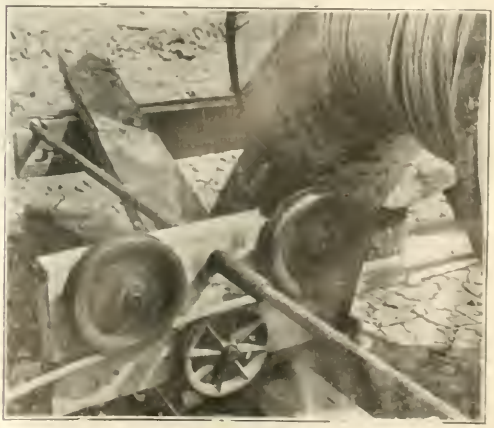


DETAIL OF "KNOCKER WHEEL" USED TO PREVENT WET MATERIAL FROM ADHERING TO THE RETURN BELT OF A BELT CONVEYOR

the belt per minute. The belt was struck every 11.38 in., and with the knocker so adjusted worked excellently.

Removing Reel Kinks From Wire Rope

A device for removing reel kinks from wire rope is described in *Engineering News-Record*. It was used in preparing wire rope for concrete block revetment at vulnerable places on the improved Miami River channel at Dayton, Ohio. This rope, cut to lengths of 20 ft. or more, was threaded through holes in precast concrete blocks, and it was important that it should lie straight to facilitate the threading operation. As indicated by the illustration, the reel of rope is suspended on an axle on a timber frame so as to unwind from the bottom. In front of the reel three pulleys attached to an axled plank, as shown, constitute the straightening device. The entire arrangement cost little and served its purpose excellently.



METHOD OF STRAIGHTENING WIRE ROPE BY MEANS OF THREE PULLEYS

THE PETROLEUM INDUSTRY

Draining Oil Reservoirs

The Mining of Oil Sands by Shafts and Tunnels in Shallow Fields Permits the Application of a Method for Determining Certain Production Estimates and the Calculation of Drainage Area

BY SETH S. LANGLEY
Written for *Engineering and Mining Journal*

OIL production is essentially the mining of a liquid. The oil reservoir is an ore which, when drilled into, is self-concentrating, and, until the gas pressure is exhausted, it will mine its concentrate. After exhaustion of the gas pressure the ore still concentrates itself and is mined by pumps. Eventually concentration is too slow to be profitable, although more than half of the original oil may still remain in the reservoir.

In a recent issue of *Engineering and Mining Journal* A. H. Fay called attention to the possibilities of draining oil reservoirs by the application of metal-mining methods. Intrenched in their ignorance, some seemingly intelligent operators scorn the idea on the time-worn argument, "it has never been done." It has been and is being done in Alsace, as reported in *Engineering and Mining Journal* of June 12, 1920, on p. 1320. The article states: "Three shafts, with 4,000 meters (13,000 ft.) of subterranean galleries, produce more than 25,000 tons (164,000 bbl.) of crude petroleum per year."

DETERMINING PRODUCTION IN OIL SANDS

Even were the precedent of this example lacking, the problems to be overcome are known and can be solved. Production by shafts and tunnels is applicable to comparatively shallow fields whose gas pressure has been exhausted and in which production by wells is no longer profitable. Data from which to base conclusions should be available. The character of the reservoir is known from the drilling records, and the porosity of the sands can be closely calculated.

Referring to "Oil and Gas Production," by Huntley and Johnson, on p. 37, "Calculations show that there are 7,758 bbl. of sand in a bed 1 ft. thick and an acre in area—assuming 15 ft. of pay sand and 4.5 per cent extractable. In Equation 1, $0.045 \times 7{,}758 = 5{,}236.55$ bbl. of oil per acre."

The above gives 349 bbl. per acre-foot. The first and third factors of Equation 1 are the variables. The first is dependent upon the porosity of the sand, and can be determined by samples from the wells. The third can be calculated from the well logs. With the original oil content known, the present content can be obtained by deduction of the total past production. All of the remaining oil will not be recovered by drainage into tunnels, but the rate of drainage per foot of exposed area should be the same as in the wells, and can be estimated on that basis.

Fig. 1 is presented as an example and represents actual subsurface conditions below the 350-ft. level. The water-bearing sand is assumed to meet a possible condition. The field map shows twenty-five wells that are distributed throughout the area represented by a lease of ninety-three acres.

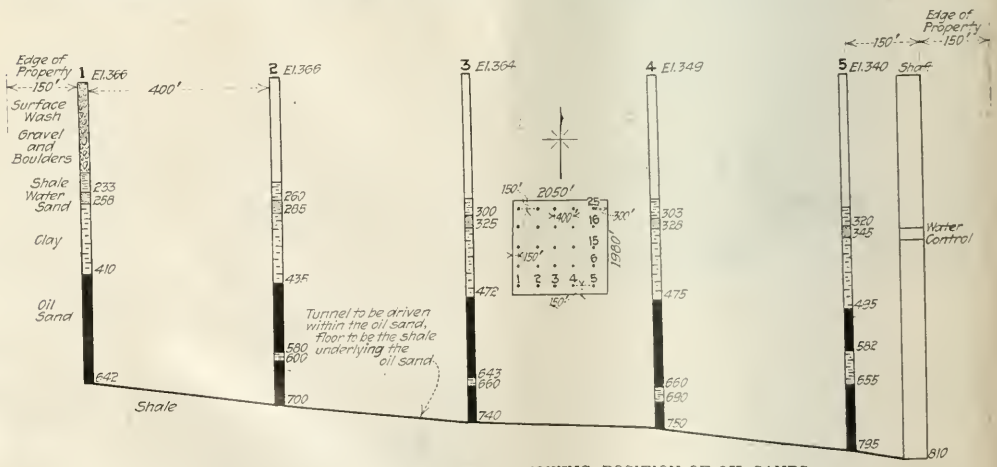


FIG. 1. CROSS-SECTION OF WELLS SHOWING POSITION OF OIL SANDS

By Equation 1:

$0.03 \times 7{,}758 \times 239 = 55{,}624$ bbl. per acre.

$93 \times 55{,}624 = 5{,}173{,}032$ bbl. total original oil.

Passed production 2,000,000 bbl.

Oil remaining in reservoir 3,173,032 bbl.

The present production is two barrels per well per day. The wells are all finished as 6-in. holes. Hence 6-in. $\times$ 3.1416 $\times$ 239 = 375 sq.ft. of draining area per well. $\frac{375}{2} = 187.5$ sq.ft. drainage area per bbl. of oil.

It is known from the well logs that the oil sands dip to the southeast. A tunnel west and drifts north would form a gravity drainage system to the sump of a shaft sunk in the southeast corner. A shaft 850 ft. deep will provide a 40-ft. sump. From the 810-ft. level drive a 7-ft. x 6-ft. tunnel west 1,750 ft., and from the tunnel five drifts north, each 1,680 ft. in length and 7 ft. x 6 ft. in cross-section. The floor of the tunnel and drifts will not be figured as drainage area, as it will be in the underlying shale. The total drainage area of the shaft, tunnel, and drifts will be 231,480 sq.ft., and if the drainage is in proportion to the exposed area the production will be approximately 1,235 bbl. per day.

Method of Water Control Must Protect Sands

The well logs—Fig. 1—show a water sand lying between the shale strata. This water must be controlled, the method outlined by G. G. Wald in the *Engineering and Mining Journal*, Dec. 28, 1918, p. 1129, being applicable. Whatever the method used, it must provide protection of the oil sands from foreign water, both for the property in question and its neighbors. This water need not be carried to the bottom of the shaft. A pump station should be cut at as high a level as possible. The experience gained in controlling the water can be applied to the oil sands encountered in sinking. When the shaft is completed it would be well to devote a month or two to the study of production per unit area of exposed oil sands. The size of the tunnel and drifts will depend upon this data.

There are probably no field records to show what percentage of the oil will be retained in the sand by capillary attraction. When the production has declined materially it may prove profitable to increase the drainage area. There will come a time when this is not profitable, and then the question of mining the entire orebody will be decided by the same factors that control all mining. The probable oil remaining can be estimated from the sands in place in the same manner that the value of any orebody is determined. The sands available for sampling will certainly be no richer than those unexposed.

In an operation such as illustrated in Fig. 1 it may be necessary to upraise through the lowest shale break shown in wells Nos. 2, 3, 4, and 5, or to drive a tunnel from the shaft to cut the shale in No. 4 at 660 and drift from this tunnel north. The local experience will decide.

Development should be done by contract, as few if any oil companies maintain technical staffs trained in this sort of work. On the other hand, as it is, in all essentials, the mining of a liquid rather than a solid ore, large mining companies with proper technical facilities would not encounter new problems.

Shortage of Fuel Oil in Vancouver

Consumers of fuel oil in Vancouver, B. C., were recently notified that the Imperial Oil Co.'s sources of supply would soon be cut off and that there is no hope of securing more oil until June 1, 1921, when two tank steamers, now building, will be ready to carry oil from the Mexican fields to Vancouver. The company announced that, after Dec. 31, 1920, all delivery wagons and tank cars will be withdrawn.

The lack of fuel oil, states Consul General Frederick M. Ryder, may force many of Vancouver's office buildings and apartment houses to convert their heating plants to the use of coal; and as most of these heating plants were not constructed with such conversion in mind at the time of installation, this announcement is likely to cost local consumers thousands of dollars. The Grand Trunk Pacific, the Terminal Navigation Co.'s steamers, the North Vancouver ferries, and a number of small boats depend on Imperial fuel oil, and considerable agitation is visible in marine circles.

It is estimated that the withdrawal of the Imperial Oil Co. from the field will necessitate an increase in the production and distribution of coal in Vancouver to the extent of 3,000 tons per month. However, according to the general sales manager of a locally prominent coal company, there need be no fear of a shortage of coal in Vancouver this winter, as the recent announcement of the oil company had been expected and the coal companies were prepared to take up at once the burden of supplying the people of this city with coal. The pulp and paper plants have announced that the new order, notifying them of a cessation of oil deliveries for six months, would have no ill effect on their operations.

American Company Secures Oil in Trinidad

On drilling a well to a depth of 1,100 to 1,200 ft., within four or five miles of the asphalt lake at Brighton, Trindad, an American company, states *Commerce Reports*, recently secured a "gusher" which had a flush product of 30,000 bbl. of petroleum oil within twenty-four hours, and has settled down to a daily production of about 1,000 bbl. Up to the present time the drilling operations of this American company in Trinidad have been mainly for the purpose of securing petroleum to use as a flux in connection with asphalt for road paving and other purposes, although some fuel oil has been exported independently. The company is also, through a constituent company in Venezuela, extensively interested in petroleum oil deposits near Lake Maracaibo, in Venezuela, and in an oil refinery at Curacao, Dutch West Indies.

California Report Covers Field Operations

The available supply of gasoline in California and other states varies with demand at different seasons of the year. The amount stored usually increases during the winter months and falls off rapidly during the summer. Regularly compiled statistics are useful to consumers who desire to follow the situation. The monthly report of the California oil and gas supervisor contains the latest available figures collected by the Bureau of Mines and may be obtained by addressing the State Mining Bureau, Ferry Building, San Francisco. The last report issued contains a report on all oil field operations passed upon by the oil and gas supervisor during September.

NEWS FROM THE OIL FIELDS

United States Demands Equal Treatment in Mandates

A demand for the application of the principles of equality of treatment of all nations, irrespective of mandatory power, with special reference to the petroleum resources of the territories involved, and a protest against the exploitation of these resources by any nation to the discrimination of others, constitute the salient points of a note signed by Secretary of State Colby and delivered to the British Foreign Office on Nov. 24. Although dealing particularly with the distribution of the oil resources of Mesopotamia, the American protest also sets forth the right of the United States, as one of the powers associated in the victory over the Central Powers, to be consulted as to the terms of mandates and other decisions, the right to make which accrued to the Allies as a result of their common victory.

Limit Placed on Oil Claims

From Our Special Correspondent

Consequent on the discovery of oil fields in the neighborhood of Mackenzie River, the Canadian government has passed an Order-in-Council limiting the maximum area which may be staked to 640 acres. Notice is also given that the Mackenzie River Petroleum Co., Ltd., will apply for incorporation at the next session of Parliament. The company seeks all powers incident to the production and storage of oil and natural gas, the marketing and transportation thereof, except by rail. In particular, the company will seek authority to construct a pipe line for the transportation of oil and gas from a point near the mouth of the Rat River, at its junction with the Peel, a tributary of the Mackenzie, thence to the international boundary.

Up to Nov. 1 7,500 applications for permits to prospect for oil on the public lands had been filed with the General Land Office. Applications for permits to prospect for coal numbered 254. Six have made application for permit to prospect for sodium. There have been two requests for leases of oil shale lands and five applications for leases on phosphate lands.

That the Government may expect a considerable income from the operation of the leasing law is indicated by the estimate that oil lands leased under the act, in Wyoming and California alone, promise during the next fiscal year a production of 14,000,000 bbl. If that production is achieved, the Government's share will amount to more than $6,000,000 at present prices.

France Defers Making Oil Law

According to authoritative reports, schemes for revision of the French petroleum laws may not take shape before next spring, says a recent issue of the New York *Sun*. The proposal by M. Eynac for state control of importations and exportations of petroleum and petroleum product is regarded by many well-informed persons as embodying anything other than a liberal, open-door policy in connection with American oil interests.

If the Eynac proposal is favorably acted on by Parliament, which now is considered unlikely in view of the growing antipathy on the part of the public to a continuation of what is virtually a monopoly in the hands of the Royal Dutch Co., American oil interests and particularly the Standard Oil Co., which recently formed a French branch with Paul Cambon as president, will have to beg for a special permit before they can bring in even small quantities of crude oil for refining here, while the selling price of oil will always be subject to the control of a special department assigned to the Ministry of Public Works.

Notes from Trinidad, B. W. I.

From Our Special Correspondent

George R. Airth, managing director of the Anglo French Exploration Co., and Walter Maclachlan, chairman of the British Borneo Petroleum Syndicate, Ltd., arrived from London via New York Oct. 6 to attend a meeting of the directors of the Apex (Trinidad) Oilfields, Ltd., and to obtain a first-hand view of the company's operations. They were met by the local general manager, Colonel Hickling, and their geologist, Dr. Miller.

The gusher brought in by the Petroleum Development Co. on their new lease near Brighton has produced over 175,000 bbl. to date and is still producing at the rate of 1,500 bbl. per day.

A local press report states that Well No. 3 of the Apex Oilfields, Ltd., caught on fire on Nov. 5 through unknown causes. The derrick engine and drill equipment were quickly destroyed. The fire spread down the ravine on which the well was located and caused considerable damage to a cocoa plantation in the valley below.

On the afternoon of Nov. 21 Anaconda Copper Co., drilling in the Cat Creek field in central Montana in what is known as the West Dome, brought in a well having an estimated output of 1,000 bbl. Anaconda has acquired from ten to twelve thousand acres in this field and a second well is being drilled.

Warren County, Ky., Leads in New Work

From Our Special Correspondent

The result of developments in the Kentucky oil fields for the month of October shows that in new work under way Warren County takes the lead, followed by Allen, while it is a race between Lee and Johnson-Magoffin Counties for third place.

Drilling activity continues unabated in the Johnson County field, and recently a number of good producing wells were brought in. No. 1 Hayden Williams made 12 bbl. in four hours' pumping. This well is in the Weir sand. The Cumberland Petroleum Co.'s No. 2 on the Oliver Wheeler tract is estimated to be good for 30 bbl.

One of the largest wells in Simpson County was brought in by C. H. Upper on the George Slate lease. In addition to the regular sands found in that section, 15 ft. of light porous sand was encountered, giving forth a large quantity of oil. The bringing in of this well fully determines that the eastern part of Simpson County and the western part of Allen County will prove probably the largest and most consistent field in Kentucky, as the sands are uniform.

In Todd County, the Kentucky Producing Co., is starting a deep test near Elkton, planned to go 3,500 ft.

Mexican Wells Showing Decline

From Our Special Correspondent

The Transcontinental well on Lot 97 has been shut in entirely. It was showing emulsion and two-tenths of 1 per cent clear salt water. Thus the end of many of Mexico's largest wells is approaching rapidly. The new field in Zacamixtle will follow the same fate, as derricks spring up like mushrooms in this vicinity. An entirely new field will have to be found when this goes, as it is the last piece on this huge underground fold that has been supplying Mexico's oil for the past few years.

Over seventeen million barrels of oil were shipped from Mexico during the month of October; this figure being just a little over two hundred thousand barrels short of the record month, September, 1920.

The Metropolitan well No. 1 on Lot 135, Chinampa, was showing two-tenths of 1 per cent and the flow was pinched down. Their well on Lot 114 has been abandoned at a depth of 1,750 ft. also.

The Mexican Gulf well on Lot 95 has been shut in entirely as it has been showing emulsion for over a month now. Their two wells on Lot 251, Amatlan, have also been checked, as they were showing two-tenths of 1 per cent sediment.

Book Review

Industrial Housing — By Morris Knowles. 6½ x 9¼; cloth; pp. 408; illustrated. Published by McGraw-Hill Book Co., Inc., New York. Price, $5.

In the preparation of this book the author has drawn from an extensive experience with the housing activities of the Emergency Fleet Corporation, U. S. Shipping Board, of which he was chief engineer. The industrial housing idea, although practical to some extent, was, in the early stages, characterized "by incorrect social hypotheses and a complete lack of consideration of the problem." Also the suggestion of paternalism acted as a deterrent to the full progress of the movement. Later there were some notable examples of successful housing programs, but under the stimulation of a stringent need for industrial housing during the war, the movement grew rapidly and has now reached a high stage of development. The reader cannot fail to be impressed with the comprehensiveness of the author's treatment of his subject. Mr. Knowles states that not all of the features discussed are applicable to one locality, but that the consideration of them is advisable, and the mere providing of the house does not complete the industrial housing plan. There is necessary, also, "the appropriate planning of streets, blocks and lots; parks and recreation facilities; the utilities, such as drainage, sewerage, water supply, gas and electricity, transit and transportation, health and sanitation." A number of excellent examples of industrial housing projects and pertinent details connected thereto are given. Although there is but slight reference to mine "locations" or mining "camps," there is ample "food for thought" for the mine manager who has not provided an adequate and successful plan for the housing of his employees. D. E. A. C.

Mineralogy. An Introduction to the Study of Minerals and Crystals. By E. H. Kraus and W. F. Hunt. First edition; cloth; 6 x 9; pp. 561. McGraw-Hill Book Co., New York. Price, $4.50.

Many books on this subject have been published, all of them inclined to be dry and uninteresting, but, however, of high scientific value. The authors of this book have taken pains to enliven it, to make it attractive enough to the reader so that, although he may not read it in preference to the latest *Saturday Evening Post*, he will at least not be repelled by the appearance of the text. To accomplish this, they have evidently worked with the enthusiastic co-operation of the photographer and the typographer. Photographs of crystal forms are shown instead of the conventional line cuts. A positive hemiorthodome does not seem so forbidding when we can see an actual picture of it. Photographs of prominent mineralogists, of equipment, and of natural minerals are generously scattered through the pages. We know that the piece of magnetite illustrated is magnetic, because half of the keys of the University of Michigan mineralogical laboratory are hanging on to it, to say nothing of a couple of worn-out safety-razor blades.

The first part of the book is devoted to crystallography and to equipment connected with that subject. Then comes a brief chapter on the formation and occurrence of minerals, followed by forty pages on qualitative blowpipe methods. Those without training with the blowpipe often will go to the trouble and expense of having a chemical analysis made, or merely make a guess at sight, when, by the use of the most simple blowpipe equipment, a sufficiently accurate qualitative analysis may be obtained. The most important blowpipe tests are given in this book. The remainder of the volume is devoted to descriptive mineralogy and tables for the determination of 150 minerals.

Professors Kraus and Hunt have produced a book which should have a wide appeal to men in the field as well as being valuable as a text for students beginning work in college, for which most of the matter has been used at Ann Arbor for several years. It has been ten years since the authors gave us a "B," or maybe it was a "C," in the course, and we still remember quite a few facts about the subject. It must have been well presented. E. H. R.

"The Limestone Deposits of New South Wales." By J. E. Carne and L. J. Jones, Mineral Resources No. 25, New South Wales Department of Mines, Geological Survey, Sydney, 1919, 6 x 9½ in., 411 pp., 67 illustrations, 31 maps.

This volume deals with the limestone deposits, and with the limestone, lime, cement, and marble industries of New South Wales. A historical review of the discovery and early development of the limestone deposits is followed by a discussion of the origin, composition, varieties, and uses of limestone, and a fairly complete treatment of the process of manufacture and uses of lime. Forty-six pages are devoted to a discussion of hydraulic cements, their properties, raw materials, processes of manufacture, and plant operation. In the general discussion of limestone, lime, and cement, voluminous reference is made to the literature on the subjects, particularly that of America, and thus a summary is presented of present available information. The discussion of marbles is accompanied by five well-executed colored plates of typical New South Wales marbles. Pages 131 to 352 comprise descriptions of the limestones and dolomites by counties in alphabetical order. These descriptions are supplemented by nearly 700 chemical analyses. In appendices I and II the gypsum and phosphate deposits are described. O. B.

Technical Papers

A Desert Guide Book—Water Supply Paper 490-A has just been issued by the U. S. Geological Survey, and is the most generally interesting one of the series which we have seen. It is entitled "Routes to Desert Watering Places in the Salton Sea Region, California." Part B is to be devoted to the district around Barstow; Part C to the area between Phœnix and the Colorado river, and Part D to the region around Ajo, but only Part A has yet been published. Much of the matter is in the form of an Automobile Blue Book. The maps are excellent, and enough descriptive matter about the area is given to provide Eastern authors with sufficient local color for several desert stories. The Salton Sea, as many of our readers know, is an artificial lake about thirty miles long and two or three hundred feet below sea level.

Oil Well Drilling—"Casing Troubles and Fishing Methods in Oil Wells" (Bulletin 182, Petroleum Technology 57), by Thomas Curtin, has been issued by the Bureau of Mines, Washington, D. C. (Price 15c. from the Superintendent of Documents, Washington, D. C.) In this paper the author has outlined the methods that have been evolved in the various oil fields for combating casing difficulties.

Workmen's Compensation Act—The subject of medical aid under the Workmen's Compensation Act is discussed in the *American Machinist* for Nov. 4, 1920 (three pages, price 25c. McGraw-Hill Co., N. Y.). The employer is generally conceded the right to name the physician. The workman must in general submit to a necessary operation if it does not endanger his life.

California Minerals—Bulletin No. 87, entitled "Commercial Minerals of California" has just been issued by the State Mining Bureau, Ferry Building, San Francisco, Cal. The bulletin is a compilation of descriptive data on metalliferous and non-metallic minerals. The industrial applications, properties and uses of the ores, distribution and association, common tests, and metallurgy are given in brief paragraphs. Not all of the minerals and ores described are commercially important in California.

U. S. Rights in Mexico—The National Association for the Protection of American Rights in Mexico, 347 5th Ave., New York, has published an eighteen-page pamphlet setting forth the points requiring adjustment in our relations with that country.

Colorado Mining—The Annual Report of the Colorado Bureau of Mines for 1919 has been issued and may be obtained by addressing the Bureau at the State Capitol, Denver, Col. It is a sixty-seven-page pamphlet, and includes a list of all the operating mines in the state, with the name and address of the operator and character of the product.

ECHOES FROM THE FRATERNITY

Mica Deposits of Madagascar Are Attracting Much Attention

Phlogopite of Good Grade in Large Slabs Plentiful in Southern Section—Deposits Accessible and Hundreds of Natives Now Employed

A correspondent of the London *Mining Journal* writes in part as follows:

"After the slump in the graphite market Madagascar, which easily reached and retained a premier place as a producer of that mineral, found it difficult to recover from the blow, and many a claim was abandoned, while others were prospected for other minerals, with the result that some interesting discoveries were made and attention was directed to their development.

"In southeastern Madagascar the occurrence of mica attracted particular attention, and while muscovite is practically absent, the deposits of phlogopite or amber mica have given some astounding results, and exportation on a large scale has begun, the month of July seeing the shipment of several hundred cases. In many instances the sizes are considerably above those actually found on the London market; the writer saw some slabs of 25 inches square without a stain or crack. The occurrence near a village called Ambatohabo is now giving employment to several hundred natives, and the depth reached is about ninety feet. There is no sign of the deposit giving out; on the other hand, fresh pockets and well-defined reefs are constantly met with.

"The abundance of the mineral, its perfect condition and easy cleavage have given rise to the making of fancy articles in mica, such as trays, cigar boxes, fans, and sailor hats entirely in mica which the natives sport occasionally in town. The latter, if improved on, should prove of some value for certain specified purposes.

"There can be no doubt that the importance of this region as a mica producer will maintain itself in the future, as every day from various places reports of fresh occurrences come to light, and no doubt a careful study of the geological features of the district will help considerably in proving the existence of other minerals either associated with occurrences of mica or lying in their vicinity.

"The central mountain backbone of the country terminates in this vicinity, where some of its highest peaks are situated. The transition from plain to mountain is very rapid, and the various formations are here easily approached and can be carefully studied without any particular difficulty. The forest vegetation which formerly covered them densely has practically all disappeared under the axe of the woodman or the fire of the old dwellers. As soon as the primitive methods of extraction are abandoned in favor of a properly organized and up-to-date system of working, southeastern Madagascar alone will be able to supply all the world's wants in mica, and the wastage will disappear. As it is now the streets of this little town [Fort Dauphin] are often strewn with mica sheets of good size and commercially valuable.

War Memorial Given by Utah Copper and Bingham & Garfield Ry.

The Utah Copper Co. and the Bingham & Garfield Ry. Co. have presented a memorial bronze tablet to the employees of the two companies, commemorating the parts taken by 775 of their number in 1917-1918 in the Great War. The tablet was dedicated on Nov. 3, at the offices of R. C. Gemmell, general manager of the Utah Copper Co. in Salt Lake City, Utah. The office employees of the two companies in that city were present at the ceremonies.

Petroleum Engineering and Oil Geology Taught at M. I. T.

The Massachusetts Institute of Technology has recently established a course on oil and gas production, to supplement those courses on oil geology already established. Paul Paine, consulting petroleum engineer of Tulsa, Okla., and formerly production manager of the Gypsy Oil Co., has been appointed special lecturer on petroleum engineering and gives a course of thirty lectures on oil and gas production.

Other courses given are a general course on the geology of petroleum, a course on the valuation of oil properties, and a course on the construction and interpretation of oil maps. In the department of chemistry are given courses on oil and gas analysis and the distillation of oils.

Ontario Will Train Prospectors

The Minister of Mines has announced that early in the new year "Instruction Classes for Prospectors" will be established at the various mining centers in northern Ontario, where enough interest is shown to justify the undertaking. Dr. W. L. Goodwin, formerly Dean of the School of Mines at Kingston, Ontario, will be in charge. It is the intention to place at the various centers a competent instructor who will give an outline course in geology and mineralogy. Mineral collections will be provided, and an endeavor will be made to familiarize the prospector not only with the more common types of minerals, but also with such minerals as might reasonably be expected to be found in this country.

Treatment for Refractory Silver Ores To Be Sought

Canadian Research Council Appropriates Funds for Experimental Work—Mines Resumed Use of High-Grade Cyanide

The Canadian Advisory Council for Scientific and Industrial Research has made an appropriation for experimental work to devise a method of treatment for the refractory silver-lead-zinc ores which are to be found throughout British Columbia, but especially in the Kootenays. Horace Freeman, secretary of the British Columbia branch of the council, has been given charge of the work. It was Mr. Freeman who devised the process for the manufacture of low-grade cyanide indirectly from atmospheric nitrogen that is in use at Niagara Falls. Last summer the Hollinger and Dome mines, in the Porcupine district, purchased car-load lots of this cyanide and tried it for the extraction of gold from the ores of the respective mines.

So far as is known no report has been made, but the fact that the mines have reverted to the high-grade Scotch cyanide indicates that no worth-while saving was made over regular practice. This really was only to be expected. Pound for pound the value of cyanide as a gold solvent is directly proportional to the cyanogen content, and unless dollar's worth for dollar's worth the low-grade cyanide contained more cyanogen there would seem to be no possible reason for using it. Should the latter prove to be the case then, of course, everything would depend on the nature of the impurities and their influence on the solvent action of the cyanide. Mr. Freeman will commence his research on the British Columbia ores immediately.

Kinds of Briquettes Used by France

In the mining, metallurgical, and fuel literature of contemporary France one frequently meets with the term "agglomerés" as a form of fuel. An authoritative source issues the explanation that this seems to be "a general term for briquetted fuel, of all sizes and shapes. Common sizes used in France are: *briquettes*, weighing 6 to 9 kg., large rectangular brick-like blocks, usually made from washed coal and supposed to run 5 to 10 per cent ash; *briquettes perforées*, weighing about 900 g., and perforated; and *boulets*, egg-shaped, and weighing 40 to 50 g."

This explanation will assist in understanding the table published in these columns Nov. 13, last, p. 958. It might be added that the lignite fuel of north central Europe is also commonly compressed into briquettes of about 50 g.

MEN YOU SHOULD KNOW ABOUT

Lester E. Grant is manager of the Braden Copper Co., succeeding S. S. Sorenson, who is now at the company's New York City office.

Prof. Herbert E. Gregory, of the Connecticut Geological Survey, has returned from Hawaii and is resuming his duties at Yale University.

S. Ford Eaton, engineer in charge of Dardanelles Mining Co. operations in the Chloride, Ariz., district, is in New York City on business for the company.

Max Barber, general superintendent on the Mesabi Range for the Cleveland-Cliffs Iron Mining Co., has returned to Hibbing, Minn., after a business trip to Ishpeming, Mich.

Forest Rutherford, consulting metallurgical engineer of New York City, has returned to New York after spending several months in Colorado on mine examinations and milling problems.

E. H. Gould, recently superintendent for the Co-operative Mining Co., at Lordsburg, N. M., is now assistant general superintendent of the Advance-Rumley Mfg. Co. at Battle Creek, Mich.

C. M. Weld, D. M. Liddell, and **P. H. Lazenby** have formed a partnership as consulting engineers and economists under the firm name Weld, Liddell & Lazenby, at 2 Rector St., New York City.

L. L. Wilcox, superintendent of the Republic Iron and Steel Co.'s mines at Hurley, Wis., and **E. W. R. Butcher**, of Duluth, chief engineer of the company, recently spent a few days in Negaunee, Mich., attending to business.

F. H. Newell, who recently resigned his position as head of the department of civil engineering in the University of Illinois, Urbana, Ill., is retained as consulting engineer for a Western project. Prof. I. O. Baker is acting head of the department built up by Dr. Newell.

H. A. Guess, managing director of the mining department of the American Smelting & Refining Co., and now head of the Premier Gold Mining Co., arrived at Prince Rupert, B. C., from New York recently to visit the latter property. He was accompanied on his trip by H. MacDonald, mine foreman.

Wm. Thomlinson, of New Denver, B. C., who was in charge of Canada's mineral exhibit at the Panama-Pacific International Exposition in San Francisco several years ago, early in November was in the Similkameen mining district of British Columbia collecting minerals and other economic substances for the Canada Department of Mines, Ottawa, Ontario, which is preparing a comprehensive mineral exhibit for display at the National Exposition of Chemical Industries, to be held in New York City during 1921.

It is of interest to note that after March 4, 1921, Congress will include five senators who are closely associated with mining. They are as follows: Senator F. R. Gooding of Idaho, who was for many years a mining contractor; Senator R. H. Cameron of Arizona is also interested in mining; Senator Tasker L. Oddie of Nevada is a mining engineer and was one of the first developers of the Tonopah mines; Senator Samuel D. Nicholson of Colorado is a gold and silver mine operator, and Senator J. W. Harreld of Oklahoma is interested in oil development.

Harris & Ewing, Photo

H. S. MULLIKEN

Harry S. Mulliken, of San Antonio, Texas, has been appointed a metallurgical engineer in the Bureau of Mines, and assigned as special technical assistant to Director F. G. Cottrell. The creation of this position is an innovation. Mr. Mulliken will not report to any division chief but will have an important voice in the technical mining matters which come before the Bureau.

Mr. Mulliken, who is a native of Lexington, Mass., is a graduate of the Worcester Polytechnic Institute, Worcester, Mass. He began his industrial metallurgical work with the Chicago & Aurora Smelting & Refining Co. While with that company he specialized in the refining of silver and lead. Other positions he has held are: superintendent of the lead smelter at Pilot Bay, B. C.; assistant superintendent for the American Smelting & Refining Co., Perth Amboy, N. J.; superintendent of the Aguas Calientes and Monterrey smelters of American Smelting & Refining Co. in Mexico; general superintendent and plant manager of the Penoles company at Mapimi, Durango, Mexico; and in charge of all metallurgical operations of the American Metal Co. in Mexico. For the last several years he has been consulting engineer in metallurgy for the same company with offices at 61 Broadway, New York City.

B. M. Concklin, chief engineer of the Arthur Iron Mining Co., has returned to Hibbing, Minn., after a trip of several weeks in Montana.

S. R. Capps, who has been engaged in geologic work in European Turkey, is en route to the United States. He is expected to arrive late in December.

A. S. Agnew, general manager of the Rogers Brown Ore Co. and of the Mahoning Ore Co., has returned to Duluth, Minn., from his recent business trip to Hibbing, Minn.

E. K. Soper, geologist, of New York City, has gone to Trinidad, as manager of Trinidad-Tarouba Oil Development Co. His address will be P. O. Box 283, Port of Spain, Trinidad, B. W. I.

E. W. Shaw and a party of geologists including **R. H. Sargent, G. L. Harrington, Edwin Kirk** and **C. P. Ross** are expected to reach New York City on Dec. 10, returning from a geologic survey made in eastern Bolivia.

SOCIETY MEETINGS ANNOUNCED

American Society of Mechanical Engineers holds its annual meeting Dec. 7 to 10, at Engineering Societies Building, W. 39th St., New York City, in conjunction with its **Fuels Section.**

Montana State Assembly of American Association of Engineers meets on Dec. 11, in Butte, Mont. The keynote of the meeting will be "Engineers for Engineering Jobs." The president, W. J. McMahon, announces that there will come up for endorsement by the assembly, a petition to the governor, and others responsible, requesting that the offices of state engineer, mine inspector, forester, and similar places be filled by engineers.

The American Association for the Advancement of Science holds its annual winter meeting this year at Chicago, Ill., during the week Dec. 27 to Jan. 1. At the same time and place meet a number of related or affiliated societies, including the **American Physical Society** (Dec. 28-31), **Geological Society of America** (Dec. 31-Jan. 2), and the **American Metric Association.** Prof. B. J. Livingston, Johns Hopkins University, Baltimore, Md., is permanent secretary of the A. A. A. S., and on request will furnish information concerning programs and accommodations.

OBITUARY

The body of Robert H. Remington, drowned while engaged in work for the U. S. Geological Survey, has been recovered and has been sent to Watertown, N. Y., for burial.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Columbia Section of A. I. M. E. Meets at Kellogg, Idaho

Northwest Engineers Visit Bunker Hill Plant—Meeting Pronounced Most Successful Ever Held

The annual meeting of the Columbia Section of the American Institute of Mining and Metallurgical Engineers was held at Kellogg, Idaho, on Nov. 19 and 20. The afternoon of the first day was devoted to an inspection of the Bunker Hill smelter and concentrating mill. In the evening a banquet was served by the Bunker Hill & Sullivan company and the business men of Kellogg, at which were seated 147 guests, a large number of business men and others connected with mining outside the technical class being present from all parts of the Coeur d'Alene district. Following the banquet Stanly A. Easton, manager of the Bunker Hill & Sullivan company, delivered a brief address of welcome on behalf of his company and the people of Kellogg. The meeting was then formally opened by James F. McCarthy, manager of Hecla Mining Co., president of the Columbia section. James M. Porter, of Spokane, dean of Northwest mining engineers, responded to the address of welcome. The following formal papers were read and discussed:

"The Federal Income Tax and Mine Valuation," by W. Earl Greenough, of Spokane; "Precipitation of Smelter Fumes in Series Treatment at the Bunker Hill Smelter," by J. P. Schuttenhelm, of the Bunker Hill staff, Kellogg; "Hydraulic Classification and Table Riffling at the Bunker Hill Concentrator," by G. Y. Garber, of the Bunker Hill staff, Kellogg; "Considerations in Relation to Flotation," by Thomas M. Owens, assistant manager of the Federal Mining & Smelting Co., Wallace; "Mechanical Shoveling in the Bunker Hill Mine," by William McDougall, superintendent; "Electrical Drying of Flotation Concentrates," by W. C. Clark, of the Bunker Hill staff, Kellogg; and "Treatment of Zinc-Lead-Silver Ores of the Coeur d'Alene District," by W. G. Woolf, of the Bunker Hill staff, Kellogg.

After the reading of these papers the following officers were elected for the ensuing year: President, Ivan De Lashmutt, of Spokane, manager of the Standard Silver-Lead Mining Co. at Silverton, B. C.; vice-president, Paul S. Couldrey, of Rossland, B. C., manager of Le Roi No. 2 mine; secretary, L. K. Armstrong, of Spokane. This closed the formal business of the meeting. The next day was devoted to visiting the Morning mine at Mullan, the Hecla and the Hercules mines at Burke, and the Tamarack on Nine Mile. The meeting was one of the best ever held by the Columbia Section.

WEEKLY RÉSUMÉ

The Cananea Consolidated Copper Co., of Cananea, Sonora, Mexico, the operating company for the Greene Cananea Copper Co., has announced its intention to shut down its mines, mill and smelter on Dec. 15 owing to present economic conditions. In order to aid producers in Mexico the Mexican government, it is stated, is about to issue a more favorable tariff on metal exports. According to word from Melbourne, the Electrolytic Zinc Co. of Australia is issuing 1,500,000 new £1 shares. In this country zinc producers continue their policy of curtailment owing to market conditions. As far as copper is concerned the list of smaller companies that are shutting down is steadily lengthening. A number of operators in the Kentucky fluorspar district have also been forced to suspend. Iron ore shipments by water from the Lake Superior district are practically completed; estimates of the 1920 output are now somewhat below those of a month ago. From Washington it is announced that the new experiment station of the U. S. Bureau of Mines at Reno, Nev., will open Jan. 20.

Cananea Con. Copper To Suspend on Dec. 15

Mines, Mill and Smelter To Shut Down —Action Forced by Present Economic Conditions

The mines, smelter and concentrator of the Cananea Consolidated Copper Co. at Cananea, Sonora, Mexico, will close down indefinitely on Dec. 15 because of present economic conditions, according to official statements. The company will continue to operate practically all the public utilities in Cananea and to furnish light and power for this purpose. The mines will be kept unwatered and some development work may be done. This company is the operating company for the Greene Cananea Copper Co. Increased costs of supplies and labor together with the present market situation as well as the increased cost of shipping bullion are responsible for the shutdown. Cananea is about forty miles from the border.

Lake Shipments Practically Completed for Season

Recent Estimates of Year's Tonnage Lower Than Those of Month Ago —1921 Ore Prices Awaited With Interest

The movement of iron ore from the Lake Superior district for 1920 has about come to a close and very little will be sent down the Lakes during December. It is figured that the total tonnage for the year will be in the neighborhood of 56,000,000, about 2,000,000 tons less than the estimates of a month ago. Cold weather and storms on the Lakes interfered with shipments during November and schedules could not be maintained. Considerable time was lost because of ore freezing in the cars and much time was consumed in thawing operations. Most vessel owners do not care to have their boats on the Lakes in December and the insurance on most of the boats expires on Nov. 30, so it is certain that there will be little transporting of iron ore by water during the remainder of the year. About the only ore that will not be stocked when raised to surface will be that which goes from the Mesabi Range to the plant of the Minnesota Steel Co. and that from the Michigan ranges which goes to charcoal iron furnaces in northern Michigan and northern Wisconsin. Most of the pit mines have already suspended operations for the year.

There is considerable uneasiness through the Lake Superior district regarding the iron ore business, but it is not expected that there will be any new developments until the 1921 prices are announced about the first of the year. When the reports were received that some of the copper companies had reduced wages, laid off many employees and put the surface men on part time, the miners on the iron ranges commenced to talk about the iron ore outlook. The only men laid off to date are those employed in the open pit mines, but they are always released at this season of the year. Wages are higher than ever before and up to a short time ago there was a scarcity of men for underground work. Of late, however, many have returned from the manufacturing centers, particularly Detroit and vicinity, and there is little employment to be had. Some of the operators do not look for a cut in the price of iron ore, putting forth the argument that they were hard hit this fall by the increases in rail and Lake freights.

It is believed by some, however, that if the demand for iron and steel products does not hold up it is likely that the iron ore business will have to suffer, in which event wages would have to be lowered and some mines forced to curtail or to close.

Surveys Started for Railroad to Flin Flon

Manitoba Government Probably Will Ask Syndicate First To Guarantee Erection of Smelter

Surveys have been started for a railway running from the Pas to the Flin Flon property in northern Manitoba, a distance of 85 miles. It is probable, however, that before the government will decide on the actual construction of the road guarantees for the building of a smelter will be demanded from the Flin Flon syndicate. The present option on the property expires next March, and while the syndicate would, no doubt, refuse to take over the property unless they were assured of a railroad, mutual guarantees would settle this difficulty.

Such a railroad, in addition to serving the Flin Flon property, would open up a territory of large mineral possibilities. There is still a considerable tonnage of ore in the Mandy mine which could be treated by a smelter on the ground. In addition to this there are a large number of gold properties within a few miles of the Flin Flon.

Lake Ore Boats Suffer Mishap

Two Lake ore carriers were badly damaged recently. The "J. H. Sheadle" of Cleveland-Cliffs Iron Co.'s fleet, a 500-ft. freighter, was driven on the rocks by wind and current while backing away from the Presque Isle ore dock and sank in 24 ft. of water. The other boat to suffer mishap was the "D. M. Clemson," a 600-ft. boat of the Pittsburgh line, which ran aground two miles off Jackson Park, Chicago, on the night of Nov. 24. This freighter was carrying 13,000 tons of iron ore from Duluth to Gary, Ind.

To Establish Sick Benefit Fund for Cobalt Employees

Arrangements are being made to establish a sick benefit fund for employees of mining companies at Cobalt, Ont., the administration of which will be in the hands of the committee representing the Central Council of Workmen and the Timiskaming Mine Managers' Association. The men are to contribute 75c. monthly, the companies paying an amount equal to that contributed by their employees. The benefits of $2.75 per day will be paid to claimants who are ill seven days or more over a period of thirteen weeks, and in case of more protracted illness the beneficiary will receive half the specified amount for the next thirteen weeks.

Chile Copper produced 9,420,000 lb. copper in October, against 9,496,000 in September.

Closing Month Finds Leadville Operations Dull

Abnormal Conditions Hit Camp Hard —Projects of Promise Fail To Materialize

The last month of 1920 finds the Leadville district operating on a scale lower than ever before in its history despite the outlook that seemed so bright early in the year and in the latter months of 1919. Early in January announcement was made that a million-dollar corporation, the C. & H. Mining Co., had been organized to develop the Graham Park section. It was expected that this company would prove a heavy producer but owing to the adverse conditions this has not been the case. Following the consolidation of the Leadville Zinc Co. and the Western Zinc Concentrating Co., the new corporation, the Western Zinc Oxide Co., announced the installation of furnaces of a new and improved type which would exactly double the production of the plant, but owing to the failure of eastern markets the new unit has stood idle for several months. The National Mining & Development Co., financed by Chicago men and holding control of large areas throughout the district, announced their arrival into the district and hinted at the erection of a $25,000 molybdenum mill, a railroad into the Iowa Gulch territory and other development projects. The extent of their operations, however, has included only the driving of the main bore of the Big Chicago tunnel in Iowa Gulch by a small force of men with no shipments resulting. With the coming of more prosperous times, they maintain, their prophecy of a mill and a railroad will become a reality.

It was also expected that the Climax Molybdenum Co., forced to close by post-war conditions, would resume normal operations but the failure of conditions to right themselves has kept the property idle. Numerous other properties prepared to resume work in the spring but only a few of these are still in operation at present. The most consistent shippers of the district have been the Yak, Down Town, Garbutt, Ibex, Dinero, Hilltop, Chrysolite, Fanny Rawlins, and Cramer & Co., while the Griffin and other properties in the Sugar Loaf section have succeeded in maintaining a fair tonnage during most of the past year.

On the Ibex a strike reported to be the richest made in the district for many years was announced in February by Austrian lessees working on No. 2 shaft. The ore is said to run as high as $10,000 per ton and shipments of the high-grade gold have continued steadily.

The Prospect Mountain project, a plan for boring into the unscratched areas of the Canterbury section, has been continually postponed owing to the inability to secure capital for financing the proposition. At present the Chamber of Commerce of Leadville is considering the matter of forming a home mining company with activities centered on this project.

Northport Smelting Co. Loses Lone Pine-Surprise Suit

Action Brought To Quiet Title to Last Chance Claim at Republic Dismissed at Spokane

The suit of the Northport Smelting & Refining Co., of Northport, Wash., against the Lone Pine-Surprise Consolidated Mining Co. has been dismissed by Judge Rudkin in the Federal Court at Spokane. It was brought to quiet title, for an injunction and for an accounting to obtain $100,000 for ore removed. The property involved was a segment of a vein or lode, bearing gold and silver, within the surface boundaries of the Last Chance claim at Republic, Wash., occupied by the defendant.

"The Northport company, as owner of the Lone Pine claim, claimed extralateral rights in ore beneath the Last Chance claim," it was explained by Fred S. Duggan, an attorney for the defendant, in the *Spokesman-Review* recently. "It was averred that the ore was in a vein having its apex in the Lone Pine.

"The decision of the court is that the Lone Pine claim has no extralateral right in the direction of the Last Chance claim for the reason that the discovery vein of the Lone Pine crosses both of its side lines. This was one of the main points in the controversy, and the decision sustains the Last Chance's contention on that point."

Hanna Furnace Co. Organized

The Pennsylvania Iron & Coal Co., Detroit Iron & Steel Co. and the United Iron & Steel Co., have been organized into one company under the name of the Hanna Furnace Co. The new organization also has lease interests in other furnace companies. Besides the holdings of the furnace companies, the Hanna Furnace Co. has acquired a 37-per cent interest in the Hanna Ore Mining Co. and a 100-per cent interest in the Hollister Mining Co. The latter company operates several iron mines on the Menominee Range in Michigan. The Hanna Ore Co. operates many large iron ore properties in Minnesota.

Recent Production Reports

Cie due Boleo, in Baja California, produced 617,120 lb. copper in October.

Calumet & Hecla produced 7,943,502 in October, as follows: Ahmeek, 1,759,100; Allouez, 0; C. & H., 4,596,959; Centennial, 0; Isle Royale, 831,700; La Salle, 14,413; Osceola, 627,264; Superior, 38,066; and White Pine, 76,000. September production was 7,288,214.

Butte & Superior produced 7,000,000 lb. zinc in concentrates, and 193,000 oz. of silver in October compared with 7,800,000 lb. and 140,000 oz., respectively, in August of this year.

New Cornelia's copper production was 3,450,000 lb. in October and 3,314,000 lb. in September, compared with 3,878,000 lb. in October a year ago.

Calumet & Arizona produced in October 2,484,000 lb. of copper, as against 3,038,000 lb. in September and 4,244,000 a year ago.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Investigation of Drill Steel Undertaken

Bureau of Mines Co-operating With New Jersey Zinc Co. in Studying Causes of Breakage

The Bureau of Mines is taking up actively an investigation of drill steel. Many users of drill steel feel that the improvements in that product have not kept pace with the improvements in drilling machines. The matter has been the subject of recent conferences between Dr. F. G. Cottrell, the director of the Bureau of Mines, D. A. Lyon, supervisor of experiment stations, and Bureau specialists with representatives of various types of mining enterprises. The testimony of users in the districts where the rock is hard is wholly to the effect that the failure of steel has become a very serious problem, due to the loss of time on the part of high-priced labor.

B. F. Tillson, of the New Jersey Zinc Co., has made a special study of the causes of breakage in drill steel and will co-operate with the Bureau of Mines in the study of the problem. Mr. Tillson's investigations lead him to believe that the blows of the drill hammer set up vibrations comparable to sound waves and that nodes are caused by the concentration of these waves at certain points in the drill. This leads to prompt fracture. When a flaw or sand hole comes within the area of concentrated wave effect, the failure of the drill takes place almost immediately.

The Bureau's specialists, who are to be assigned to this problem, will be sent to the manufacturing plants to discuss the matter with officials there. A collection is to be made of broken steel so that the breaks may be studied.

Over Half of Railroad Tonnage Product of Mines

Fifty-six per cent of the tonnage handled on the larger railroads of the country during the quarter ended June 30 consisted of products of mines. Class 1 railroads are those having annual operating revenue in excess of $1,000,000. They carry more than 90 per cent of all freight transported. Figures just compiled by the Interstate Commerce Commission show the following tonnages for products of mines:

	Tons
Anthracite coal	19,300,597
Bituminous coal	83,152,797
Coke	6,032,255
Iron ore	24,183,287
Other ores and concentrates	6,355,047
Base bullion and matte	144,060
Clay, gravel, sand and stone	25,867,455
Crude petroleum	1,600,870
Asphaltum	335,672
Salt	832,403
Other products mined	1,722,822
Total	169,627,265

War Mineral Awards

Awards totaling $18,032.45 were recommended during the week ended Nov. 20 by the War Minerals Relief Commission. The details of the recommendations are as follows:

Walter M. Long, tungsten, $1,687.93, 62 per cent; estate of H. and William Rich, pyrites, $3,461.27, 40 per cent; A. H. Layton, chrome, $886.58, 50 per cent; Akin & Stilwell, chrome, $474.50, 65 per cent; J. G. Murphy, manganese, $5,896, 39 per cent; Tungsten Development Co., tungsten, $4,766.42, 76 per cent; Leadville District Mining & Milling Co., manganese, $456.75, 12 per cent; T. H. Williams, tungsten, $424, 60 per cent.

The award in the claim of the estate of H. and William Rich was recommended by Senator Shafroth only. Commissioners Moore and Pomeroy recommended the disallowance of the claim because the losses could not be traced to Government stimulation.

In addition to the above awards the payment of $746 on the chrome claim of Noel and Johnson which had been disallowed was recommended.

At the close of business on Nov. 13, $2,640,802.15 had been expended or recommended for award by the War Minerals Relief Commission. This leaves $5,859,197.87 of the original appropriation unexpended. The administrative expenses of the Commission to that date totaled $322,646.82. Claims were filed under the War Minerals Relief Act for a total of $16,655,481.94. This was the aggregate of 1,203 claims. Action has been taken on 1,104 of these claims but awards were recommended on only 267. The amount involved in the 99 claims still under consideration is $1,172,302.13.

During the week ended Nov. 13, awards totaling $104,499.31 were recommended. They were as follows (the name of the claimant, the mineral, the amount recommended, and its percentage relationship to the amount claimed are shown): W. H. Shewan, tungsten, $13,759.38, 35 per cent; F. M. Doak, manganese, $14,023.56, 71 per cent; Crimora Manganese Corporation, manganese, $76,616.37, 16 per cent; Charles E. Wilcox, chrome, $100, 14 per cent.

Additional amounts were recommended in the following claims which had been acted upon previously: George and William Pedro, $1,253.35; Lehigh Valley Manganese Co., $2,369.22.

Reno Station To Open Jan. 20

The experiment station of the U. S. Bureau of Mines at Reno, Nev., will be opened formally on Jan. 20. The opening is to be the occasion for fitting ceremonies.

Problems of Zinc Industry Receiving Attention

Improved Methods of Treatment Sought With View to Lowering Cost of Production

A series of conferences has been held by Bureau of Mines officials in several centers of the zinc mining industry in the Middle West. The idea has been to learn more about the problems which are facing this industry. It develops that there is a widely held opinion that the most helpful thing that can be done at this time would be the development of cheaper reagents for use in flotation. Recent experiments have shown that the cost of ammonia and sodium sulphite equals the value of the recovery. In the Illinois-Wisconsin district the concentrate averages 33 per cent zinc. With a smelting cost around $30 the chances of profitable operation are small at present prices.

Some operators in the Illinois-Wisconsin district believe magnetic separation could be utilized to greater advantage and would like to see the Bureau of Mines undertake experiments to that end. The opinion was expressed at one of the conferences that magnetic separation could be made after a dead roast, utilizing the sulphur for sulphuric acid. A middling product, running as high as 14 per cent zinc, could be expected, which might be used for oxide making. On a basis of $6 to $7 per ton for oxidizing the middling product this method figures $3.75 better than the margin on 33 per cent zinc concentrate.

Experiments in the production of electrolytic zinc and in making standard brasses are also being urged. It has been suggested that under the new Water Power Act hydro-electric power could be developed which could be utilized to advantage in the making of electrolytic zinc. Sentiment was in favor of the electro-thermic process.

The electro-thermic smelting of zinc ore could not be undertaken, it was admitted, with power costing two cents per kilowatt. It is believed, however, that hydro-electric power can be produced for one-half cent per kilowatt. It is thought that this would enable the saving of at least $3 a ton over the retort process.

In the Kansas, Missouri and Oklahoma districts means must be found, it was declared, for the recovery of ore left as pillars. As much as 20 per cent of the original ore in the mine is contained in these pillars. It is believed that other support can be provided and these pillars removed with a profit. All concerned in that district, however, are anxious that concentrated attention be given to underground haulage.

NEWS BY MINING DISTRICTS

SPECIAL LONDON LETTER

Surprising Assays Reported at Globe & Phoenix—Russo-Asiatic Shareholders in Luck—Broken Hill Strike Over

BY W. A. DOMAN

London, Nov. 16.—Work having been resumed at the coal mines a slight feeling of something akin to confidence is manifest in the financial and industrial spheres. This is noticeable in the appeals made to the public for millions sterling for new working capital. Matters, however, are not proceeding so smoothly as could be wished owing to the Russian military situation and the further depreciation in the French franc. Both of these disturbances have a reflex action on mining business as shares are continually coming on offer, with results disastrous to prices. Especially is this the case with those descriptions that enjoy—"enjoy" is scarcely the correct word, perhaps, at the moment—an international market. The incipient upward movement in South African gold mining shares has received a check, though the gold produced in the Transvaal last month was estimated as sold at £5 17s. 6d. per fine oz. This compares with £5 15s. for September, and £5 12s. 6d. for August. The total output of 662,472 oz. is poor, and is the lowest since February last, when 625,380 oz. was obtained. Working expenses have risen, and it is quite clear that apart from the gold premium many mines would be compelled to shut down as profits would vanish. Profits are not declared in any standard form, and it is consequently not easy to contrast results obtained by one company with those by another. Native labor seems to be a perennial trouble. A fresh outbreak of influenza is reported, while it is suggested that the Kaffirs are less inclined than formerly to follow any underground occupation.

Whether Fortune's wheel is making a favorable turn for the Globe & Phoenix mine in Rhodesia is still not quite clear, but some rather high assays over fair stretches of ground, at depth, are reported. Few people are able to comprehend the position seeing that a mining engineer of repute a few months ago had virtually written "Finis" to the prospects of discovering further profitable ore in the mine. The 5s. shares are now quoted at 20s. 6d.

Shareholders in the old Russo-Asiatic Corporation have had a bonne bouche. When the company went into liquidation and the Russo-Asiatic Consolidated was formed the Inland Revenue authorities demanded £147,458 as excess profits duty. This matter has been fought in a very strenuous manner, and after months of argument the company has won its case. The distribution of assets can consequently now proceed, and for every Russo-Asiatic Corporation share previously held 5½ Russo-Asiatic Consolidated shares will be given.

News has come to hand from Melbourne that the strike of miners on the Barrier Range has terminated, after being in existence since May, 1919. The cost to the Broken Hill mines and the miners is estimated at approximately £12,000,000. Work is being resumed, but owing to the fall in the price of the metals there can hardly be a return to the former scale of profits. Just at the moment the Colony cannot buy shares on the London market as the balance of trade is against Australia and the government has prohibited the export of gold. This, by the way, does not apply to the production of the gold mines, but to the stock of metal held by the banks.

Holders of diamond shares were rather perturbed a few weeks ago by reports that German scientists had discovered a method of fabricating diamonds. The Hamburg firm of Nobels has tested the invention and rejected it, which is the result generally expected.

AUSTRALIA

Electrolytic Zinc Co. Issues 1,500,000 Shares Carrying 8 Per Cent

Melbourne, Oct. 25—The Electrolytic Zinc Co. of Australia, Ltd., is issuing 1,500,000 £1 cumulative participating preference shares carrying 8 per cent. Of this number 900,000 will be available to share-holders of the companies constituting the original "proprietary" company, 150,000 to the shareholders of the Mount Read & Rosebery Mines Ltd., and the Mount Lyell Mining & Ry. Co. Ltd., and 50,000 to the staffs of the various companies. The remaining 400,000 preference shares are held in reserve. The authorized capital of the new company will be £3,000,000 comprising 1,500,000 preference and 1,500,000 ordinary shares. Of the ordinary shares 1,100,000 have been issued to the following companies as payment for the investment: Amalgamated Zinc (De Bavay's) Ltd., 300,000; North Broken Hill Ltd., 150,000; Broken Hill South Ltd., 150,000; Zinc Corporation Ltd., 150,000; and Mount Read & Rosebery Mines Ltd., 350,000. The shares issued to Mount Read & Rosebery Mines Ltd. are in consideration of the company's leases and assets, and they are "deferred" as to any dividend payable before July 31, 1925, but thereafter will rank with the other ordinary shares.

The present issue is being made to provide funds for the completion of the company's works at Risdon, Tasmania. The enlarged plant is estimated to produce 100 tons electrolytic zinc per day together with substantial tonnages of various by-products. It is anticipated that the first half of the plant will be ready before the end of 1921 and the whole of the plant twelve months later. The following from the report of the general manager, H. W. Gepp, is of general interest:

"The site of the works at Risdon (near Hobart) is from every point of view ideal, and being situated on one of the finest deep sea water ports in Australia insures to the company ability to draw raw material for this and other industries from any part of Australia, or, indeed, from any part of the world. The company's wharf now in course of erection, and which will be 60 ft. wide and 1,000 ft. long, will be available for use within six months from date. There is 30 ft. of water at low tide at this wharf, and no dredging of any kind is required in the channel between the works and the Southern Ocean—thirty miles to the southward.

"Good progress is being made with the construction of the first half of the 100 tons a day plant. A large portion of the new cell room is practically completed, and work has been started on the erection of a new leaching building and other necessary divisions of buildings and plant. The unit will, it is anticipated, be in operation before the end of 1921, by which time a minimum of 15,000 horsepower will, under the contract with the Tasmanian Government, be made available. By the end of 1922 the whole of the plant is expected to be in operation, utilizing 30,000 horsepower and producing 100 tons of zinc daily with corresponding quantities of the various by-products and also considerable amounts of rolled zinc, zinc dust, etc.

"In England today the cost of labor is more than 100 per cent higher than pre-war, and the increase in the price of coal is considerably more than 100 per cent. Producing and operating costs the world over have increased enormously. As these factors must be reflected for many years to come in the selling price of zinc, it is my opinion that £30 per ton London is a conservative and safe price upon which to base estimates of profits.

"Accepting this price £30 with corresponding prices for other zinc products and by-products, and basing the price of raw material on the cost of zinc concentrates obtained from the Broken Hill companies, I estimate that the net profits of the company, after making all necessary provisions for depreciation and amortization, will be £413,000 per annum."

CANADA

Ontario

Power Situation Little Changed—Small Surplus of Labor Reported

Cobalt—The power situation in Northern Ontario still remains about the same. During the last few weeks there has only been a small amount of moisture, and although this has proved a great benefit to the power company, there has not been sufficient yet to jus-

tify the hope that the mines will be able to operate during the winter. Fortunately, however, the weather still remains mild. Kirkland Lake camp is supplied from the Cobalt power companies. Porcupine is in a little better position than Cobalt, but the condition there is also serious. This shortage of power, together with a considerable influx of labor has provided sufficient men and gives a small surplus of labor for the first time in four years.

Cobalt—Ore shipments in October from Cobalt mines over the T. & N. O. Ry. totaled 1,739 tons of 2,000 lb. Shippers were as follows: Coniagas, 96; Dominion Reduction, 77; Hudson Bay, 32; Kerr Lake, 31; La Rose, 44; Mining Corporation, 520; McKinley-Darragh, 184; Nipissing, 555; O'Brien, 32; H. F. Strong, 30; and Temiskaming, 140. These shipments went to the following plants: Deloro S. & R., 1,391; Coniagas Reduction, 161; Ontario S. & R., 30; Pueblo plant A. S. & R., 65; and Perth Amboy plant A. S. & R., 93.

Porcupine — The McIntyre Consolidated has done considerable drifting on the new vein discovered on the 1,375-ft. level. The silver content is irregular, one section of the vein 60 ft. in length showing high values, while it is lean in other places. The 1,500 level is being opened up and operations have so far confirmed the reports of diamond drill results.

It is proposed to sell 100,000 treasury shares of the Schumacher to finance the resumption of operation in the spring.

Kirkland Lake—The Lake Shore during October treated 1,570 tons of ore with a recovery of $47,077, an average of $29.98 per ton, the highest in the history of the mine. The mill ran 89.11 per cent of possible running time, some loss of time being due to power interruptions.

Copper Cliff — The International Nickel Co. of Canada, Ltd., is building a 60-ton experimental mill here for concentrating low-grade copper-nickel sulphide ore. It is expected to be in operation next spring. H. E. T. Haultain, professor of mining engineering at the University of Toronto, has been engaged in the capacity of consulting engineer.

British Columbia

Trail—Ore shipments from the Consolidated smelter during the week ended Nov. 21 totaled 10,664 tons coming from shippers given in the following table:

Mine	Location	Gross Tons
Bluebell.....	Riondel	179
Bunyan.....	Lake Windermere	30
Canada Copper	Allenby	107
Emerald.....	Salmo	33
Helldriver	Lake Windermere	36
Horn Silver ...	Similkameen	39
Josie.....	Rossland	164
Knob Hill	Republic	54
North Star....	Kimberley	150
Providence....	Greenwood	40
Ptarmigan....	Lake Windermere	4
Rambler.....	Caribou	42
Velvet.....	Velvet	23
White Water..	Retallack	30
Company mines		9,733

MEXICO

New Tariff on Metal Exports To Aid Producers

City of Mexico—The Secretary of the Treasury announces that a new tariff on metal exports will be promulgated the coming week in order to assist the mining industry in general, but more particularly silver bearing properties. The government's decision to make haste, was brought about by the shut down of the Velardeña Mining Co., of Durango. This was preceded by the shutting down of the mines at Matehuala, some in the El Oro district and a number of less important companies. In speaking of the new tariff the secretary said:

"It is difficult to arrive at a just tax on ores at this time, and no general law can be applied. All of the mining properties are not in the same category. Some of them are working exclusively on low-grade ores, some on low and high-grade and others are confining themselves to high-grade shipping ores. My department has been making a careful study of individual cases with the idea in view of meeting the urgent demands of the miners and at the same time conserving the interests of the government. Owing to the urgency of the situation a new tariff will be presented within the next few days."

In addition to the continued depression of silver, the conditions as to copper and zinc have been slumping at an alarming rate and threaten to effect the operation of many of the important concerns, especially in the northern part of Mexico.

The market situation, taken with the coal shortage, due to the continued strikes in the northern coal fields of Mexico, has cast a gloom over mining interests. During the second week in November seventy-nine important mines were obliged to close for lack of fuel and if the strike is not settled by the end of the month it is more than probable that there will be a practical complete tie-up of the northern mines.

At the end of October taxes were being paid on 28,618 distinct properties covering a surface of about 900,000 acres. Many properties have been abandoned in the past sixty days because of refusal on the part of owners to stand for back taxes accumulated during the riotous days of the revolutionary period.

Durango

Officers of Monterrey Steel Co. Inspect Iron Mountain Property at Durango

Durango — Adolfo Prieto, president and one of the controlling stockholders of the Cía. Fundidora de Fierro y Acero de Monterrey, México, William G. Moler, representative of the same company in the United States, and Miller, their counsel, arrived in Durango recently on a special train. Upon the report of their chief engineer here, Manuel Rangel, they proceeded to make an examination of the property owned by the Callahan Estate on the Iron Mountain (Cerro Mercado), north of the city of Durango. A deal was closed whereby the Callahan Estate, represented by its executors, J. B. Rowns, James Callahan and Gowen, transfers to the Cía. Fundidora de Fierro y Acero de Monterrey all of its holdings in the Iron Mountain, consisting of mineral rights on approximately 300 acres of ground, and about 150 acres of land adjoining the mountain suitable for the erection of buildings and improvements. The Cía. Fundidora had formerly acquired about eighteen pertenencias on the mountain, known as "Bracho & Creel" group.

Mr. Prieto, who has been in the directorship of his company since 1908, with a whip-hand in the management of the same, has outlined his program as follows: First of all they will have to study the mountain thoroughly by making a complete sampling thereof, using drills for the purpose of ascertaining the mean percentage of phosphorus in the ores; should this grade be less than 1½ per cent the Bessemer process could not be employed and they will have to find out the best kind of treatment. The grade of iron (60 per cent as a minimum) has been found satisfactory; the problem of treatment involved is due to the silica and phosphorus content. The company has a staff of engineers in Austria, Germany and France studying the treatment process fit for ores too low grade in phosphorus.

The present system of working the deposit will be greatly improved, and as soon as the treatment problem is solved they will study the most convenient place for the erection of a smelter. This Cía. Fundidora has also acquired some big iron deposits located in Hercules, near Laguma de Jaco, in the Sierra de las Cruces, about 120 kilometers north of Sierra Mojada mining camp, State of Coahuila. As soon as the National Railroads finish the Cuatro Ciénegas line to Sierra Mojada, the Cía. Fundidora will build a branch to the Hercules iron mines. Mr. Prieto will proceed to Mexico City to close the Hercules deal.

Sinaloa

Fuerte M. & S. Co. Preparing to Blow In Smelter

Culiacan—In the Fuerte district of Sinaloa the Fuerte Mining & Smelting Co. is preparing to blow in its smelter and will be making a high-grade copper matte about Jan. 1. The Fuerte company is the company operating the mines of the Choix Consolidated Mining Co. A. M. McDermott is general manager.

The Potrero Mining Co. has its new power plant installed and is progressing with its new shaft. This is in the Mocorito district.

The Palmarito Leasing Co., also in the Mocorito district, is crushing about 80 tons daily in its 20-stamp mill and in spite of the low silver price is making both ends meet.

SURFACE WORKINGS AND HEADFRAME, OLD EUREKA MINING CO., SUTTER CREEK, CAL.

CALIFORNIA

Harvard Mine at Sonora Sold—Carson Hill's New Stamp Unit Ready—Suit Against Mammoth Copper Transferred to Federal Court

Sonora—The old Harvard mine has been sold to John Ferguson, of Berkeley. Until a few years ago this mine was in steady operation. However, labor conditions grew so bad that the mine was forced to shut down, and after having remained idle for three years the mill was dismantled and moved to the Angels Deep mine at Angels Camp. At a meeting of the stockholders in Boston it was voted to sell the Harvard holdings for $5,000. The vote represented 18,871 shares of the company stock and a majority of the total shares.

The transfer includes besides the Harvard mine property several adjoining claims and mine rights, among which are the Jamestown claim on Whiskey Hill, the Consolidated Gold & Silver Mining Co.'s claim, the Preston & Garrison claim, Capp's & Mussel claim, including a 10-stamp mill, the McCann quartz mine, the Vulture, Donovan & Clark quartz mine, the McKinley quartz mine, the Erin-Go-Bragh quartz, the Cloudman quartz claim, and the Sabrante quartz mine and all machinery and equipment of all the claims controlled by the Harvard company. Ferguson will not work the property. It is reported that he has closed the deal for other interests who will reopen the famous old producer.

Angels Camp—The construction of a new 10-stamp unit at the big mill of the Carson Hill Gold Mining Co. has been practically completed and the battery will go into commission in about two weeks. The addition will increase the capacity of the mill to approximately 15,000 tons per month, according to advices from the property. During October 10,500 tons of ore was treated at the mill.

In the issue of November 20 the Rainer Mining Co. is erroneously referred to as owning the property now being unwatered on Bald Hill near Angels Camp. This mine belongs to the Victor Land & Mineral Co. with offices at 512 Commercial Bldg., St. Louis, Mo.

Placerville—The Wiedebusch gold mine, near Georgetown, has been purchased by Edward Spencer, of Vallejo, who with associates has been operating the property under lease. A 5-stamp mill was installed. The ore is of fair grade with the vein showing indications of persisting to good depth. The new owners are planning further development.

Sutter Creek—At Central Eureka mining operations are rapidly approaching normal, now that the power regulation is withdrawn, and labor conditions have improved.

Kennett—The suit filed against the Mammoth Copper Co. by the Shasta Copper Exploration Co. has been transferred to the Federal Court by order of the Superior Court of Shasta County. Both companies claim ownership of valuable copper claims in the Kennett field.

Randolph Flat—The South Star mine, which was recently re-opened by A. W. Johnson, is giving encouraging signs and the shaft is down only seventy-five feet. There are three men employed and Mr. Johnson believes that more will soon be employed.

NEVADA

Conditions Improving in Tonopah District—Arrowhead Company Gets New Equipment

Tonopah—Reported bullion shipments from mills of the Tonopah district, representing operations for the first half of November, indicate a gross production of the district for the month of about $550,000 in gold and silver. The latest shipments are: Tonopah Belmont $91,960; West End $57,585; and Tonopah Extension $48,500. Shipments from the Tonopah Mining and MacNamara have not been reported as yet.

Conditions in the district are good. Labor is not as scarce as in previous months and as a whole is more reasonable. Living conditions are good, due principally to the existence of "The Miners Mercantile Co.," a corporation organized and financed by companies of the Tonopah and Divide districts to reduce living costs, which sells practically all necessaries at cost. The method of operation, including all books of account, is open for inspection to a committee of the mine workers, and the few complaints made are seriously considered by the management.

The larger mines, including the Tonopah Belmont, West End, Tonopah Extension and Tonopah Mining, report normal and satisfactory development and ore production, with no new discoveries of importance.

In the Rescue Eula, in the southeast portion of the Tonopah district, a very promising ore shoot has been cut on the 1,100 level. This is thought to be a downward continuation of the vein as developed on the upper levels. Drifting is being done to the east and west, the west face being low while in the east face there is exposed 5 ft. of ore averaging $50 per ton.

Divide—As the management of the Tonopah Divide had predicted, no ore values were encountered when crosscutting the vein on the 800 and 1,000 levels. Drifting on the hanging wall, to the southeast, has been started on both these levels with the expectation of driving several hundred feet before

MINE OFFICE, ADIT AND COMPRESSOR HOUSE AT MORGAN MINE, CARSON HILL GOLD MINES, INC., CARSON HILL, CAL.

reaching the ore shoot as projected from the levels above. The only other development performed during the last week was on the 165 level, drift 101 being driven ahead 30 ft. and raise 107 32 ft. with no change of importance.

At the Kernick Divide, where work is being done from the 900 level (which corresponds approximately to the 1,300 level of the Tonopah Divide mine), no special changes in conditions or formation are reported. The crosscut being driven toward the Hasbrouck is out 60 ft. from the shaft and the crosscut is out 55 ft.

Arrowhead—Regular development is being accomplished in several properties in this district. New surface machinery for the main Arrowhead company has arrived in Tonopah and is being transferred to the mine by motor truck. The new equipment includes a hoist, a 40-ft. steel headframe, and a blower. In this property shaft sinking and drifting to the west are being done, and conditions are reported favorable.

Candelaria—Underground work has been suspended for the winter, excepting for sampling and mapping of the Lucky Hill workings. More than 8,000 samples have been taken in the Mt. Diablo, Argentum and Holmes mines, proving several hundred thousand tons of mill ore. Designs are being prepared for a large mill, according to C. D. Kaeding, manager.

Virginia City—The North End mines, namely, the Con. Virginia, Ophir, Mexican, Union and Sierra Nevada, will reduce wages from $6 to $5 on Jan. 1. The South End mines have paid only $5 and all report an abundant supply of good labor. The Con. Virginia is producing rich ore from the recently discovered orebody below the 2,150-ft. level. A drift north from the sub-level at 2,200 ft. has advanced 140 ft., in rich ore and in a distance of 24 ft. it produced 67 tons, assaying $553 per ton. The Mexican mill, operated by the North-end group, is treating 100 tons daily, assaying from $15 to $50 per ton. Storage bins contain 1,000 tons of high-grade ore, which is mixed in milling with ore from stopes on the 2,050, 1,950 and 1,650-ft. levels. At the south end of the lode the United Comstock, embracing a dozen of the old bonanzas, has advanced its haulage tunnel over 100 ft. underground, besides building 100 ft. of snow shed over the open grading. The large compressor house and shops are completed and 8 faces from old shafts are being driven to the survey line of the tunnel, in the foot wall of the lode. The tunnel will be 10,000 ft. long and 8 by 8 ft. in the clear. A spur line has been extended to the millsite, and work will begin at once on the 2,000-ton cyanide mill. This enterprise is controlled by Bulkeley Wells, representing Harry Payne Whitney and associates. Roy A. Hardy is engineer in charge.

Jarbidge—Options on three groups of claims in the district have been secured by the Tonopah Mining Co. but it is unlikely that any new work will be started before spring.

Pioche—Ore shipments from the Pioche district for the week ended Nov. 18 were as follows: Prince Con, 1,355 tons; Virginia Louise, 660; Combined Metals, 240; Bristol Silver Mines, 150; Black Metals, 105, and Bristol Walker Lease, 45; total 2,555.

Notification of the much discussed change in freight rates on Pioche ores has been received by the larger shippers The new schedule is based upon the smelter returns to the mine or owner before deducting transportation charges, which amount is divided by the gross weight of the ore as found at destination. The new rates are as follows:

Ore Not Exceeding in Value	Old Rate	New Rate
$6 50	$2.75	$2 20
7 50	2.75	2.75
8 50	3.50	2.80

For ore exceeding $8.50 in value the new rate is the same as the old. Three per cent war tax must be added to the total freight.

This new tariff will shortly be published, as request for short notice publication has already been made to the Interstate Commerce Commission. Immediately on completion of publication the new rates will become effective.

ARIZONA

Producers in Johnson District Forced To Close—Gila Copper Sulphide Suspends

Johnson—The Arizona United and all other producing properties of this district have been forced to close down, being unable to produce copper at the present price. The Johnson Development Copper Co. continue development work on the eighth level. Lessees on the Arizona-Texas have repaired the compressor and are drifting to cut the orebody on the third level.

Dragoon—The Cochise Marble & Granite Co. has been incorporated to take over the sixty claims owned by L. R. Ligier, on which marble of all colors can be found in large quantities. This property has been tied up by litigation for several years.

Bisbee—Shattuck-Arizona is reported to have laid off 100 men on Nov. 23. It is also said that mining operations will be suspended Jan. 1.

Phoenix—The Arizona Corporation Commission has granted the application of the Ray Electric & Telephone Co. to establish a rate of 2.75c. per kw.-hr. for industrial uses. The case came up on complaint from the Gila Copper Sulphide Co., which previously had been receiving power at 2c. from the American Smelting & Refining Co.'s Hayden smelter.

Arizona shippers are opposing an application made by the railroads to the State Corporation Commission for new demurrage charges of $3 a day after 48 hours, $6 a day for the next three days and $10 a day thereafter. These rates are more than double those now in force.

Christmas—All mining operations have been suspended here by the Gila Copper Sulphide Co., which has been furnishing about 250 tons daily of concentrating ore to the Hyden smelter for several years. With the present price of copper and slack demand, no profit could be had through operation.

Duncan—Creditors representing an indebtedness of $35,000 have petitioned the Grant County, N. M., court for a receivership for the Duncan Mining & Milling Co., which has been working the Mount Royal property in the Steeple Rock district. Bonds to the amount of $100,000 on the property were issued to bankers in east Texas. The representative of these parties has been operating the property recently. It is claimed that the bondholders intend to foreclose and thus block payment for supplies sold the company. This is a gold property, the ores being treated satisfactorily by the cyanide process. The mill, however, was operated but a short time.

COLORADO

Indiana-Colorado To Erect Mill at Lake City

Idaho Springs—The Denver tunnel is being cleaned out and retimbered, preparatory to resumption of development work. The tunnel has been advanced 1,800 ft., and will be continued as soon as new equipment is installed.

Cripple Creek—The Rittenhouse, International, and Lexington properties on Gold Hill, have been acquired by the Moonlight Gold Mining Co., recently organized by Hildreth Frost, C. W. Hays, and J. S. Anderson. The Rittenhouse shaft has been sunk to a depth of 700 ft. Electric hoisting equipment will be installed.

Ouray—The Loyal Mining & Milling Co. will resume operations at the Mickey Breen property. Development work is in progress under the supervision of E. G. Holden. A new power line will be built to the property either this winter or early in the spring. The company is planning the installation of a new mill. Thomas P. Mitchell is manager.

Lake City—The Indiana-Colorado Mining & Milling Co. is developing and operating the Golconda property, and has opened some high-grade ore. The company will erect a 200-ton mill, the machinery for which has been delivered on the ground.

Cripple Creek—The Modoc Con. Mining Co. is installing a new electric hoist, capable of hoisting from a depth of 2,000 ft. The new equipment will be ready for operation on Dec. 1. The cost of the hoist was $35,000.

Leadville—Joseph T. Terry, holder of patents on a selective flotation process for treating low-grade complex ores, is preparing to install his process at the old Leadville District mill here. Satisfactory tests have been made on such ores, it is said.

MONTANA

North Butte Curtails Further—A. S. & R. To Cut Wages at East Helena

Butte—North Butte, which has been operating on a 70 per cent basis, has made a further cut in production and will hold its output within a half million pounds of copper monthly.

John Gillie, manager of Anaconda's mines, has announced that no further reduction in output is to be made for the present.

The quarterly report of Barnes-King for the period ending with September shows a net loss of $17,795.54. The directors passed the third quarter dividend.

The American Smelting & Refining Co., which recently cut wages 50c. a day at its Tacoma, Wash., plant, will shortly reduce wages at its East Helena plant.

ALABAMA

Second Manganese Ore Shipment Due at Mobile from Brazil

Birmingham—Sixty-two hundred tons of manganese ore from Brazil was due at Mobile Nov. 29, on the S. S. Bantu, and will be loaded on barges en route to the Birmingham district via the Warrior River. The ore is being brought up by the Tennessee Coal, Iron & R.R. Co., a subsidiary of the Steel Corporation, and is the second shipment of manganese ore received from Brazil in the last three months. The other shipment was handled from Mobile half by river and the other half by rail, but the shipment just arriving is to be brought up the river on barges operated by the government.

Independent ore producers of the Birmingham district are feeling the big slump in the pig iron market, the closing down of furnaces cutting off many contracts. Even those mining companies which a few weeks ago were happy over the fact that contracts had been made for stipulated tonnages instead of selling on tonnages alone and for immediate delivery are now feeling the effects of the general depression.

Y. A. Dyer is interested in a small brown ore property at Cave Springs, Ga. The product is being hauled in auto trucks to one of the charcoal furnaces of the Birmingham district.

MINNESOTA

Mesabi Range

Six State Leased Mines Suspend Shipping—Morrow Mine Reopened

Chisholm—The Morrow mine has been reopened by the Kingston Mining Co. This property was opened by the Sellwood interests in 1902 and over 100,000 tons of ore has been shipped. A new shaft has been sunk and all ore from drifting is being stockpiled.

The M. A. Hanna Ore Co. plans to deepen the Alexandria shaft and to cut a new station 76 ft. below the present station. There will be 2,690 ft. of drifting in rock at this level which has been selected as being below the ore. This will allow the mining of all ore on the Alexandria's forties and the south Snyder forty.

Buhl—The No. 300 electrically operated shovel at the Wabigon pit of the M. A. Hanna Ore Co., which is being operated with a drag line, removed 40,000 cu.yd. of stripping in its first month's work. It is equipped with a 5-yd. bucket and it is anticipated that under ordinary circumstances it will remove 60,000 cu.yd. per month working two ten hour shifts per day.

Nashwauk—The central repair shop of the Cleveland-Cliffs Iron Co.'s properties is practically complete. The structure is of brick with rolling steel doors and steel frame windows and has a floor space of 11,613 sq.ft., which is divided between three shops, a machine, forge and blacksmith and a carpenter shop. All heavy or special work will be done at this new plant.

Hibbing—The state mine inspector's report for the week ended Nov. 20 shows that six state leased mines have suspended ore shipping.

Small shipments comparatively are recorded as only a total of 64,359 tons was shipped. The Missabe Mountain pit, usually the largest state shipper, reported only 19,200 tons shipped during the week.

MICHIGAN

Gogebic Range

Steel Corporation Mines Stop Shipping for Season

Ironwood—The mines of the U. S. Steel Corporation on the Gogebic Range have definitely stopped shipping for the season. The total tonnage shipped during the season was about 2,036,000 an increase of about 22 per cent over the previous season, when the company's shipments totaled about 1,663,000 tons.

The Steel & Tube Co. of America are still shipping, several cargoes being loaded the week of Nov. 27. They have, however, begun to reduce their working forces. A few hundred men have been laid off at their Anvil-Palms and Newport mines. A number of shop men and timekeepers have also been laid off.

The Wakefield Iron Co. has completed its shipping program for the year at the Wico pit, having forwarded about 980,000 tons, a big increase over last year's shipments. Most of the other mines on the range have stopped shipping, and some have reduced forces.

With the close of the shipping season No. 10 shaft of the Tilden mine was temporarily shut down on Nov. 22. The old wooden shafthouse is being torn down and the steel frame taken from "A" shaft of the Aurora mine is being erected. This practically stops production.

Marquette Range

May Reopen Breitung-Hematite Property at Negaunee

Ishpeming—The Truscon Steel Co., of Youngstown, Ohio, has completed a new warehouse here for the Cleveland-Cliffs Iron Co. The building is 60 ft. by 200 ft. in size and will be used for storing heavy mining supplies. Part of the old warehouse has been turned over to the electrical department.

Negaunee—The Marquette Ore Co. has suspended mining at the Mary Charlotte mine for a week while repairs are being made to the shaft. It is reported that the same company is shortly to reopen the Breitung-Hematite property.

Menominee Range

Cardiff Surface Plant To Be Completed This Month

Iron River—It is expected that the surface improvements at the Cardiff mine will be completed in December. These include a new steel headframe, change house, engine house, boiler house and a few smaller buildings. The shaft, which is bottomed at 560 ft., has been concreted. The timbered shaft was found inadequate because of water, but the pumps have handled very little since concreting was completed. The mine is owned by the Wickwire Mining Co., which also has the Homer, adjacent. The surface equipment at the two properties is much alike. A concrete tunnel connects the engine house, change house and the shaft, and all steam and air lines and electric wiring go through the tunnel. Power is secured from the Peninsular Power Co. The engine house contains a 1,300-ft. I.-R. and two Nordberg electric hoists.

KENTUCKY

Many Fluorspar Mines Shut Down Owing to Lessened Demand

Marion—Owing to slackened demand, many of the Kentucky fluorspar mines have suspended operations during the last month. The only large producers now running are the Franklin mine of the Fairview Fluorspar & Lead Corporation, the Mary Belle mine of the Kentucky Fluorspar Co., the Tabb mine of the West Kentucky Ore. Co., the Lucile mine of the Guggenheim Mining Co., the Haffaw mine of the Aluminum Ore Co., and the Blue & Marble mine of the Keystone Fluorspar Co. There has been no tendency toward lowering of prices, operators simply shutting down to await more settled conditions.

The Aluminum Ore Co. have lately made considerable improvement at their Haffaw mine near Mexico, the latest being the addition of a large generator.

An experiment, the outcome of which has been awaited in this district with considerable interest, has just been brought to an apparently successful conclusion at the Big Four mine of Avery H. Reed. In order to handle the drainage of his mine more economically than by means of pumps, Mr. Reed has installed a four-inch air lift; the surplus air from his compressor now handles all of the water which formerly kept two 2 in. pumps busy, without in any way affecting the operation of drills, and with almost no expense. The successful result of this innovation will probably lead to the adoption of the same methods by other mines of the district.

THE MARKET REPORT

Daily Prices of Metals

Nov.	Copper, N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N Y	Lead St L.	Zinc St L
25	.....	.....	.....	....	...	....
26	13.50@13.75	33.00	35.00@35.50	5.40	5.40	5.75
27	13.50	33.00	34.75@35.00	5.40	5.40	5.70
29	13.25@13.50	32.00	33.00@33.50	5.15	5.15	5.60
30	13.25	31.75	33.00@33.25	5 00	5.00	5.55
Dec. 1	13.25	32.00	33.00@33.50	5.00	5.00	5.55

*These prices correspond to the following quotations for copper, "delivered": 13.75@14, 13.75, 13.50@13.75, 13.50, and 13.50c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Nov.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
25	78¾	79	90	229¼	229½	28¼	29¼	32¾	34¼
26	78	78¼	90	221¼	225	28	28⅞	32¼	33¼
27	...	...	...	...	...	...	...	...	...
29	77¼	77¾	87	208¾	212½	25½	25¾	29½	31
30	75½	75¾	84	207½	212	25	26	29⅜	31¼
Dec. 1	76¾	77¼	85	208¾	213¾	26¼	27	29¾	31½

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Nov.	Sterling Exchange	Silver New York Domestic Origin	Silver New York, Foreign Origin	Silver London	Nov	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
25	Holiday	Holiday	Holiday	47⅛	29	348	99½	71¾	40⅛
26	347½	99½	75½	48¾	30	347½	99½	68⅛	43⅜
27	348	99½	76	49⅛	Dec. 1	347¾	99½	69¾	44⅜

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Dec. 1, 1920

The meager selling at declining prices which has characterized trading in the last few weeks has continued, and no hope for an improvement is offered before the new year. Buying is only hand-to-mouth on the part of consumers, and speculative demand is absent.

A comparison of present prices with the average for 1913, the last full year before the war, indicates that, with costs now far higher than at that time, the prices of copper, tin, and zinc are near the bottom. The first figure given is the 1913 average and the second the current price: Electrolytic copper, lb., 15.27c., 13.25c.; Straits tin, lb., 44.25c., 33.25c.; zinc, lb., 5.50c., 5.55c.; lead, lb., 4.37c., 5.00c.; iron, basic, ton, $15.57, $36.96; silver, oz., 59.79c., $1 (domestic), 69¾c. (foreign). Prices can hardly be expected to go much lower for copper and tin, although the large stocks of the former will have a bad influence. Zinc production is being rapidly curtailed, so the present price is probably near the bottom. Lead has been held up by under-production, but with the present decreased demand, is rapidly falling into line with the other metals. It has not much further to go to reach the 1913 prices, but has acquired considerable momentum. Iron would seem to be due for a big drop. Artificial conditions, of course, enter into the silver market with the Pittman act in force.

Monthly Average Prices for November:

Copper:	
New York Electrolytic	14.257
London Standard	84.807
London Electrolytic	94.614
Lead:	
New York	6.159
St. Louis	6.127
London	32.489
Silver:	
New York, foreign	77.734
New York, domestic	99.500
London	50.952
Sterling Exchange	342.333
Zinc:	
St. Louis	6.247
London	35.028
Tin:	
99 per cent	35.667
Straits	36.854
London	241.080
Antimony	6.109
Quicksilver	58.417

Copper

Large producers report that they are not willing to sell for less than 14c. delivered, and a small amount of scattered business was done early in the week at that figure. Others have been willing to shade this price considerably, and a little business was done, U. S. Steel being among the buyers.

At present prices, curtailments, shutdowns, and wage reductions can be expected in constantly increasing numbers. As reported elsewhere, Cananea has closed down; wages have been reduced at Tacoma; and Inspiration has further curtailed production. These are only the opening guns. No resumption of activity at many of these properties can be expected until not only the demand improves, but the surplus stocks of copper metal are largely dissipated. Then the copper industry will be in excellent position for a long prosperous period.

With this week we are increasing the differential between the price f.o.b. refinery and delivered to consumer's plant, from 15 to 25 points. This is more nearly in accord with present conditions, due largely to increased freight rates.

Lead

On Tuesday, Nov. 30, the A. S. & R. reduced its official price of lead, New York and St. Louis, from 6 to 5½c. The move was anticipated, as the outside market was well under the former price.

Those who follow the market closely feel that with the present statistical condition of lead, the metal is worth 5c. a pound and unlikely to go lower, unless the London price falls sufficiently to make importation profitable. Current London quotations are equivalent to 5.50@5.75. New York, so a con-

siderable fall in London would be necessary before this condition would exist. Many producers would stock lead rather than sell should prices drop further.

Mexican lead is now being sold here, as it is cheaper to pay the duty than to ship to Europe. A deduction from the New York price, equivalent to the freight and selling expense, is made by the government to arrive at the Mexican price, on which the 25 per cent duty is levied.

Zinc

The market in St. Louis is firmer today, and unless selling pressure appears from a new quarter, further price reductions may not be expected. Demand is confined to galvanizers.

No demand for forward delivery exists.

Tin

Conditions are unchanged from last week, and only small lots have been purchased.

Straits tin for future delivery: Nov. 26th, 36.50@37c.; 27th, 36@36.50c.; 29th, 34@34.50c.; 30th, 34.50@35c.; Dec. 1st, 35@35.50c.

Arrivals of tin in long tons: Nov. 24th, Straits, 400; China, 40.

Silver

The market has showed continued weakness, although there has been a slight improvement today. Yesterday's figure for foreign bullion is a new low. China is the dominant factor in the market, with India a potential support at low prices.

Mexican Dollars: Nov. 26th, 57⅜; 27th, 58¼; 29th, 54⅜; 30th, 52⅜; Dec. 1st, 53¼.

Gold

Gold in London: Nov. 25th, 117s.; 26th, 117s. 7d.; 29th, 117s. 1d.; 30th, 117s. 6d.; Dec. 1st, 117s. 5d.

Foreign Exchange

On Tuesday, Nov. 30, francs were 6.065c.; lire, 3.66c. and marks, 1.425c. New York funds in Montreal, 13⅛ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c. Outside sales reported at lower prices than quoted above.

Antimony — Chinese and Japanese brands, 5⅞@5⅞c.; market very quiet; W.C.C. brand, 8¼@8½c. per lb. Cookson's "C" grade, 12½@13c. Chinese needle antimony, lump, nominal at 5c. per lb. Standard powdered needle antimony[1] (200 mesh), 10c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 10c.

Bismuth—$2.40 per lb. 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100-lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

[1]**Palladium**—$75 per oz. Dull.

Platinum—Firm at $75 per oz., nominal.

Quicksilver—Market quiet; $50@$60 per 75-lb. flask. San Francisco wires $53@$55. Weak.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

[1]**Manganese Ore**—45@50c. per unit, seaport; chemical ore (MnO_2) $65@$70 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

[1]**Tungsten Ore**—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $5, f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4.25@$4.50, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 11 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Nov. 27—Zinc blende, per ton, high, $45.35; basis 60 per cent zinc, premium, $33.50; Prime Western settling, $45@$35, buying, $35@$32.50; fines and slimes, $30@$27.50; calamine, basis 40 per cent zinc, $35@$32. Average settling prices: Blende, $43.07; calamine, $36; all zinc ores, $42.97.

Lead, high, $111.75; basis 80 per cent lead, settling, $110@$55; buying, $55; average settling price, $84.34 per ton.

Shipments for the week: Blende, 6,918; calamine, 98; lead, 1,738 tons. Value, all ores the week, $448,030.

Tuesday will end the contracts of a number of purchases of zinc made on $45@$40 basis, and lead $110 basis, with perhaps nearly all deliveries on these contracts in at the end of next week.

With offerings today leaning heavily downward on zinc, the mines are closing indefinitely as fast as they can arrange business details.

Platteville, Wis., Nov. 27—No market quotations are available for lead and zinc ore. Shipments for the week: Blende, 161; lead, 45 tons. Shipments for the year: Blende, 58,973; calamine, 2,534; lead, 4,473; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 2,724 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@ $3,000; No. 2, $1,400@$1,700; spinning fibres, $400@$800; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@ $75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $8@ $12; washed, $12@$15; powdered, $18@ $22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@ $30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@ $23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $22.50 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

ical or enameling purposes, $60; lump, $17, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$18 per ton carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade is practically unobtainable, prices being 7@9c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block: No. 6, 55c.; No. 5, $2; No. 4, $3.50; No. 3, $5, No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25, all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150 @$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.60 per lb.; No. 2. $1.30. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17, all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18, all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 13@14c. per lb.; sulphide, powdered, 16@17c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 16@17c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $150, freight allowed; $145, f.o.b. seaboard bases; English, $135@ $140, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $60@$65, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $160.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 23½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9¾c. in quantity, mill lots.

Nickel Silver — Unchanged at 35½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 22½c.; sheathing, 22½c.; rods, ⅜ to 3 in., 19½c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Nov. 30, 1920

Last Friday several large independent mills, which had previously been quoting 3c. on bars, shapes and plates, came down to the Steel Corporation prices of 2.35c. for bars, 2.45c. for shapes and 2.65c. for plates. Previously 3c. had been shaded by some mills on particularly desirable orders and by a few Western mills on all business. Yesterday a large independent maker of wire products came down to the Steel Corporation prices.

Finished-steel prices are now quotable as follows: Bars, 2.35c.; shapes, 2.45c.; plates, 2.65c.; tin plate, $7 per base box; steel pipe, 57½ to 54 per cent basing discount; blue annealed sheets, 3.55@4.05c.; black sheets, 4.35@4.85c.; galvanized sheets, 5.70@6.20c.; plain wire, 3.25c.; wire nails, $3.25.

Independent mill operations have continued to decline, though the Steel Corporation fully maintains its production and seems well provided with orders for several months.

Pig Iron—Foundry iron is down $2 to $37, Valley, bessemer and basic remaining nominally at $37.50 and $35, respectively, Valley, with $1.96 freight to Pittsburgh.

Semi-finished Steel—The first sale of semi-finished steel at the Corporation price, 6,000 tons of sheet bars at $47, Pittsburgh, has not been followed by others. Billets are nominally $50 and sheet bars $55.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 6c. per lb., in 250-lb. bbls.

Connellsville — Furnace, $10@$12; foundry, $8@$10.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

METAL STATISTICS

Monthly Average Prices of Metals

Silver

	New York			London		
	1918	1919	1920	1918	1919	1920
January	88 702	101 125	132 827	44 356	48 438	79 846
February	85 716	101 125	131 295	42 792	48 027	85 005
March	88 082	101 125	125 551	43 620	48 171	74 194
April	95 346	101 125	119 729	47 215	48 886	68 848
May	99 505	102 135	102 585	48 980	52 104	60 010
June	99 500	110 430	90 957	48 875	53 896	51 096
July	99 625	106 394	91 921	48 813	54 133	53 736
August	100 292	111 370	96 168	49 077	58 835	59 875
September	101 125	114 540	93 25	49 500	61 668	93 6 5
October	101 125	119 192	83 483	49 500	64 049	54 97
November	101 125	127 924	77 734	48 969	70 065	50 952
December	101 125	131 926	. . .	48 492	76 432	..
Year	96 772	111 122	....	41 516	57 059	....

New York quotations cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London			
	Electrolytic		Standard		Electrolytic	
	1919	1920	1919	1920	1919	1920
January	(a)	18 918	92 238	118 095	106 619	123 238
February	16 763	18 569	78 700	120 188	95 700	126 950
March	14 856	18 331	76 821	109 533	82 071	118 348
April	15 246	18 660	77 300	103 025	82 200	111 500
May	15 864	18 484	77 262	96 750	81 227	109 200
June	17 610	18 065	83 062	87 864	85 900	101 909
July	21 604	18 26	99 576	90 148	103 046	106 455
August	22 319	18 346	97 300	93 935	106 429	111 143
September	21 755	18 144	100 267	86 381	.....	111 105
October	21 534	15 934	103 418	93 3 7	.....	111 5
November	19 758	14 257	98 894	84 807	.....	94 614
December	18 295	.....	103 708	.....	.....	.....
Year	18 691	.....	90 796	.....	.....	.....

(a) No market.

Lead

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	5 432	8 561	5 316	8 300	32 227	47 095
February	5 057	8 814	4 784	8 601	28 675	50 256
March	5 226	9 145	4 992	8 894	27 952	46 054
April	4 982	8 902	4 722	8 618	24 888	39 225
May	5 018	8 576	4 723	8 352	23 852	38 488
June	5 340	8 323	5 070	8 169	22 544	34 330
July	5 626	8 338	5 408	8 283	23 457	34 960
August	5 798	8 687	5 583	8 725	24 750	36 304
September	6 108	8 177	5 853	8 160	25 330	35 452
October	6 487	7 0	6 249	7 0 8	28 423	3 8
November	6 808	6 159	6 649	6 127	34 731	32 489
December	7 231	....	6 955	.....	41 202	....
Year	5 759	....	5 530	.....	28 590	....

Tin

	New York				London	
	1919		1920			
	99%	Straits	99%	Straits	1919	1920
January	67 702	...	61 596	.	248 557	376 512
February	66 801	.....	58 466	59 932	223 963	395 750
March	67 934	.....	61 037	61 926	236 843	369 489
April	72 500	.....	61 120	62 115	225 275	345 450
May	72 500	.....	53 230	55 100	234 398	294 815
June	71 240	.....	46 125	48 327	238 263	250 614
July	68 000	.....	45 798	49 154	253 222	261 886
August	57 226	.....	43 856	47 620	273 625	274 048
September	54 482	.....	41 940	44 465	280 102	270 1.0
October	54 377	.....	..	.. 5	279 239	..
November	53 307	.....	35 667	36 854	283 556	24 080
December	53 870	.....	.....	.....	314 113	.....
Year	63 328	.....	....	.....	257 601	.. .

Zinc

	New York		St. Louis		London	
	1919	1920	1919	1920	1919	1920
January	7 272	9 483	6 922	9 133	56 045	58 643
February	6 623	9 058	6 273	8 708	46 150	61 338
March	6 500	8 881	6 150	8 531	38 500	53 467
April	6 465	8 534	6 114	8 184	36 118	42 388
May	6 429	7 938	6 079	7 588	35 422	45 088
June	6 901	7 815	6 551	7 465	36 763	41 193
July	7 873	8 070	7 523	7 720	41 815	41 886
August	7 789	8 185	7 439	7 835	39 338	41 220
September	7 510	7 717	7 160	7 661	40 955	39 690
October	7 823	..	7 473	7 150	43 630	3 7 8
November	8 177	.....	7 827	6 247	46 588	35 028
December	8 700	.....	8 350	.....	53 101	.....
Year	7 338	.....	6 988	.....	42 879	....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Pig Iron, Pittsburgh

	Bessemer ‡		Basic ‡		No. 2 Foundry	
	1919	1920	1919	1920	1919	1920
January	$33 60	$40 47	$31 40	$39 88	$32 40	$39.86
February	33 60	42 95	31 40	42 61	32 40	43 40
March	32 54	43 40	31 40	42 90	29 12	43 40
April	29 35	43 72	27 15	44 22	28 15	43 90
May	29 35	44 00	27 15	44 88	28 15	45 36
June	29 35	44 89	27 15	45 41	28 15	46 40
July	29 35	47 21	27 15	47 42	28 15	46 56
August	29 35	48 90	27 15	49 88	28 15	49 35
September	29 35	50 46	27 15	50 46	28 15	51 96
October	29 35	49 21	27 15	44 38	28 30	48 58
November	31 60	....	31 56	....	32 16	....
December	36 57	....	35 32	....	36 86	....
Year	$31 11	....	$29 26	....	$28 35	....

‡ As reported by W. P. Snyder & Co.

Antimony, New York; July, 7 500c., August, 7 177c., September, 7.113c., October, 7 c., November, 6 1 9c.

Quicksilver, New York; July, $90.333, August, $85 355, September, $75 000, October, $67 200, November, $58 417

Monthly Copper Production

The crude-copper content of blister copper of the principal producers, in pounds, for July-October, 1920, follows:

MONTHLY CRUDE COPPER PRODUCTION, 1920

	July	August	September	October
Alaska shipments	5,297,645	5,762,551	1,635,627	4 984,219
Arizona				
Arizona Copper	3,000,000	3,000,000	3,000,000	2 800,000
Calumet & Arizona	4,232,000	5,200,000	4,292,000	3 802 000
Cons Ariz Smelting	250,000	975,000	950,000	85 000
Inspiration	6,500,000	7,200,000	6,500,000	7,000,000
Magma	865,774	536,740	663,219	750,814
Miami	4,549,298	4,630,225	4,549,140	4,582,293
New Cornelia	3,522,000	3 842,000	3,314,000	3 450,000
Old Dominion	2,640,000	2,802,000	1 952,000	2 912,000
Phelps Dodge	5,955,000	5,875,000	6,381,000	5,309,000
Shattuck Arizona	166,938	194,003	166,513	206,772
Ray	4,500,000	4,505,000	4,502,000	3,990,800
United Verde	5,085,140	5,125,000	4,832,000	5,858,000
United Verde Extension	3,304,878	5,805,568	3,327,644	3,864,756
Michigan.				
Calumet & Hecla	8,312,025	7,520,107	7,228,215	7 945,502
Other Lake Superior	6,200,000	6,000,000	6,000,000	6,000,000
Montana:				
Anaconda	11,700,000	11,800,000	11,100,000	11,000 000
East Butte	1,532,880	1,566,800	1,634,260	1,500,000
Nevada				
Nevada Cons	4,650,000	4,650,000	4,650,000	3,850,000
New Mexico:				
Chino	4,360,932	4,000,140	5,161,894	3,933,435
Utah				
Utah Copper	8,500,000	4,820,000	8,420,000	8,000,000
Eastern Smelters	1,600,000	1,600,000	1,600,000	1,600,000
Total reported	97,729,510	101,430,854	91,919,262	94 204,591
Others, estimated	12,000,000	15,000,000	13,000,000	10,900,000
Total United States	109,729,510	116,430,854	104,919,262	105,104,591
Imports: Ore and concentrates, etc	3,937,824	11,040,057	10,132,272	
Imports in blister, etc	26,553,600	20,320,824	20,428,866	
Grand total	140,220,934	147,791,535	135,480,905	
British Columbia:				
Granby Cons	2,400,000	2,471,200	2,239,174	2 293,500
Mexico.				
Boleo	781,613	618,390	440,720	617 200
Cananea	3,500,000	3,500,000	3,500,000	3,500,000
Phelps Dodge Mexican properties	2,402,000	2,490,000	1,617,000	1,817,000
Other foreign				
Cerro de Pasco	3,652,000	4,440,000	4,360,000	4,698,000
Chile	9,904,000	10,640,000	9,490,000	9 420,000
Katanga	5,632,822	4,615,176	None	2,697,696
Backus & Johnston	1,458,000	1,580,000	1,560,000	1 740 000

Domestic copper production for 1918, 1919, and part of 1920 follows:

	1918	1919	1920
January	165,431,568	135,733,511	121 903,744
February	160,011,364	111,649,512	117 450 000
March	185,525,168	102,040,460	120,304 316
April	163,202,096	98,808,998	116,078,871
May	181,070,350	92,652,975	114,964,207
June	166,723,599	95,856,570	116,107,856
July	159 329,031	100,369,247	109,729 510
August	165,550,799	107,994,040	116,440 654
September	157,992,487	108,203,075	104,919,262
October	168,638,775	115,143,143	105,104,591
November	159,217,588	117,289,235	
December	161,801,916	102 997,633	

(a) Revised

MINING STOCKS

Week Ended November 27, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston	...	...	*50	...	...
Ahmeek	Boston	48	45	47	Sept. '20, Q	.50
Alaska-B.C.	N. Y. Curb	...	...	⅛	...	...
Allouez	Boston	19½	18⅞	19½	Mar. '19	1.00
Anaconda	N. Y.	42⅛	38	40⅛	Nov. '20, Q	1.00
Ariz. Com'l	Bostoo	8½	7½	7½	Oct. '18.	.50
Big Ledge	N. Y. Curb	⅜	⅜	⅜	...	...
Bingham Mines	Boston	10	9½	9½	Sept. '19, Q	.25
Calumet & Ariz.	Boston	46½	44½	46	Sept. '20, Q	1.00
Calumet & Hecla	Boston	248	245½	247	June '20, Q	5.00
Canada Copper	N. Y. Curb	...	...	*20	...	...
Centennial	Boston	7½	7½	7⅛	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	33	30	32⅛	Sept. '20, Q	1.00
Chief Consol.	Boston Curb	3¼	3	3⅛	Nov. '20, Q	.10
Chile Copper	N. Y.	13	12	12⅛	...	...
Chino	N. Y.	21½	19⅞	20	Sept. '20, Q	37½
Colu mbus Rexall	Salt Lake	*36½	*35	*35	...	...
Con. Ariz.	N. Y. Curb	...	...	⅛	Dec. '18, Q	.05
Con. Copper M.	N. Y. Curb	...	...	2⅛	...	...
Copper Range	Boston	29	27⅛	28	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*50	*41	*47	...	...
Davis-Daly	Boston	6	5⅜	5⅜	Mar. '20, Q	.25
East Butte	Boston	8⅜	7⅛	8⅜	Dec. '19, A	.50
First Nat'l	Boston Curb	*80	*80	*80	Feb. '19, SA	.15
Frankl'n	Boston	2½	2½	2½	...	...
Gadsden Copper	N. Y. Curb	...	...	*70	...	...
Granby Consol.	N. Y.	21½	19½	20	May '19, Q	1.25
Greene Cananea	N. Y.	25⅜	22	23	Nov. '20, Q	.50
Hancock	Boston	3	3	3	...	...
Houghton	Boston Curb	...	...	*45	...	...
Howe Sound	N. Y. Curb	...	...	2⅛	Oct. '20, Q	.05
Inspiration Con.	N. Y.	36	33½	34	Oct. 20, Q	1.00
Iron Cap	Boston Curb	7	6½	7	Sept. '20, K	.25
Isle Royale	Boston	20	18½	19½	Sept. '19, SA	.50
Kennecott	N. Y.	20⅞	19	19½	Sept. '20 Q	.50
Keweenaw	Boston	...	...	1⅛	...	...
Lake Copper	Boston	2½	2½	2½	...	...
La Salle	Boston	...	...	2	...	...
Magma Chief	N. Y. Curb	...	...	*21	...	...
Magma Copper	N. Y. Curb	22½	20	22	Jan. '19, Q	.50
Majestic	Boston Curb	...	...	*12	...	...
Mason Valley	Boston	1⅛	1	1	...	...
Mass Consol.	Boston	...	...	2⅛	Nov. '17, Q	1.00
Mayflower-O.C.	Boston	4	3¼	3⅞	...	...
Miami	N. Y.	18	16⅛	16⅞	Nov '20, Q	.50
Michigan	Boston	3	2½	2⅝	...	...
Mohawk	Boston	47	45	46	Nov. '20, Q	1.00
Mother Lode (new)	N. Y. Curb	...	...	5⅛	...	...
Nevada Con.	N. Y.	10	8⅛	9⅜	Sept. '20, Q	.25
New Arcadian	Boston	...	...	2½	...	...
New Baltic	Boston Curb	...	...	3	...	...
New Cornelia	Boston	15⅛	13⅜	15	Aug. '20,	.25
Nixon Nev.	N. Y. Curb	...	...	*5	...	...
North Butte	Boston	11⅛	9⅛	10	Oct. '18, Q	.25
North Lake	Boston	*25	*25	*25	...	...
Ohio Copper	N. Y. Curb	...	...	⅛	...	...
Oilbway	Boston	1⅞	1⅜	1⅞	...	...
Old Dominion	Boston	20	17½	20	Dec. '18 Q	1.00
Osceola	Boston	25½	23	23	June '20 Q	.50
Phelps Dodge	Open Mar.	†175	†150	...	Oct. '20, Q	2.50
Quincy	Boston	39	37	38	Sept. '20, Q	1.00
Ray Con.	N. Y.	12⅛	10⅞	11⅜	June 20 Q	.25
Ray Hercules	Boston Curb	...	...	*61	...	...
St. Mary's M. L.	Boston	32	29	30	June '20, K	2.00
Seneca Copper	Boston	18⅞	17⅛	18⅜	...	...
Shannon	Boston	1⅛	1	1	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	5⅛	5⅜	5⅜	Jan. 20 Q	.25
South Lake	Boston	...	...	2	...	...
South Utah	Boston	*8	*6	*6	...	...
Superio Copper	Boston	4⅛	4	4	Apr '17.	1.00
Superior & Boston	Boston	2⅛	2	2	...	...
Tenn. C. & C.	N. Y.	8⅛	7⅛	8	May '18, I	1.00
Tuolumne	Boston	*44	*36	*38	May '13,	.10
United Verde Ex.	Boston Curb	27	24	24	Nov '20 Q	.50
Utah Consol.	Boston	4	3⅞	4	Sept '18.	.25
Utah Copper	N. Y.	53⅜	51	51	Sept. '20, Q	1.50
Utah M. & T.	Boston	1	1	1	Dec. '17.	.30
Victoria	Boston	...	...	1⅛	...	...
Winona	Boston	...	...	*50	...	...
Wolverine	Boston	10⅛	10	10	Jan. '20, Q	.50
LEAD						
Hecla Mining	N. Y. Curb	4⅛	4⅛	4⅛	Sept '20, QX	.15
St. Joseph Lead	N. Y.	14⅛	13⅜	14	Sept '20, QX	.50
Stewart	Boston Curb	...	...	*13	Dec. '15,	.05
Utah Apex	Boston	3⅛	2⅞	3⅛	Nov '20, K	.25
ZINC						
Am. Z. L. & S.	N. Y.	8	7⅛	7⅞	May '17,	1.00
Am. Z. L. & S pf.	N. Y.	33	31	31⅛	Nov '20, Q	1.50
Butte C. & Z.	N. Y.	6	4⅜	6	June '18, I	.50
Butte & Superior	N. Y.	12⅛	11	11	Sept. '17.	1.25
Con. Interst. Cal.	N. Y.	8	7	7	June '20, Q	.50
New Jersey Z.	N. Y. Curb	152	152	152	Nov '20, Q	4.00
Success	N. Y. Curb	2	1⅛	2	July '16,	.03
Yellow Pine	Los Angeles	*80	*80	*80	June '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1⅛	1⅛	1⅛	...	...
Alaska Juneau	N. Y.	1⅛	1⅛	1⅛	...	...
Carson Hill	N. Y. Curb	...	...	22⅛	...	...
Cresson Consol. G.	N. Y. Curb	1⅛	1⅛	1⅛	June '20, Q	.10
Dome Ex.	Toronto	*45	*45	*45	...	...
Dome Mines	N. Y.	11⅛	11⅛	11⅛	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡	...	*73	Sept. '20, Q	.02
Goldfield Con.	N. Y. Curb	*8	*6	*6	Dec. '19,	.05
Hedley	Boston	...	...	4⅛	June '19,	.10
Hollinger Con.	Toronto	...	...	5 65	Nov. '20, X	.05
Homestake	N. Y.	52	51⅛	52	Sept. '19,	.50
Kirkland Lake	Toronto	...	...	*38	...	...
Lake Shore	Toronto	...	...	1.02	Oct. '20, K	.02
McIntyre-Porcupine	Toronto	1.93	1.91	1.92	Sept. '20, K	.05
Porcupine Crown	Toronto	*20⅛	*20	*20	July '17,	.03
Portland	Colo. Sprgs.	‡	...	*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb	*4	*3	*3½	May '19,	.05
Silver Pick	N. Y. Curb	*6	*5	*6	...	...
Teck Hughes	Toronto	...	...	*6½	...	...
Tom Reed	Los Angeles	1.45	1.42	1.45	Dec. '19,	.02
United Eastern	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '20, Q	.15
Vindicator Consol.	Colo. Sprgs.	‡	...	*18	Jan. '20, Q	.01
West Dome Consol.	Toronto	*5⅛	*5	*5⅛	...	...
White Cape Min.	N. Y. Curb	*8	*6⅛	*8	...	...
Yukon Gold	Boston Curb	...	...	1⅛	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*25	*21	*21	Apr. '20, M	.03
Beaver Con.	Toronto	*36	*34	*34	May '20, K	.03
Conagas	Toronto	...	...	2.35	Nov. '20, Q	.12½
Crown Reserve	Toronto	*20	*20	*20	Jan. '17,	.05
Kerr Lake	Boston	3	2⅞	2⅞	Oct. '20, K	.12½
La Rose	Toronto	†*28⅛	†*24	*26	Apr. '18,	.02
McKinley-Dar.	Toronto	*49	*47	*47	Oct. '20, Q	.03
Mining Corp.	Toronto	1.67	1.65	1.65	Sept '20, Q	.12½
Nipissing	N. Y. Curb	8⅛	8⅛	8⅛	Oct. '20, QX	.50
Ontario Silver	N. Y.	4⅛	3⅛	4⅛	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb	⅛	⅛	⅛	Jan. '12,	.10
Peterson Lake	Toronto	†*11	†*10⅞	*11⅛	Jan. '17,	.01¼
Temiskaming	Toronto	*27	*26	*26	Jan. '20, K	.04
Trethewey	Toronto	*23⅛	*23	*23⅛	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb	*1⅛	*1⅛	*1⅛	...	...
Barnes-King	Butte	‡...	....	1.11	Aug. '20, Q	.05
Bost. & Mont.	Boston	...	...	*63	...	...
Cashboy	N. Y. Curb	*8	*7	*7	...	...
El Salvador	N. Y. Curb	⅛	⅛	⅛	...	...
Jim Butler	N. Y. Curb	*18	*16	*16⅛	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb	*6	*5	*5⅛	June '16,	.05
Louisiana Con.	N. Y. Curb	⅛	⅛	⅛	...	...
MacNamara M.	N. Y. Curb	⅛	⅛	⅛	May '10,	.02½
N.Y. Hond. Rosar.	Open Mar.	†11⅛	†10	...	Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb	1⅛	1 1/16	1 1/16	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb	1⅛	1	1	...	...
Tonopah Ex.	N. Y. Curb	1 1/16	1	1⅛	Oct. '20, Q	.05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1 1/16	Oct. '20, SA	.05
West End Con.	N. Y. Curb	1 1/16	1	1 1/16	Dec. '19 SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*18	*16	*17	July, '20, M	.01
Consol. M. & S.	Montreal	21	18⅛	19½	Oct. '20, Q	.62½
Daly Mining	Salt Lake	...	...	2 40	July '20, Q	.10
Daly-West	Salt Lake	5	4⅛	4⅛	Oct. '20, Q	.25
Eagle & Blue Bell	Boston Curb	...	...	2⅛	Apr. '20, Q	.10
Electric Point	Spokane	*12	*12	*12	May '20, SA	.03
Fed. M. & S.	N. Y.	...	...	6⅛	Jan. '09,	1.50
Fed. M. & S pf.	N. Y.	31⅛	29	31⅛	Sept. '20, Q	1.75
Florence Silver	Spokane	...	...	*25	Apr. '19,	.01¼
Grand Central	Salt Lake	...	...	*37⅛	June '20, K	.03
Iron Blossom	N. Y. Curb	⅛	⅛	⅛	Oct. '20, Q	.02½
Judge M. & S.	Salt Lake	...	...	3.82½	Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	...	...	*10	...	...
Prince Consol.	N. Y. Curb	⅛	⅛	⅛	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*2⅛	*2	*2⅛	Feb. '19,	.01
Rex Con.	N. Y. Curb	*5	*5	*5	...	...
South Hecla	Salt Lake	...	...	*70	Sept. '19, K	.15
Stand. S. L.	N. Y. Curb	⅛	⅛	⅛	Oct. '17,	.05
Tamarack-Custer	Spokane	2 20	2 20	2 20	Dec. '19, K	.03
Tintic Standard	Salt Lake	3 82½	3 55	3.55	June '20, Q	.10
Wilbert Mining	N. Y. Curb	*2⅛	*1⅛	*2	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y.	15⅛	14⅛	14⅛	Mar. '19,	.50
Internat'l Nick pf.	N. Y.	...	...	83	Nov. '20, Q	1.50
QUICKSILVER						
New Idria	Boston	...	...	2	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	....	....	*9	...	...
VANADIUM						
Vanadium Corp.	N. Y.	49⅛	41⅛	43⅛	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp.	Montreal	86	82	82	Oct. '20, Q	1.50
Asbestos Corp. pf.	Montreal	94	93	93	Oct. '20, Q	1.75
MINING, SMELTING AND REFINING						
Am. S & R.	N. Y.	47	44	45⅛	Sept. '20, Q	1.00
Am. S. & R pf.	N. Y.	88	86⅛	88	Sept. '20, Q	1.75
Am. Sm. pf. A	N. Y.	73	73	73	Oct. '20, Q	1.50
U. S. Sm. R & M.	N. Y.	45⅛	43	43	Oct. '20, Q	1.50
U.S.S.R.& M. pf.	Boston	42⅛	41	42	Oct '20, Q	.87½

*Cents per share †Bid or asked ‡Quotations missing. Q Quarterly
SA, Semi-annually BM, bimonthly K, Irregular. I, Initial X, includes extra

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A Weekly Journal of the Mining and Mineral Industries
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Volume 110 New York, December 11, 1920 *Number* 24

Existing Conditions a Challenge to Engineers

THE existing stagnation in the major metal markets, together with the partial curtailment in some of our important mining industries, is not, in our judgment, a reason for particular discouragement. The adjustment in prices in other important manufacturing industries has produced more or less uncertainty with respect to the immediate future. Nevertheless, the mining industry has had the advantage of other industries in that for the period succeeding the armistice it has been compelled to operate on a rock-bottom basis. There has been some bread and butter, but comparatively little butter. Some mining companies have been in a better financial condition than others, but all have made prompt readjustment to meet existing conditions. In some cases the readjustment has been superficial, in others fundamental.

We mean by this that some properties have simply curtailed, closed down, or taken the most obvious steps to decrease money outgo and conserve resources. This, in our opinion, is a superficial readjustment. By a fundamental readjustment we mean the thorough analysis of operating conditions with a view to putting them in such form as to meet present circumstances. This may mean a radical change in mining methods, the introduction of improved equipment or the complete overhauling of metallurgical methods and equipment. In our opinion, this getting down to the dregs of the problem is of vital importance to the mining industry.

Necessity is the mother of invention. Adverse economic conditions are in themselves a challenge to managers, superintendents, technical staff, and operating men. This fact is of importance to the mining industry. We venture to say that every live organization is getting down to cases.

We know of one mining engineer who has an important gold-producing property under his direction. War conditions practically eliminated all profit margin. Apparently there was nothing to be done except to shut down, which would have been a serious blow to the stockholders and the workers. Operations were, however, continued, and this engineer is calling all his ability into play to improve operating conditions and reduce his costs. He told us that he could not improve either mining or transportation methods, but that he had hopes of so changing milling operations as to cut his milling cost in two. We like the spirit of this man. He is asking no favors from anyone. He is putting his brain into his work.

American mining engineers and metallurgists have won an eminent position by reason of their courage in breaking away from precedent and building up the mining industry upon a substantial and low-cost basis. By meeting the present economic situation the mining industry will be in a stronger position to compete in the world's markets.

Reorganization for Washington

THIS is the open season for gunners who wish to reorganize the executive departments at Washington. We have had our little shot at this, and do not begrudge the sport to others. The most ambitious and thoroughgoing plan we have seen is that put forward by the Committee for Governmental Economy, representing a number of other weighty organizations. Here, apparently, is the last word in efficiency. We have only gotten far enough in the elaborate and complete chart of the new organization to see that the Geological Survey will be incorporated in the Department of Public Works, and the Bureau of Mines in the Department of Commerce. The War Minerals Relief Commission of the present Interior Department (the engineering and auditing staffs of this commission are under the Bureau of Mines) will be transferred to the Department of Public Works.

Read no further, gentle stranger.

Great is the reformer when he gets really serious and attempts to unscramble the egg, as in the present case, by making egg nog out of it. The mining industry—did the National Committee for Governmental Economy ever hear that the United States had a mining industry?—is thus hanged, drawn, and quartered. We think that, as they have gone that far, they should have so scattered the remains as to leave no clue to their crime. For example, the department of the Geological Survey that deals with the mineral resources of foreign countries should go to the Department of State, the Petroleum Division of the Bureau of Mines should go to the Shipping Board, the Division of Statistics in the Geological Survey should go to the Census Bureau, the Safety First work of the Bureau of Mines to the Bureau of Medicine and Surgery in the Navy Department. Dr. Cottrell should be assigned to the Patent Office and Dr. George Otis Smith to the Red Cross. A final grand disorganization banquet would be a proper and dignified finis.

The Opportunity of the Labor and Trade Unions

A TREND to the open shop in industry is going hand in hand with a gradually increasing labor supply. The tendency receives added impetus from the unpopularity of some of the strikes engineered by radicals among the unions, which have offset much of the good that has been accomplished by saner elements in labor groups during the last few years. The public has been quick to realize that in some cases where the closed shop has prevailed, too great opportunity is offered to squeeze out all the traffic will bear, regardless of agreements and contracts. Grafters, safely ensconced as union officials, not only demand blood money from employers, but sometimes also collect it from union members themselves. The disclosures in the building trades investigation in New York City exhibit a rottenness which shows to what lengths the vicious system may be carried.

The fairly conducted unions need have no fear of the open shop. If the union can offer any advantages to the worker he will join; if not, there is no excuse for its existence. Perhaps in no district has the open shop idea spread faster recently than in Montana, and more particularly in Butte. There, union and non-union men are now working side by side, and conditions are peaceful as compared with the time when the I. W. W.'s, or, as more commonly termed, "Wobblies," held control.

That some of the radical union activities have had an effect on public sentiment is also shown by the present unpopularity of the boycott. Striking placarded pickets wasting their time parading before their former employer's place of business are coming to be good advertisements and to engender a feeling that we must all stand together to protect ourselves from unjust demands.

The unions have done too much good to be allowed to be run into the ground. The open shop will give them a good opportunity to show what they can offer and how they can act, as compared with unorganized labor. With good leadership they should continue to prosper.

The Mines of Asia

ASIA has large mineral resources. Much of her mineral wealth has never been worked and what has been worked has never been exploited with that ravaging thoroughness and intensity which modern mining has invented, and which in the course of a few years guts from the richest mine its concentrated wealth of all past eternity. On such metallic framework, on metal so scientifically won, is our power built; and Asia will learn this among other secrets.

The urge toward mining in the East is already striking. Japan has a highly developed mining industry, especially in copper, where she ranks third among the world's nations. China is rich in coal and iron—possessing, after the deposits of the Eastern United States, and, second, the long-fought-for borderlands between France and Germany (including Alsace and Lorraine), the greatest coal and iron deposits in the world. If England's power depended largely upon her coal and iron, if the strength of France and Germany had this basis, if the great power and wealth of the United States rests mainly upon its being richest in coal and iron of all nations, what deduction may we draw from the future development of the wealth in coal and iron of China? Surely, that here will be concentrated the strength of the Pacific region. Whether it will be the Chinese, the Japanese, the Americans the Russians or the British who will wield this power remains to be seen.

Struggling China would gladly have American capital and resourcefulness open up her mines, since in the co-operation by every other country, including Japan, she sees political conquest following upon the threatened commercial domination. British, American and French companies actually have large mining interests in China and in other countries of Eastern Asia, and at present an active movement is going on in this country looking toward further investigation and acquisition. None of these movements, however, have the strength and swiftness of that of Japan, which behind its commercial and competent technical enterprise has the force of a definite government policy. Japan, cramped and active, with discrimination against her race and her citizens by the United States, Canada, Australia and Europe, can hardly be expected to be anything but unsympathetic to increase of Caucasian power in the Mongolian continent. The discrimination in question, as all fair thinkers must acknowledge, is based on purely economic grounds, rather than conceptions of fundamental racial superiority. What we have we would keep for ourselves, and without too strenuous a competition against the lean bellies of Asia or anywhere else.

The tin industry of Asia and Australasia is controlled, either by ownership or trade relations, by Great Britain—indeed, through this and other trade relations, and the possession of her own Cornwall tin mines, Great Britain substantially controls the tin of the world. The substantial petroleum supplies of the East Indies are controlled by British and Dutch capital, now apparently welded together under British direction. Tungsten is an important product of China and other Far Eastern countries, and Chinese antimony dominates the markets of the world. Till recently under British control, it has been under Chinese direction since the establishment in New York of a selling agency of the Wah Chang Co., which controls, through a government concession, the Chinese output. It is the only strictly Chinese-controlled mining industry in China.

India, not a great mining country, has important mines of manganese, and gold mines which are of some moment, and has, with Brazil, the most important deposits of monazite and zircon. Ceylon produces perhaps the best graphite in the world. It is probable that Siberia is, in respect to gold and many other metals, the richest undeveloped country on earth; and certainly the vast interior mountainous regions of Asia, now little explored, will yield much mineral wealth. The struggle over Asiatic Turkey and Persia is emphasizing the great resources of these countries, in petroleum, copper and many other minerals. England and France have agreed to divide the petroleum. France apparently has the approach to the main copper district, that of Diarbekir; and Greece and Italy are quarreling about the coastal belts of Asia Minor, rich in emery, chromite, and other minerals.

Above and back of all, like a formless cloud, a vast inchoate Russia threatens all: China, India and Persia; Mongolian and Caucasian.

Who will develop the mines of Asia?

Fair Play for the Mine Cost Sheet

THE closing down of certain mining properties and curtailment at others causes even the ordinary observer to question the reasons for such action. We have discussed the causes so frequently that our readers should know them by heart. In brief, surplus supplies of metal, a stagnant market, and high costs.

We have not been free to predict the time period of the depression, for the reason that many economic conditions necessarily have considerable bearing on the situation, and until the adjustment of these is completed the resumption of former activities cannot begin. However, there is little reason to believe that a delay is necessary in some quarters, and in view of the fact that we are beginning to see recessions in commodity prices, and even greater drops are predicted, it is reaonable to suppose that we may look for reductions in other markets.

A short time ago, in the same issue of one of the Western newspapers which announced the closing down of a prominent quicksilver mine, we noted with some

curiosity a statement of the earnings of a well-known powder company for the first nine months of 1920. The gross receipts showed an increase of over three hundred thousand dollars and the net earnings more than double that amount *above* the corresponding period for the year before.

The item "mining supplies" occupies no unimportant part on the cost sheet of any mine, and of the different charges that are included, blasting powder is by no means the smallest. Nor is the total amount of powder used in the mining industry of such insignificance that it compares unfavorably with that used in other fields. During the war the story was somewhat different, but, even though we are still, politically speaking, at war with Germany, the consumption of explosives for military purposes has slackened materially. So, as we have already remarked, it is interesting to observe that at this period, when all the mines are having such a difficult time, the powder companies are making net earnings twice as large as last year. In other words, notwithstanding the very low price of their raw materials, such as glycerine and other essential commodities, they are still charging war prices for their product.

Such a condition as this demands a remedy, and the sooner the better if the mining industry is to resume its former activity quickly.

A Siberian Incident

WASHINGTON D. VANDERLIP, stated to be a mining engineer, has recently figured considerably in international press dispatches, since he arrived in London with a mining concession for eastern Siberia, including Kamchatka, where, among other things, he is going to mine oil. Figuratively speaking, he laughs hoarsely at the United States for failing to recognize Soviet Russia, and get Russia's trade, and believes that England will beat us to the trough. Later dispatches state that Mr. Vanderlip was awarded Siberia by the Russian Soviet Government (our latest news is that this government does not control Siberia) because it supposed him to be a cousin of Frank A. Vanderlip.

Washington D. Vanderlip has a good front and rear name, and his middle initial is the same as John D's; also his business deals, as he himself admits in tones sufficient to be detected over two continents, are Napoleonic. We do not find him on the membership list of the American Institute of Mining and Metallurgical Engineers. We shall look for further news from Washington.

Botany Applied to Mining

THE letter of Mr. Wichman's on page 1116 brings up a subject which has never been properly treated —the relation of botany to geology, and the use of the former in the determination of facts appertaining to the latter. We recommend the subject as affording an appropriate thesis for some of our graduating university students.

As is well known, certain marine plants concentrate in their structures iodine from sea water, and potash; and are important commercial sources of these chemicals. Similarly, in Spain a plant which secretes soda was long cultivated and harvested for that chemical; the ash being known as *barilla*. A "mineral farm" therefore, is not necessarily an absurdity.

Students of geology are quite accustomed to the help of vegetation in following and mapping the bi[illegible]er facts of that science. Frequently, in a series of limestones and shales, for example, a different type of vegetation, even diverse tree species, will be characteristic of the different outcropping zones, the variations being due in part to the different chemical character of the soil, and in part to the variable permeability of the rocks by water. Similarly, fault zones are often easily traceable with the eye, by a line of more luxuriant and greener vegetation, due to the fault being a natural watercourse. This may often be observed in the desert region, where the color and size of the desert shrubs may be striking. Similarly, certain veins may likewise be watercourses, as zones of persistent sheeting, and be traceable with the eye by differences in vegetation.

The relation of various plant species to the different chemical properties of the rocks out of which they grow, however, has not yet been thoroughly summarized. We hope to see it done.

Shoving the Queer

AS CHAMPIONS of the metal-mining industry, the editors of *Engineering and Mining Journal* are in the habit of securing, when possible, a few gold pieces from their respective banks, and putting them into circulation Of course, they get right back to the banks and stay there, because the merchant hastens to bank them for fear that they may not be legal tender. However, some of our missionaries complain that they are regarded with more or less suspicion, first by the bankers and more especially by the merchants whom they pay in gold. The majority of the latter—or their clerks—say they have never seen a gold piece before, and hesitate to accept it.

New York has been defined as a place where a thousand people live on an acre of land which they never have seen. It is also a place where a thousand people do business on a few ounces of gold which they have never seen. But if the acre of land, or the few ounces of gold, should be withdrawn—what a cataclysm!

French Pronunciation of Bauxite

ALTHOUGH some time ago we closed the discussion as to the pronunciation of the word bauxite, the following communication is too important not to be added to the discussion:

Quebec, Nov. 17, 1920.

Monsieur le directeur:

Avec tous le égards dus à M. McDonald, je me permets de ne pas partager son opinion au sujet de la prononciation française de "bauxite." Je crois pouvoir l'assurer qu'en français l' "x" est toujours dur (ks.). Donc, nous avons toujours prononcé, prononçons maintenant, et prononcerons toujours "bokseet" et n[illegible] "bozeet." THEO C. DENIS,
Service des Mines de la Province de Quebec.

Mr. Theo C. Denis, of the Quebec Mining Bureau, the writer of the above communication, informs us in it that the word is pronounced in French "bokseet," and not "bozeet."

In this connection, we may quote from a private letter recently received from a specialist on bauxite. He states that he has visited every working bauxite mine in the country, and that in all his field travels he has never heard the "French" pronunciation of the word. He continues "so that you can count me with those who pronounce the word 'boxite.'"

According to Mr. Denis, the difference between the Anglicized pronunciation and the proper French pronunciation is less than we have believed.

WHAT OTHERS THINK

The Forked Stick and Structural Geology

I have read with interest the occasional articles in which the divining rod as an indicator of water, mineral, or anything else has been held up to ridicule. The article in one of the late issues in which some Australians took a punch at it has shown that the matter is still open to discussion.

A few facts on the divining rod from personal investigation might be of interest to engineers. At the age of fourteen, with an extremely skeptical mind upon all subjects either material or spiritual, with a supreme contempt for anything savoring of the supernatural or magical, and a desire to smash all such things, I challenged a well smeller "to show me," and he did.

The forked stick worked better for me than it did for him. There was no question that it worked, and the psychological element was totally lacking. I had a desire that it would not work, it would not work in places where I wanted it to do so, and in fact my state of mind had nothing to do with it.

After I had satisfied myself of this beyond peradventure of a doubt I set to work to make a map of the indications obtained on about twenty acres covering the crest and side of a hill. I have the original of this map showing the lines and indications of supposed watercourses as indicated by the forked stick. At that time I had only an elementary knowledge of geology and little or none of the structure of the area covered.

There was one well on the property, and its watercourse could be traced easily on the surface. Some years later I had to clean this well out. I then found that it was located on a slip or minor fault, the strike of which was identical with the bearing as traced on the surface. Later, a second well was dug on another of the indications, water was obtained, and another slip of identical bearing with surface indications was found. A third well was drilled on another, and in this instance a clear case of fault was encountered. Two other wells were put down, and these checked up the forked stick.

Upon my return after graduation from a technical school, I found this old plan, and set to work to ascertain the exact geological conditions of the area mapped. The result was that the forked stick had correctly located ten slips in the Cambrian shale and one large fault between the shale and the overlying limestone. This is a fact that can be verified.

That the psychological element had nothing to do with it and that lack of slips meant no indications or negative evidence are proved by the fact that it was particularly desirable to obtain water at a certain place. I wanted to find it there, but the stick would not turn. The nearest point was four hundred feet away. An old quarry at the point I wanted to obtain the indication, when cleaned out at the time I made the geological examination, showed no signs of slip or fault whatever.

It has been ten years since I have tried the forked stick. In that case I worked out the geology first and then tried the forked stick and checked it in a search for water in Arizona. Water was obtained, but it was too alkaline to be of any use. I do not know if I could do it now, but it can be done.

This is no claim for the forked stick as an indicator of ore, but the statement of an indisputable fact that it did indicate structural geological conditions in rocks which were fully verified by independent study of the rocks themselves.

All of which goes to show that there are many things in heaven and earth that engineers never dreamed of or hypothesized about, and there is more fact and less guess with the forked stick than in many of the theories concerning the genesis of orebodies. J. H. EBY.

Spokane, Wash.

Botany Applied to Mining

I have read with much interest an article in *Engineering and Mining Journal* of Oct. 30, entitled "Desert Prospecting," by Leroy A. Palmer. His reference to the occurrence of gold invariably associated with a certain yellow flower reminds me of those divining-rod stories (or shall we call this a "Golden Rod" story?) which you have been printing recently.

However, I do not doubt Mr. Palmer's assertions in the slightest, except that I beg to differ with him in his theory that hematite in the rock is in any way responsible for the growth of the plant. I do not claim to be a botanist, but I do remember being taught once that plants required for their sustenance potassium, phosphorus, and nitrogen. All other elements are of secondary importance, but certain ones, particularly iron, have the property of rendering characteristic colors to fruits and flowers. All who have visited beautiful Grass Valley and Nevada City, Cal., in the late summer, have noticed the brilliant coloring of the normally yellow Bartlett pears which grow so abundantly in that locality. This has been attributed to the high percentage of iron in the decomposed granodiorite soil.

In my wanderings over the hills in search of dip and strike, I have often been impressed with the peculiar relationship between plant life and certain rocks. In an area comprised largely of hard limestone and quartzite it is often comparatively easy to trace the outcrop of a dike of basic or subsilicic rock by the heavy growth of vegetation overlying it.

This affinity of vegetation for certain types of rock may be due to one or several causes. The basic rocks usually weather and disintegrate more rapidly than the sedimentaries. The result is a deeper soil, which not only offers more favorable opportunity for root growth, but acts as a reservoir for water, the supply of which is being continually added to by drainage from surrounding areas into depressions on the surface where the outcrops have weathered.

Of still greater importance, however, is the fact that nearly all igneous rocks contain orthoclase, leucite or some other potash-bearing mineral, and apatite, the commonest of the phosphates. It is therefore reasonable to expect a more luxuriant growth on rocks containing such high plant food value than on the leaner quartzites and limestones.

If any of your readers are botanists as well as geologists it would be interesting to hear of their experience with flowers as divining rods. Anyway, if it comes to

a showdown, I'll bet on the little yellow flower against the "whip handle with a spring in it" any day.

Salt Lake City, Utah. F. M. WICHMAN.

An Advocate of Bimetallism

I have read with much interest the comment of the *Engineering and Mining Journal* on the "McFadden Gold Bonus Bill," together with Mr. McFadden's arguments on other pages of your paper. I thoroughly appreciate your remarks regarding an "elementary knowledge of economics" as being "a dangerous thing," and for that reason wish to state before going further that I do not wish to open a discussion as an authority on the subject. However, the onlooker can often see things that those in the midst of a fight do not observe. Being accustomed to looking on all subjects with an analytical mind, and from both sides, I am taking the liberty of asking you a few direct questions regarding your stand, as well as Mr. McFadden's, on his gold bonus bill, as you state that mining men should uphold only such measures as would promote the national welfare.

Now, first, don't you think that our national welfare depends on international welfare? Yes, I know you do, when you say, "We can hardly expect a return to stable prosperity until Europe again becomes a buyer as largely as of old." Every word of the paragraph in which the above sentence is copied is true and an excellent argument for increased metallic money (page 891 of the *Engineering and Mining Journal*), but I contend that future gold production is limited. I further believe that even if the gold miners get a bonus, the increased production due to that fact would not materially help the situation of world financing. I believe that Mr. McFadden's argument giving as an example the increased production of gold on England's part, which he attributes to gold producers receiving the benefit of an exchange premium, is not based on facts altogether. Of course, the premium exchange would attract some attention to gold mining, however, and the financiers of England are wise enough to know that gold is one of their nation's biggest assets. With it they can buy silver at a much lower rate and use it as a medium of exchange in the East to much better advantage.

Mr. McFadden ends his argument by saying: "Are we going to continue to ignore the problem of gold production in the United States, thus permitting the British Empire to gain an unquestioned supremacy?" Natural resources alone determine this, and although a premium will help some, it will also disturb the only standard that we have today; and in the long run do more harm than good. I would like to ask how much longer the mining men and bankers of America are going to sit blindly by and let England control our silver market? The United States today is paying $1 per ounce for silver England buys for about 80c. and when she trades it in India it is difficult to determine just what profit she makes, but every one has an idea.

This brings to the front the old so-called worn-out story of bimetallism, Bryan's hobby of a generation ago. Bryan's other two hobbies, prohibition and suffrage, never died. The only thing that killed bimetallism was that it could not be used permanently and successfully by any one or two nations. International bimetallism is the foremost issue before the world today Why? Because, first, the gold supply is insufficient, and to increase the value of gold is like playing with fire. Second, silver is recognized the world over as the next best metal for monetary purposes so far as its value and physical and chemical characteristics are concerned. Third, it is geographically more widely distributed by nature, and the mining of it in turn aids a larger number of people, and does not, as with gold, tend to favor a few. Fourth, through the findings of the international commission working recently in Brussels (see *Literary Digest* of Oct. 16, 1920, pages 20-21), we learn that steps and plans are under way for solving financial and monetary problems, indicating clearly the pressing need to increase the world's medium of exchange.

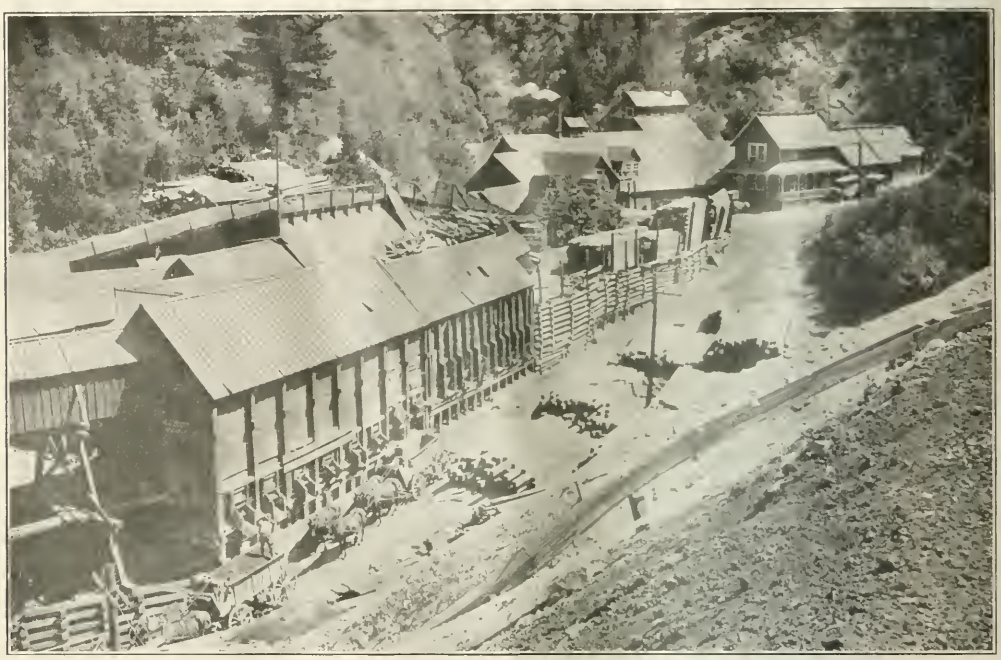
We read that the national debt of the ten leading nations of the world for 1920 totals $210,000,000,000, more or less. In 1918 the gold and silver stocks, including those of practically all the nations of the world, were approximately $8,000,000,000 in gold and $1,500,000,000 in silver. Assume that in 1920 these figures increased to $10,000,000,000, then the entire stocks of gold and silver of the world would only be about one-twentieth of the national debt of the ten leading nations, to say nothing of the debts of the nations aside from these ten. The payment of a premium for gold and the taxes on gold used for other purposes than money will probably increase the gold stocks to some extent. However, it seems apparent that this has its limit, and an insufficient one, even if carried out by all nations, as suggested by Mr. McFadden.

An international agreement to use silver at a definite ratio to gold, weight of pure metal for weight of pure metal, using a 900 fine alloy in every case, would eliminate at one stroke the trouble of international exchange, as, no matter what money of any nation one had in his possession, all that would be necessary would be throw it on the scales, figure 90 per cent of its content for the pure metal, and make the change accordingly. Of course the use of bulky and weighty silver coins has its handicaps, but this could be offset by the different nations issuing gold and silver certificates which would certify that the national vaults held the amount of silver specified, and these would in turn become international currency.

Mr. McFadden figures that the $80,000,000 in gold withdrawn from a possible coinage for industrial purposes meant a contraction in the credit structure of $1,600,000,000. It would be well to limit by international law this expansion to some definite ratio, as one financier has so thoughtlessly exposed the depravity of some of the banking institutions' credit expansions. Now let him figure how much of the approximately 13,000,000,000 ounces of silver which statistics show the world has produced could be turned back to coinage and what expansion this would mean in the credit structure, and the many advantages it would have over meddling with the gold standard or the favoring of one class.

Of course it would be hard for England to see the advantages of it. From a selfish "Rule or Ruin" point of view she would be against it. However, in the long run, by increase of trade with the Far East, she would carry on a safer and surer business, as well as with the whole world in general. Thus it comes to the point whether or not the different nations are going to work out a co-operative scheme of dealing with one another, to the benefit of mankind as a whole, or whether the old competitive system is going to be patched up in some way so that a few will reap the benefits of the toil of the many. HUGO W. MILLER.

Nogales, Ariz.



SURFACE PLANT OF THE JUDGE MINING & SMELTING CO. IN EMPIRE CANYON

The Judge Electrolytic Zinc Plant

Main Features of the Process as Now Conducted—Concentrates Averaging About 38 Per Cent Zinc Roasted and Leached—Electrolyte Purified by Zinc Dust and Zinc Plated On Aluminum Sheets—Purified in Small Reverberatory

By George C. Heikes
Written for *Engineering and Mining Journal*

TO SEPARATE the zinc from the other metals contained in the concentrating ores from the mines of the Judge Mining & Smelting Co., Park City, Utah, has been found a difficult problem. These ores contain from 4 to 12 per cent of lead, 4 to 15 oz. of silver, 6 to 15 per cent of zinc, and from 4 to 10 per cent of iron. The oil flotation process has been tried recently on a small scale, but has not proved successful. At present,[1] gravity methods of wet concentration are used, the zinc concentrates, consisting of jig and table products, being roasted and leached, and the zinc recovered electrolytically. Gravity concentration separates the zinc blende from the galena, but does not separate the zinc blende from the chalcopyrite and pyrite, the differences in specific gravity being too slight. The lead concentrates are shipped to the Salt Lake smelters; so it is with the zinc product that this article will be concerned. A separate electrolytic zinc plant has been erected by the Judge company near the mines and mill, to which the zinc concentrates are hauled in wagons.

The zinc concentrates contain about 38 per cent of zinc, 3 to 5 per cent of lead, 9 to 10 oz. of silver, 30 per cent of sulphur, 8 per cent of iron, 0.2 per cent of manganese, and small quantities of antimony, copper, cadmium, and arsenic. The different sizes are kept in separate bins, as the jig product is too coarse for efficient roasting without crushing. The table concentrate is hoisted to the top of the roaster by a skip-hoist, which dumps it into a feed hopper. The flow is regulated by extensions on the rabble arms of the drying hearth pushing the desired amount of concentrate from the spout of the hopper onto the hearth. The jig product is carried from the bin by a belt conveyor to a cylindrical drier, and thence to a Hardinge ball mill, where it is ground fine enough to roast. It is hoisted to a bin above the roaster by a bucket elevator and fed onto the drying hearth of the roaster by a belt conveyor.

The roasting is done in a 25-ft. seven-hearth Wedge roaster, which is heated by two coal-fired combustion chambers situated at opposite sides of the roaster and entering the sixth hearth. The heats of the hearths average 700 deg. C. The rabble arms of the hottest hearths are cooled with water, whereas the remaining arms are cooled with air supplied from a motor-driven fan. The seventh hearth is used to partly cool the calcine before it flows by gravity to a Baker cooler. From

[1]The plant was temporarily closed down last month, owing to the present low price of zinc being below cost of production.

THE JUDGE MILL IN EMPIRE CANYON

the cooler it is hoisted to a 400-ton storage bin by means of a bucket elevator, and from there in a skip-hoist to small charging bins built over Pachuca tanks.

There are three Pachuca tanks, made of 3-in. redwood, 10 ft. in diameter and 22 ft. high, each holding thirty-five tons of solution. The tanks are filled with acid electrolyte and enough 60 deg. sulphuric acid to bring up the acid content to the right amount. Calcine is added until the acidity is about 1.5 gm. per liter. Pulverized lime rock is then used to neutralize any excess acid. Enough iron sulphate, from two small tanks where scrap iron is agitated with sulphuric acid, is added to bring the iron content in the solution up to 0.3 gm. per liter. Manganese dioxide is sometimes added in sufficient quantities to oxidize the ferrous iron to ferric iron. Calcium hydrate coagulates the solution and precipitates such impurities as antimony and arsenic. An agitation cycle generally requires about three hours to complete.

A centrifugal sand pump transfers the neutral pulp to a drag classifier. The sand from the classifier is washed with water and run by gravity to a smaller drag classifier that drops it into a storage bin for shipment to the smelter. The overflow from the large classifier goes to a 30-ft. Dorr thickener. When the thickener overflow becomes clear it is pumped into one of three purifying Pachuca tanks. The spigot product of the Dorr thickener is piped to an air lift, where it is raised and run into the hopper of an 11.5 x 6-ft. Oliver filter. The vacuum on the filter averages seventeen inches and the wash water nine gallons per minute. The filtrate is pumped back to the large Dorr thickener, which is used as a storage tank for the purifying Pachucas.

The Oliver filter cake falls by gravity into a rectangular-shaped mixing trough, where it is mixed with an acid wash water to wash out the soluble zinc. The pulp is pushed along by paddles which are fastened to a rotating shaft running lengthways over the middle of the trough. The overflow from the mixer is pumped to a small Dorr thickener 20 ft. in diameter. By the time the washed cake has reached the overflow of the mixer it is neutral or preferably contains a small amount of acid. The overflow from the small Dorr thickener is pumped to the leaching Pachuca tanks.

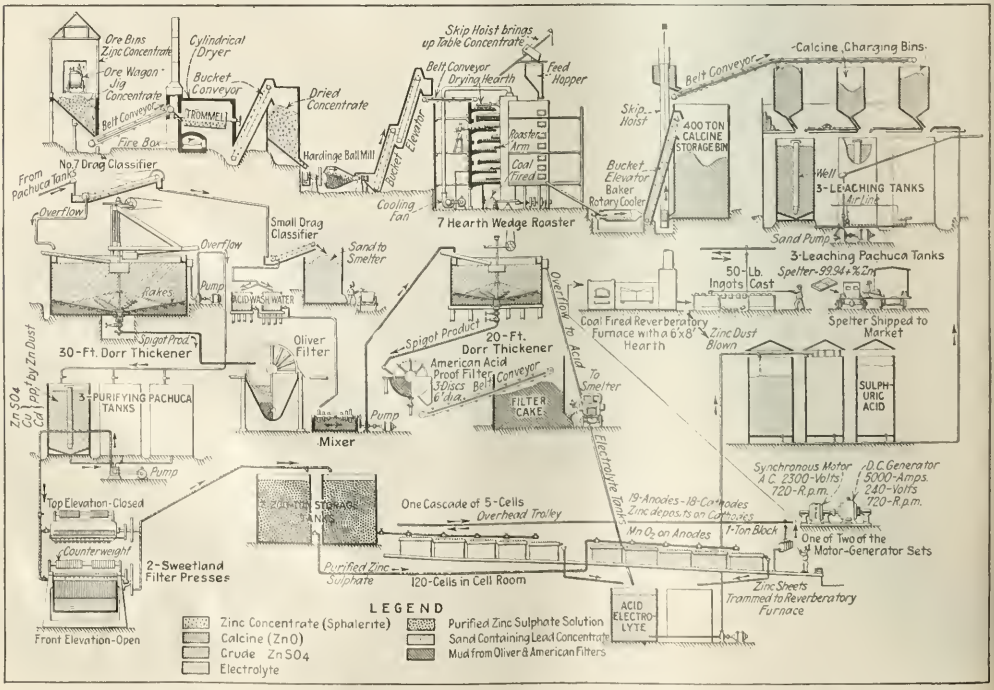
The spigot product flows to an acid-proof American filter, which was especially designed for this plant. It has three disks 6 ft. in diameter and a filter surface of 140 sq.ft. A good cake results when the pulp contains at least a trace of acid. The American filter cake drops onto a belt conveyor, which delivers it to a storage bin. The sand from the drag classifiers and the American filter cake are shipped to the lead smelters and contain 20 oz. of silver per ton, 10 to 20 per cent of zinc, and 8 per cent of lead. Trouble in filtering has resulted from zinc hydrate, calcium sulphate, and ferrous hydrate clogging the pores of the filter bags. This is partly remedied by using stronger acid in leaching to do away with the zinc hydrate, and by employing high air pressure on the filter bags to clean out the other insolubles.

Purification is carried on in the three purifying Pachuca tanks by agitating zinc dust with the solution. The quantity of zinc dust required depends upon the amount of impurities present in the solution, which are determined by analysis. On the average, 70 lb. of zinc dust is used for every twenty-five tons of solution. The zinc dust is made at the zinc plant by allowing a fine

LOADING ZINC CONCENTRATES IN 7½-TON LOADS

stream of molten zinc metal to pass in front of a nozzle from which compressed air with at least 100 lb. pressure per square inch is being blown. The dust is collected in a tank-like, galvanized iron receptacle, sacked, and carried to the purifying department. The purifying cycle of each tank containing 25 tons is 45 minutes. It takes 40 minutes to pump the purified solution through two Sweetland filter presses. Each press has 36 leaves 3 ft. in diameter. The presses are opened, and cleaned every other day by water from a high-pressure line. The filtrate is nearly pure zinc sulphate and is pumped into two 200-ton storage tanks situated at the head of the cell room. The Sweetland filter cake is carried out and dumped into a field near the plant, where it is being stored for future refining, as it contains 30 to 50 per cent of zinc, 4 to 7 per cent of copper, and 3 to 6 per cent of cadmium. Effort is made to hold the solution in the cell room at 60 gm. per liter of zinc, and not over 0.002 gm. per liter of any other impurity. Any solution from the various filters or tanks that overflows runs into a sump in the filter room, where it is saved and pumped to the large Dorr thickener. The floor of the filter room is washed with solution, either purified or unpurified, in order that all the solution and pulp may be saved.

SLIME CAKE RESIDUES BEING LOADED FOR SHIPMENT



DESCRIPTIVE FLOW SHEET OF THE ELECTROLYTIC ZINC PLANT OF THE JUDGE MINING & SMELTING CO., PARK CITY, UTAH

The cell room is divided into two sections of sixty cells each. The cells are made of 2-in. redwood, 4.5 ft. deep, 3 ft. wide, and 7 ft. long, and are arranged in cascade. Each cascade consists of five cells, which differ three inches in elevation. The overflow from each cell flows over a chemical sheet-lead chute which extends two inches past the end of the following cell and delivers its flow one inch above the solution, which is kept two inches below the top of the cell. At the inlet end of each cell is a cooling coil made of 45 ft. of 1-in. chemical sheet-lead pipe and coiled into five 4-ft. loops. The coils are cooled by water, which is pumped through an outdoor spraying system to reduce its temperature.

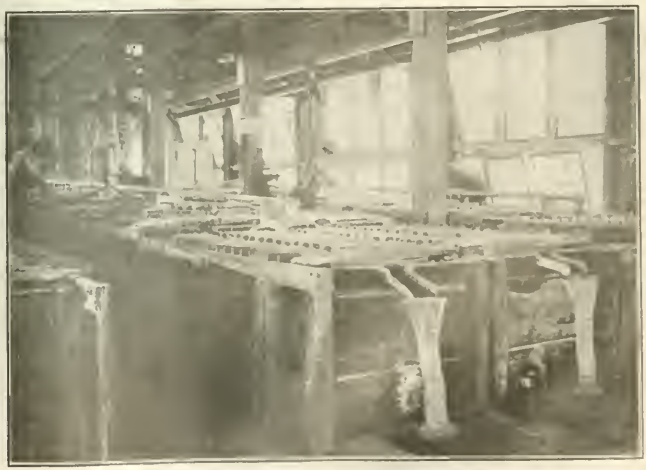
CUTTING OUT CONDUCTOR BARS FROM SPENT ANODES

The zinc-sulphate solution is delivered to the head of each cascade by iron pipes, and the amount of flow regulated by gate valves. Provision is made for fresh solution to be run into each separate cell. The overflow from the last cell in each cascade is delivered to one of two acid electrolyte storage tanks situated outside the cell room, from which it is pumped to the acid storage tanks for use in the leaching process. Twenty grams of zinc per liter are left in the cell tailing solution. The manganese dioxide already mentioned as being used to precipitate the ferric iron becomes manganese sulphate in leaching and remains in solution with the zinc sulphate. The manganese deposits on the anodes in the form of manganese dioxide. The anodes are taken from the cells when the deposit becomes too thick for efficient use and scraped with small triangular steel scrapers. The residue scraped from the anodes, together with the manganese dioxide which has precipitated at the bottom of the cell, is collected in a bin outside of the cell room, where it is sacked and taken to the leach room to be used again.

Each cell has nineteen anodes and eighteen cathodes, which are kept two inches apart center to center. The anodes are cast at the zinc plant, of chemical lead ¼ in. thick, 21 in. wide, and 34 in. long. They are cast over a 1-in. square rolled steel bar 41-in. long and a piece of tinned No. 00 copper wire which runs along the top of the supporting bar and through the bar close to the busbar end, where it is riveted to make a good contact. The iron bar is used for its supporting strength and the copper for its conductivity. The copper is tinned to prevent the zinc sulphate solution from creeping between the wire and the lead.

The cathodes are made of sheet aluminum ⅛ in. thick, 23.5 in. wide, and 37 in. long, and are supported by two copper bars ⅜ in. thick, 1.5 in. wide, and 44 in. long, which are riveted together with the aluminum sheet between. Two hook-shaped sheet-steel lugs are riveted between the copper bars at the edges of the aluminum sheet. These serve as a means to pull the cathode from the cell. Each square foot of the cathode area in the cell has a current density of twenty amperes. The cathodes are removed every twenty-four hours and average 210 lb. to the cell. The strippers pull six cathodes from the cell at one time by means of a one-ton chain block hooked to a frame which fits under the hook-shaped lugs and tightens up under them when the frame is raised. The "pull" of six cathodes, as it is called, is carried to a stationery steel stripping frame at the lower end of the cell room by means of the block running on an overhead steel trolley. The cathodes are held in the stripping frame while the stripper inserts a sharp chisel between the zinc and the aluminum cathode and peels off a sheet of zinc about ⅜ in. thick. These sheets are piled near the stripper and then trammed to the furnace room. Wooden strips which stick tightly to the edges of the cathode are used to stop irregular deposits and make the zinc easier to handle.

Because the amount of current carried by the cell busbars decreases with the increase in the number of anodes and increases with the number of cathodes, it is possible to save copper by tapering the busbars, and this has been done. The busbars are 1.25 in. thick, 4 in. wide, and taper to ½ in. wide in the length of the cell. The busbars holding the electrodes are on the outside of the cell, the anode bar being on the inside



THE TANK ROOM IN THE ZINC PLANT

STRIPPING CATHODES IN THE ELECTROLYTIC ZINC PLANT

RABBLING THE DROSS IN A ZINC FURNACE

and one-half inch lower than the busbar for the cathodes. The busbars are insulated from each other and from the cell by means of heavy plate glass one inch thick. The opposite ends of the supporting bars of the electrodes rest on wooden strips insulated from the cell by pieces of ¾-in. plate glass. At present, experiments are being made using the heavy forty-eight-hour sheet-zinc deposit as a cathode. It is planned to then melt the whole cathode. The sheet is held between two heavy pieces of copper wire and clamped. The wires are riveted to the same style of supporting bar now in use for cathodes. The main difficulty at this time is the breaking of the sheet zinc when the deposit becomes heavy; so this cathode is still an experiment.

The zinc sheets are trammed to the "melt" room, where they are weighed and thrown into a small coal-fired reverberatory furnace with a 6 x 8-ft. hearth. The temperature is kept between 600 and 750 deg. C. Every twenty-four hours dross is pulled. Ammonium chloride is added to the dross, the furnace doors are opened, and the dross is carefully raked into perforated wheelbarrows. More ammonium chloride is added and mixed with each wheelbarrow load while the dross is hoed back and forth in the wheelbarrow to push the metal through the holes. The remaining dross is weighed, screened, and hoisted into a storage bin by a bucket elevator. The metal which was pushed upon the floor is gathered together and thrown back into the furnace. When the bath is sufficiently hot, a small door at the back of the furnace is opened; this is just large enough to admit a ladle which will hold 150 lb. of zinc. The ladle is suspended by a steel rod from an overhead steel trolley, and the molten zinc poured into cast-iron molds. The average weight of the finished ingots is 50 lb. The zinc, analyzing 99.93+ per cent, with very small amounts of cadmium, copper, iron, and lead, is weighed and shipped.

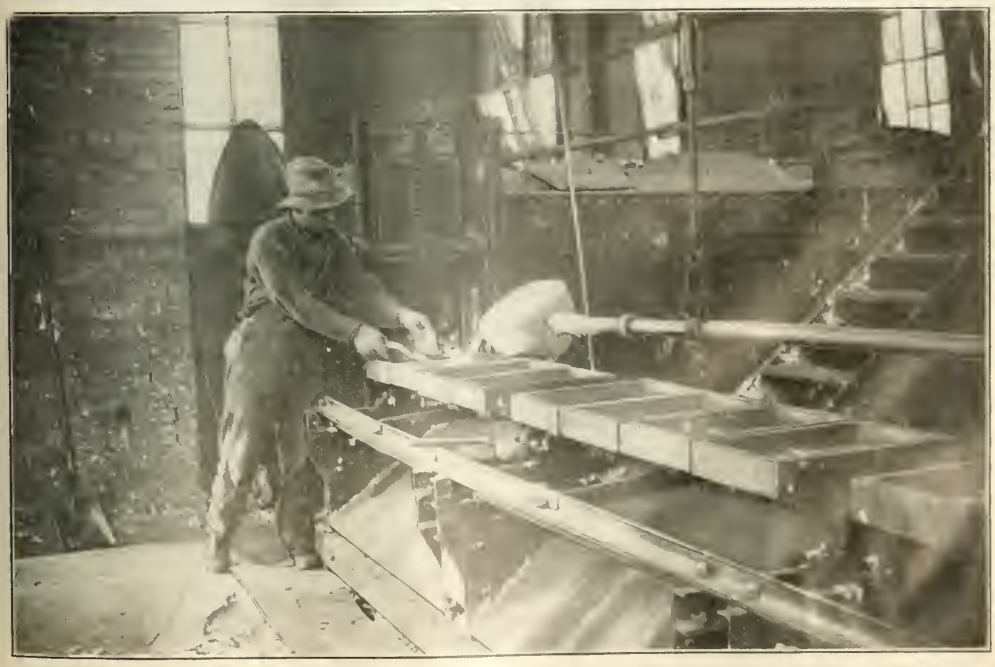
At present the plant is producing between seven and nine tons of zinc a day. The plant was originally planned for fifteen-ton daily capacity, but the roaster and the filters have not reached that tonnage.

Two motor-generator sets are so arranged that either set may run on either side of sixty cells in the cell room.

WORKING DROSS IN PERFORATED WHEELBARROWS

The cells are connected in series and the electrodes in parallel. Ten pounds of zinc is produced for every horsepower of electricity used and five tons of zinc for every ton of coal consumed.

My best thanks are due to G. W. Lambourne for permission to publish these notes and also to John T. Ellsworth for helping me obtain the data.



POURING ZINC INTO MOLDS AND SKIMMING

FLOTATION MILL OF ENGELS COPPER CO., ENGLEMINE, CAL.

Miners' Dormitories at the Engels Mine*

By E. G. Gardner
Mining Engineer, U. S. Bureau of Mines Rescue Car No. 1
Written for *Engineering and Mining Journal*

THE Engels and Superior mines of the Engels Copper Mining Co. are situated in the mountains of Plumas County, Cal., at an elevation of 5,200 and 3,800 ft., respectively, above sea level. The Superior mine is at the end of the Indian Valley R.R., and the Engels about three miles up a canyon. The mill and general offices are at the lower mine.

The mining company officials are Elmer E. Paxton, general manager, Mills Building, San Francisco, Cal.; Robert A. Kinzie, supervising engineer, First National Bank Building, San Francisco, Cal.; W. R. Lindsay, superintendent, Engelmine, Cal.; J. J. Barrett, foreman, Engels mine, Engelmine, Cal.; W. E. Kyle, foreman, Superior mine, Engelmine, Cal., and W. I. Nelson, mill foreman, Engelmine, Cal.

The company is mining and milling about 450 tons from the Engels mine and 250 tons of ore from the Superior mine per day. One hundred and seventy men are employed in the Engels and 60 in the Superior mine. Including all on the payroll, about 200 men are employed at each camp.

At the upper camp there are twenty dwelling houses, six lodging houses containing a total of sixty rooms, a new dormitory, a boarding house, a hospital, a store, a club, and the foreman's residence, besides the mine buildings. The family houses contain three and five rooms and rent for $6 and $10 respectively. Water is piped to each house, but no bathtubs are yet installed and the latrines are outside the buildings. Formerly the mine had bunk houses, but the present management, believing that better living quarters, with personal privacy, increase a man's self-respect and also attract a better class of workers, subdivided the bunk houses into rooms and installed on each floor a lavatory, with the necessary sanitary accommodations and shower baths. The sewage drains into a septic tank. The rooms in the bunk houses are 8 x 12 ft. in size, where occupied by one man, and 10 x 12 or 12 x 14 ft. where occupied by two. The company furnishes beds and mattresses, and the men supply their own bedding and take care of their own rooms. A janitor employed by the company takes general care of the buildings. The men are not charged rent. The management has also recently built the new thirty-three room dormitory, which is modern in every respect. The floor plans are simple and elevations free from architectural complication. The rooms are 12 x 14 ft. in size, are occupied by two men each, and are furnished with two single beds, tables, and chairs. The company furnishes bedding, linen, and janitor service, and makes a charge of 15c. per day per man. This building and all the lodging houses are steam heated. The buildings are kept free from vermin by treating the rooms with live steam, monthly.

After the dormitory was completed, for a time the miners seemed to prefer the old quarters, but now it is filled to capacity, and there is a waiting list of applicants.

*Published by permission of the Director, U. S. Bureau of Mines.

At the lower camp there are fifty-two five-room and eight three-room company houses, which are rented to the miners with families at $6 and $10, respectively, per month. At this camp the old bunk houses have also been remodeled and subdivided into rooms 8 x 16 and 12 x 14 ft. in size, which are occupied by two men. These rooms are furnished in a manner similar to those in the lodging houses at the upper camp, and no charge is made for them. Plans have been drawn for a dormitory like the one at the upper camp, and all the buildings are being improved and painted.

Photo by Bureau of Mines

STREET OF COMPANY HOUSES IN LOWER CAMP, ENGLEMINE, CAL.

Board is furnished to 160 men in the lower camp at $1 a day and to 135 men in the upper camp at the same rate. As it costs the company about $1.60 a day to board a man, the company loses 60c. a day on each man's board.

The company maintains a store at each camp to supply the needs of the miners. No profit is desired by the company from this establishment, but the goods are marked to pay interest on the capital furnished. Men are not required to buy at the stores, and no discrimination is made against those who buy from mail-order houses.

Photo by Bureau of Mines

THE MEN'S CLUBHOUSE AT THE LOWER CAMP

About 35 per cent of the miners are Americans, 30 per cent Italian and Spanish, 30 per cent Mexicans, and 5 per cent other nationalities.

At each camp the company maintains a clubhouse, containing a reading room with papers and magazines, card and pool tables, barber shop, and soft-drink stand. No club dues are charged, and the rooms are open to all. The Plumas County Circulating Library has a branch at the camps. Moving-picture shows and dances are given weekly. Mr. Baker, the manager of the store, is also in charge of the clubs. The boarding houses are run by a steward.

The company owns all of the town site and there are no private buildings in the camps.

The men at the upper camp work from 7:30 a.m. to 12 noon and from 1 p.m. to 4:30 p.m. on day shift, and from 6:15 p.m. to 11 p.m. and 11:45 p.m. to 3 a.m. on night shift. They come to the surface for a hot dinner or supper on their own time on each shift. Until recently the men carried a cold lunch in buckets on night shift, but the company offered to put a night shift in the boarding house if the men would come out to supper on their own time. This was agreeable to the men, and the change was made.

Wages at Engelmine camp (August, 1920) are $4.50 for shovelers and $5 for miners. This compares favorably with the scale at the Nevada camps with which the mine competes for men. A miner at Tonopah, for instance, will pay $60 per month for accommodations which are furnished at Engelmine for $30, and this lower rate of living costs offsets the difference of $1 per day in wages.

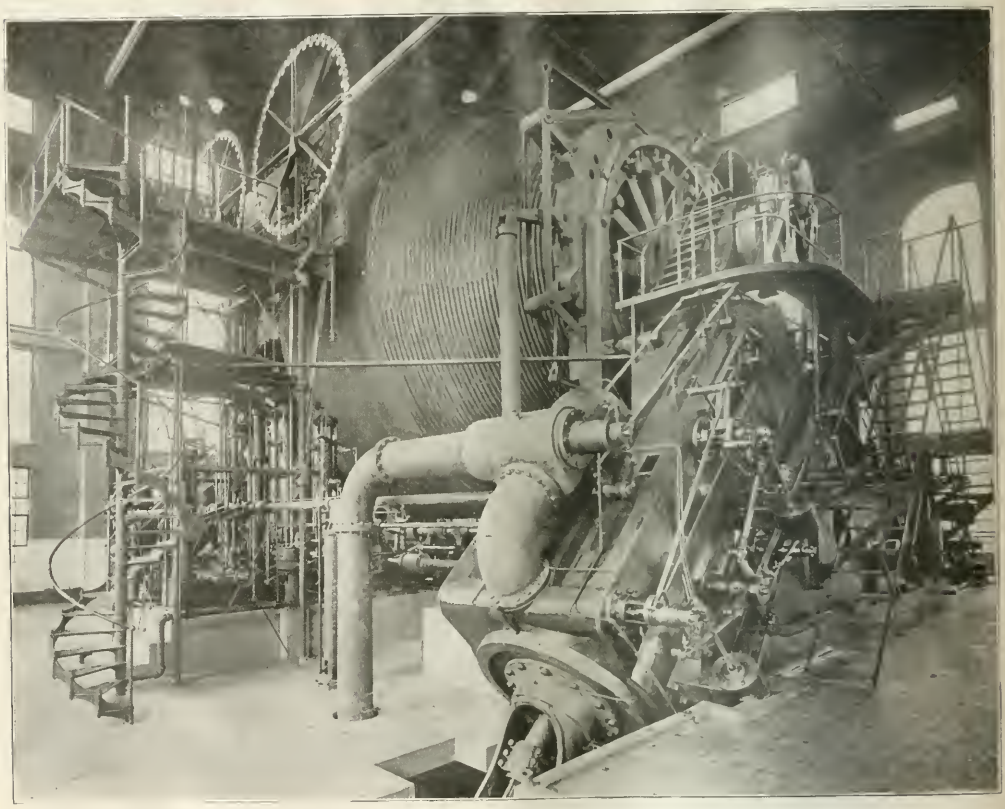
HEADFRAME AT SUPERIOR MINE OF ENGELS COPPER CO.

The efficiency of the men at the Engels mines is estimated at about 80 per cent by pre-war standards, which is very high. The labor turnover is comparatively small for these times. The mine has a full crew of laborers and shovelers, but is short of miners. The employment agents at Sacramento and San Francisco have a standing order for miners, who are shipped in at company expense. However, the labor shortage is not as serious as has been reported in most Nevada or Arizona camps.

Though the company's books show a loss on board, and it furnishes living quarters free or at a very reasonable cost, the lower living cost attracts men to the camp at a correspondingly lower wage than is offered in other camps, and when the cost of living comes down to a level more nearly normal, the loss in the boarding houses will decrease.

I believe that this camp is a good example of how consideration for the welfare of the men by the mine management is reflected in a lower cost of mining the ore, as well as more general satisfaction in operating conditions.

The Quincy Hoist



COMPOUND, CONDENSING STEAM-DRIVEN HOIST—A NOTABLE ACHIEVEMENT IN MECHANICAL ENGINEERING

AT THE Quincy company's No. 2 shaft at Hancock, Mich., the largest steam-driven hoist as yet constructed has just been completed. The hoist operates in balance and is designed to raise a load of ten tons of rock at a rope speed of 3,200 ft. per minute. The drum is of the cylindro-conical type, with a maximum diameter of 30 ft., minimum diameter 16 ft., and a rope capacity of 10,000 ft. of 1⅛-in. rope, sufficient to attain a vertical depth in the incline shaft of 6,600 ft. By winding the rope down on the opposite cone the rope capacity reaches 13,300 ft., equivalent to a vertical depth of 8,600 ft. The drum is carried by two main bearings 28 in. in diameter by 54 in. long, upon triangular-shaped castings, which, in turn, rest upon the concrete foundation and also support the four engine frames and cylinders.

A cross-compound steam engine, with two high-pressure and two low-pressure cylinders on each side respectively, is attached to the cranks of the drum. Each engine is set at 45 deg. to the vertical, and both engines on a side are attached to a common crank pin 15 x 15½ in. in diameter. High-pressure cylinders are 32 in. in diameter, low-pressure 60 in., and stroke is 66 in. The low-pressure pistons are supported by crosshead and tail guides. High-pressure piston rods are 6 in. and low-pressure 10 in. in diameter. Crosshead pins are 8 x 12 in. Between each high-pressure and low-pressure cylinder a reheating receiver is placed, the pressure within which is under the control of the operator.

The condensing equipment is designed to handle 1,460 lb. of steam per trip of 10,000 ft. The low-pressure cylinders exhaust into a steam drum 8 ft. in diameter and 17 ft. long, from which the exhaust steam passes to the air pumps.

The hoisting drum weighs 516,000 lb., exclusive of the shaft. It is constructed in forty-eight sections, which are bolted together. Inner trussing prevents any deflection. Light impulses per revolution together with the great mass of the hoist eliminate all pulsations in the rope. Post brakes of an improved type, 16 ft. in diameter, are attached to each end of the drum. Each pair of brake shoes is operated by an oil cylinder which receives its oil from a loaded accumulator. The oil cylinders are controlled by special poppet valves, one controlling the lift and the other the drop of the piston, and so arranged that both valves cannot be opened at the same time. Throttle and reverse mechanism are handled in the same way.

All of the mechanism is operated by a floating lever gear and is under the control of the operator. By means of an improved safety stop the throttle can be automatically closed as the skip approaches the landing. Overwinding applies the brakes automatically, and the control is so arranged as to prevent starting the hoist in the wrong direction. A speed governor controlling the cut-off cams of the valve gear prevents overspeeding.

The total weight of the hoist with condensing equipment is 1,765,000 lb.; floor space covered is 60 x 54 ft., and vertical height from foundation to top of drum is 60 ft. The weight of 10,000 ft. of 1⅛-in. rope is 41,500 lb.; weight of skip, 10,000 lb.; time required for one trip of 10,000 ft., 4 min. 8 sec.

The Nordberg Manufacturing Co., of Milwaukee, Wis., designed and manufactured the hoist.

The Administration of the McFadden Bill

A Discussion of the Tax-Collection Problems in the Proposed Gold Bonus Act, the Possibility of Distributing Larger Premiums Than Taxes, and the Provisions Made for Export And Import Trade in Gold Used in the Arts

By S. L. Willis
Written for *Engineering and Mining Journal*

DOMESTIC gold producers occupy a unique position as the only producers of a raw material who have not realized an increased price for their product as a result of the advance in the cost for labor and materials incident to the war. This fact, coupled with the exhaustion of many high-grade mines and rich placer deposits, has caused an alarming decrease in production, which, if permitted to continue, will undoubtedly result—and that in the near future—in an output so small that the arts will be obliged to import metal to supplement that obtained from domestic sources. The effect upon the domestic gold-mining industry will be disastrous, because many large, low-grade producers, with an assured long life under pre-war conditions, are even now facing the alternative of shutting down or continuing to operate at a loss. If the former course is pursued, cave-ins and water will terminate the careers of some of the nation's largest mines.

Foreign producers, situated in countries having a depreciated currency, are in a better position, because labor and materials are paid for in depreciated currency, and the product is sold at par. The resulting premium amounts to from 15 to 20 per cent in Canada, and even more in other countries.

Domestic gold producers assert that domestic manufacturers using gold in their product have been subsidized, in that the raw material has remained at a fixed price, permitting them to realize an increased profit on the finished product. Someone has certainly profited, but, leaving profiteering out of the discussion, the consumer has benefited rather than the manufacturer. Jewelers, gold beaters, and other consumers of gold have been subject to heavy exploitation on the part of their labor, this fact justifying larger price increases than were necessary in many industries. Wages in the gold-beating trade, for example, have increased from $15 to $44 per week, and advances in other trades have been in proportion.

It may be claimed by producing interests that the tax provisions of the McFadden Bill do not concern them directly, but as each objection creates opposition to the whole bill, a careful analysis of the tax provision is absolutely necessary if arguments of the consumers are to be met with any degree of success.

Features of the McFadden Bill

House Bill 13201, submitted by Mr. McFadden, aims to provide financial help for the gold-producing industry, by means of an excise tax levied upon all gold consumed in the arts and on all gold contained in imported articles of foreign manufacture. In an amendment, submitted at a later date, all gold contained in articles exported is exempted from payment of the tax. The premium and tax are equal, although figured on different units of weight; the tax being fixed at 50c. per pennyweight and the premium at $10 per oz.

The bill provides explicit rules and conditions governing payment of the premium, but is vague regarding administration of tax provisions, that matter being left to the Treasury Department in general and the Collector of Internal Revenue in particular. It does provide, however, that materials, or packages containing them, shall be suitably stamped on payment of the tax, and all articles manufactured, but not in the hands of the ultimate consumer at that time, shall be so stamped before further sale.

Discussion of the McFadden Bill may be conveniently divided under seven heads:

First. Is the bill practical?

Second. Comparison between the probable tax receipts and premium requirements, as indicated by past production and consumption statistics.

Third. The best time for imposing the tax; whether at the mint on withdrawal, after the last manufacturing process, or when sold to the ultimate consumer.

Fourth. Treatment to be accorded old jewelry and worn-out material containing gold.

Fifth. Treatment to be accorded scrap metal produced during the manufacturing process.

Sixth. Tax administration upon manufactured material in the hands of wholesalers and retailers, and imported materials containing gold.

Seventh. Procedure for safeguarding our export trade by refund of the tax on materials exported.

It is well to state at this point that the writer owes allegiance to neither the gold producers nor to the industrial consumers, except that, as a mining engineer, he regrets that the proud record of the United States as a producer of gold is in danger of becoming a memory. The following remarks are based upon facts, and refer to the bill as framed, and not to the principle involved:

First. Is the Bill Practical?

France places an excise tax upon all gold consumed in the arts. No mention is made of gold contained in imports, and, so far as can be learned, that factor is covered by the normal tax upon imports. The French tax is for revenue purposes and amounts to a luxury tax, figured on a specific instead of an ad valorem basis. There is, therefore, no reason for assuming that legislation of this character cannot be enforced if properly drawn up.

Second. Tax vs. Premium

Statistics for the domestic production of gold and its consumption in the arts, as combined in the following table, clearly demonstrate the fact that the bill in its present form will inevitably result in a steady and considerable drain upon the Treasury. In 1918, although the total apparent consumption of gold in the arts amounted to 76.3 per cent of the domestic production of new metal, 28.4 per cent, or more than a third of this, was old metal, largely manufacturers' scrap returned for refining. The value of this material must be deducted

from the apparent consumption when figuring the net amount of new gold used. The net consumption of new gold in the arts was therefore probably little more than 50 per cent of the domestic production of new metal. Assuming the bill to have been in force, the Treasury would have been drawn on to the extent of nearly eighteen million dollars in 1918, and this in a year when production was decreasing rapidly, and consumption was at a high peak, due to high wages throughout the country.

The figures for 1919 will probably be more favorable,

RATIO BETWEEN DOMESTIC GOLD PRODUCTION AND THAT USED IN THE ARTS (a)

Year	Domestic Production	Consumption New Metal	Per Cent Production	Consumption Old Metal	Per Cent Production	Consumption Total	Per Cent Production	Probable Tax Def (b)
1880	$36,000,000	$8,811,047	24 5	$1,294,385	3 6	$10,105,432	28 1	$14,100,000
1885	31,801,000	9,653,650	30 4	2,171,092	6 8	11,824,742	37 2	11,050,000
1890	32,845,000	13,025,462	39 7	4,630,498	14 1	17,655,960	53 8	9,500,000
1895	46,610,000	10,954,419	23.5	4,474,666	9 6	15,429,085	33.1	17,800,000
1900	79,171,000	17,061,553	21.6	5,086,589	6 4	22,148,142	28 0	31,100,000
1905	88,180,700	25,475,192	28 9	7,733,423	8 8	33,208,615	37 7	31,350,000
1910	96,269,100	34,160,874	35 5	7,626,278	7 9	41,787,152	43 4	31,050,000
1915	101,035,700	29,599,507	29 3	8,220,520	8 1	37,820,027	37 4	35,700,000
1918	68,646,700	32,892,395	47 9	19,517,345	28 4	52,409,740	76 3	17,850,000
1919	58,488,800	.....	....	.....	....	.....	...	.....

(a) Official figures from report of U. S. Mint, 1918.

(b) Assuming value of gold $20 per oz., then deficit = $\frac{\text{domestic production} - \text{domestic consumption new metal}}{2}$

but when consideration is taken of the fact that any bonus would result in an immediate expansion of production, and that price increases on top of an already sluggish luxury market would result in decreased consumption, it will readily be seen that the 1918 ratio is probably representative of actual results.

The natural remedy lies in a decreased premium or increased tax, or both, and with Congress in its present economical mood, one course or the other must be resorted to if the bill is to receive serious consideration.

Third. Methods of Imposing the Tax Proper

The old milling axiom regarding recovery of the values at the earliest possible point in the manufacturing process is as true when applied to tax collection as it is when applied to ore concentration. Consumers, however, strenuously object on the ground that collection at the mint imposes a serious financial burden upon all the manufacturers involved.

The most important consumers of gold are jewelers, gold beaters, and dental supply and pottery manufacturers. Gold beaters and the manufacturers of solid gold jewelry know exactly how much gold is contained in every unit of product, because the gold value is a considerable part of the total cost. They make little or no waste in the process, and the tax could be collected with equal facility at any point, except that the cost of collection from retailers would be greater than it would be if collection were made at the mint.

Pottery and plated jewelry manufacturers, and gold-leaf consumers, buy the gold they use in the form of liquid gold, decalcomanias, gold-plated sheets and wire, and gold leaf, and figure their costs in terms of these products, rather than in terms of the actual gold content. In fact, it is extremely doubtful whether the average consumer of this class has even a general idea of his gold consumption. The situation is further complicated by the scrap metal produced in the manufacturing process. This must be exempt from tax (if the collection is made at the mint), or a rebate allowed when the material is returned for re-smelting.

The very small amount of gold present in the manufactured articles renders collection by the retailer difficult and expensive, and the large amount of scrap produced in intermediate manufacturing plants discourages collection at these points. Collection when the metal is withdrawn from the mint can be easily and economically inforced, provided that rebates are allowed on returned manufacturers' scrap. Payment could safely be made to the manufacturer, because the tax would have been figured into his metal cost.

Dental-supply manufacturers produce pure gold products, such as gold dust, wire and foil, and gold teeth. They are able to consume all scrap produced, but the practicing dentist produces a certain amount of scrap which must be allowed for by rebate or other means when it is returned to the trade. Conditions in this case are not radically different from those obtaining in the jewelry industry, and collection of the tax at the mint is probably the most satisfactory method.

Fourth. Status of Worn-Out Material Containing Gold

Old jewelry and other materials containing gold re-enter the trade in considerable quantities through the medium of pawnbrokers and other dealers in scrap stock. This material is not entitled to rebate of the tax, and all such receipts must be kept separate from manufacturers' scrap. This requirement imposes some hardship upon refiners, because it will be necessary to hold old metal in stock until sufficient is collected for a separate furnace run.

Fifth. Treatment of Manufacturers' Scrap

The text of the bill provides that the tax be paid on "weight of fine gold contained in all gold manufactured, used, or sold for other than monetary purposes." This phraseology permits of three interpretations of the tax provision, but if the tax is to bear equally upon all consumers, it must be levied on the gold content of the material as sold to the ultimate consumer. Any other interpretation would result in a marked advantage to large manufacturers who are equipped to re-treat all scrap produced in process. The small producer, forced to buy gold at $30.67 per oz., and to sell his scrap at $20.67 per oz., would be driven out of business. If, therefore, the tax is collected prior to the manufacturing process in which scrap is produced, a rebate must be allowed covering all gold returned in this way to the trade. If, as is often the case, the scrap is sold to the original producer, payment may be made by crediting the shipper, and the material will be reissued without a second passage through the mint. When the scrap is sold to an outside refiner, on the other hand, cash payment will be made, equivalent to the monetary value plus the tax, and less the treatment charge. The refined bullion may be resold to the arts, in which case no additional tax should be collected by the Government; but if it is sold to the mint, a rebate equivalent to the tax is due the refiner to recompense him for his payment to the manufacturer.

SIXTH. TAX COLLECTION ON MANUFACTURED STOCK AND IMPORTS

Gold plays a widely varying part in the value of the products in which it is used. Enumeration of the articles affected reads like a list of the products of the United States, and includes jewelry, chinaware, picture frames, gold teeth, chemical apparatus, textiles, books, and other articles in common use.

No difficulty will be experienced in collecting the tax by weight upon bulk gold leaf, and manufacturers' stocks of liquid gold, dental gold, and plated wire and sheet, because the gold content is a considerable part of the value and accurate records are kept of the consumption per unit of product.

When gold leaf is the only decoration used, a fair idea of the quantity of gold on an article may be obtained by figuring the area covered. This method is feasible, but would require a large amount of work, and as the weight of gold used per article is generally very small, the returns would hardly justify the expense involved.

The same reasoning applies to the collection of the tax upon chinaware. Some expensive ware contains an appreciable amount of gold, it is true, but the amount of metal used in plain gold-band decoration is infinitesimal, and cannot be ascertained with accuracy, if at all.

Jewelry falls into three classes: solid gold, gold-platinum, and plated ware. The amount of gold in domestic solid gold and gold-platinum products can be determined in most cases by consulting the manufacturer, because he keeps such information as a matter of cost accounting. Plated ware contains only a very small amount of gold, and as the manufacturers have at best only a vague idea of the actual gold content under present conditions, all hopes of determining the taxable value are lost if the pattern has become obsolete.

The same difficulties are encountered when taxing gold imports. The foreign jewelry manufacturers operate small shops; in fact, a large part of the production is made in the homes of the workers. The operators buy semi-finished materials and figure costs in these units. An added difficulty is presented by the fact that a large part of the manufacturing process, as practiced abroad, is hand work, and for this reason the gold content variation will be more than is found in machine-made goods.

It seems advisable, therefore, to change the tax on jewelry stocks and imports from a specific to an approximately equivalent ad valorem rate. The rates could be fixed by a careful determination of the gold content of a large number of articles in each class. This system would obviate dispute and eliminate the necessity of an enormous amount of labor and expense.

SEVENTH. PROCEDURE FOR SAFEGUARDING THE EXPORT TRADE

The jewelry industry is the only domestic consumer of gold vitally affected by the export provisions of the bill. Determination of the gold content of solid goods would require little extra expense on the part of the manufacturer, but plated-ware manufacturers would be forced to maintain carefully divided establishments, so that the net consumption of gold in exports can be figured to the satisfaction of the collector. This course is expensive, due to extra clerk hire and warehouse charges, and would seriously handicap the domestic industry in competition with foreign manufacturers.

In conclusion, it may be said that the gold-mining industry needs and deserves financial help to combat the increased costs of labor and materials, and legislation of the type proposed is proved to be practical by foreign precedent. The McFadden Bill, as framed, however, will result in larger premiums than taxes collected. It proposes difficult conditions for tax collection, especially as regards finished stocks of manufactured articles and imports of those materials, and does not provide adequately for scrap material returned to the trade for manufacture. These tax provisions have created a powerful opposition from consumers of gold, which would be largely dissipated were the McFadden Bill revised to fit actual industrial conditions. The net result might be a smaller premium to the producer, but the chances of the bill becoming law would be greatly improved.

Recoveries of Metals by a Cottrell Treater

According to tests recorded by A. B. Young in a recent paper presented to the A. I. M. E., the metal recoveries at the Tooele plant of the International Smelting Co. on the flue gases from the McDougall roasting furnaces by a Cottrell treater were: Copper, 98.2; lead, 81.2; silver, 96.5, and gold, 96.4 per cent. The total metal recovery amounted to 93.97 per cent. The velocity of gases through the treater (actual conditions of temperature and pressure) was 21.45 ft. per sec., and the volume under the same conditions was 146,004 cu.ft. per min. The temperature at the outlet averaged 260 deg. F. (127 deg. C.) and at the inlet 280 deg. F. (138 deg. C.).

Analyses of the precipitated dust in the successive hoppers of the flue showed an interesting relation. Copper, gold, silver, insoluble iron, and lime were in greatest percentage in the first two hoppers at the intake and diminished to a marked extent toward the outlet. Lead progressively increased in percentage and was highest at next to the last hopper. The power input to the treater could not be accurately stated, but for volumes from 125,000 to 150,000 cu.ft. per min. the average power approximated 8.4 kv-a. for the first electrical section and 5.5 kv-a. for the second.

The first section accounted for about 85 per cent and the second for 15 per cent of the dust. Sphere-gap peak voltages ranged from 30,000 to 35,000. Each section contains two 10-ft. banks of plates of an effective length of 20 ft. The treater consists of a flue 10 ft. high, 12 ft. wide and 61 ft. long. Four banks of No. 20 corrugated iron plates, placed vertically and running longitudinally, give an effective treater length of 40 ft. Spacing between rows of plates is 9½ in., giving sixteen rows of plates to a bank. Midway between the rows is a vertical row of ¾-in. pipes running longitudinally. The vertical spacing between them is 6 in. The plates are grounded and the pipes are connected to the feed wires.

America's Share of the World's Gold

Of a total accumulation through the ages of $8,000,000,000 in monetary gold, the United States is estimated to hold $2,500,000,000, or 30 per cent of the world's supply. Gold holdings were increased greatly during the war because of the heavy shipments of gold made by other nations to the United States in payment for commodities.

Mining Engineers of Note

A. E. Bendelari

BY P. R. COLDREN
Written for *Engineering and Mining Journal*

WHEN the late O. S. Picher, president of the Picher Lead Co., decided that his company, long exclusively engaged in lead smelting, ought to enter the mining branch of the industry, he appreciated the importance of selecting the best man available to become manager of mines. After careful consideration he employed A. E. Bendelari, of Joplin. The venture turned out to be a bigger undertaking than even Mr. Picher had imagined. The flat prairie land north of Commerce, Okla., where Mr. Bendelari started sinking five shafts on March 11, 1915, quickly became a modern mining camp of 10,000 persons. Mr. Bendelari, by virtue of his position with the Picher company, encouraged and guided this phenomenal development, being at all times at the very center of its activities. His task was mining development primarily, of course. The Picher company entered the mining game in no halfway manner. Within three years it had eight concentrating plants in operation in the new field, and today it is handling over a million tons of rock annually; and at all times its leasing and sub-leasing activities have extended over the entire section. But besides the executive ability required, it was also demanded of Mr. Bendelari that he assume the responsibility that naturally falls to the guiding spirit of a new and rapidly growing municipality, such as Picher. Mr. Bendelari measured up to this responsibility in a manner highly satisfactory not only to the far-seeing and broad-visioned man who had employed him, but also to the people of the community.

A. E. BENDELARI

The Picher Lead Co. was consolidated with the Eagle Lead Co., of Cincinnati, in 1916, Mr. Picher becoming president of the new company, and the change meant only increased responsibilities for Mr. Bendelari. He continued as manager of mines in the Tri-state field, and in recent years has been supervising the company's zinc smelter at Henryetta, Okla., and the gas fields operated by his company near there. His record and ability were officially endorsed in February, 1920, when he was elected a vice-president of the Eagle-Picher company.

Mr. Bendelari has been engaged in the mining business since leaving college. He was born at Toronto, Ont., Nov. 23, 1879, and attended Upper Canada College there. He came to Joplin in 1900, and has been engaged in operating lead and zinc mines in this field ever since. Immediately before accepting a post with the Picher Lead Co. he was with the Underwriters' Land Co., and it was while employed by the latter company that he operated the Yellow Dog mine, at Webb City, one of the best-paying properties opened in that camp. Like many successful men, Mr. Bendelari ascribes his achievements to his ability to surround himself with capable and loyal men. Some of his assistants have worked with him for more than ten years; six men now in the employ of his company have been his associates for sixteen years, and the Rev. Wesley Post, who is known from one end of the district to the other, has been with him for eighteen years. Mr. Post, who is pastor of a Picher church, where he preaches every Sunday, has charge of all the Eagle-Picher sludge mills. Oddly enough, Mr. Bendelari has two other ministers on his payroll, the Rev. Fred De Mier, who is in charge of the company's flotation plants, and the Rev. Frank Bray, who is ore weigher at the company's plants and is also Boy Scout Master for the Picher field. Each of these ministers has a church in Picher, and Mr. Bendelari thinks he is the only mine manager in the country employing three regular clergymen.

Mr. Bendelari is a member of the A. I. M. E. His development as a mining man has progressed parallel with the growth of the company that employed him, and he has shown his eminent fitness for the position he holds. He is quiet and unassuming in manner, but there is never any question as to his authority. There is nothing of the old-fashioned, blustery "boss" about him. Bendelari's success has come through his ability to keep close to his men to have things go as he wants them to go without seeming arbitrary or dictorial. He is loved by his men, and his influence is steadily increasing in the Tri-state mining field.

BY THE WAY

Forty Redskins Bite the Dust

Foreign labor has generally been depended upon for underground work in this country. When scarce, Americans of foreign descent are mustered into service, but we had not heard of any real simon-pure Americans —American Indians—being engaged in such work, until recently. We understand, however, that forty full-blooded Navajo Indians have been employed in the Bullion tunnel workings of the Smuggler-Union Mining Co. at Telluride, Col. The management found labor so scarce that the experiment was decided on, and the redskins were persuaded to leave their homes in New Mexico. We await with interest the outcome, for the American Indian is particularly fond of the open air.

The Etymology of Siskiyou

A writer in the November *Sunset Magazine* relates how the rugged Siskiyou Mountains, the dividing line between Oregon and California, were so named. The story is substantiated by several old pioneer miners of Siskiyou County, Cal. These mountains recall the days when the only evidence of civilization in the Pacific northwest was represented by the old Hudson's Bay Company. It is said that the company had a trading post at the headwaters of the Sacramento River in California, where the stream was so narrow that it was crossed on six huge stepping stones. In the language of the French trapper, it was known as the post of the "six caillaux" (six stones), and the first American settlers quickly transformed the French word into American phonetic spelling as "Siskiyou."

Nature Still Supreme in Making Diamonds

Newspaper reports recently told of a German explosives firm which had secured the rights to a patent for the manufacture of diamonds and would produce several hundred carats daily. Later reports stated that the firm had found the diamonds were not equal to the natural product and had cancelled its contract with the discoverer. Artificial diamonds have been made, but only of microscopic size. However, the ruby, topaz, sapphire, amethyst and emerald, precious stones of the corundum class, are often made by artificial methods. The product is in many cases superior to the natural stone and of equal value in the market. When an imitation has all the qualities of the original it is no longer an imitation but the thing itself. Diamonds have so far been a stumbling block, owing to the difficulty of getting carbon into the liquid state from which the diamonds can crystallize. Even were a process discovered it is likely that its cost would be prohibitive.

Translating Mexican Prices

An easy way to convert Mexican prices per kilo into their American equivalent is given in *The Mexican Review*. Considering the rate of exchange as two pesos in Mexican coin equals one dollar in American coin, we have only to remember the magic number 23. For example: If frijoles are quoted at 35c. per kilo, their value per pound in American money would be 23 per cent of that, or 8.05c.

Wanted: A Shortstop To Mine Copper

Accomplished entertainers and skilled athletes are as welcome in most mining camps as in college fraternities. A dinky brakeman may have more knowledge of baseball than of railroad operation, and be hired for that reason. The following, which we clip from the New York *Sun*, illustrates the point:

"Can you play baseball, handle any musical instrument, or sing?"

This was the first question asked recently of an applicant for a position as a stenographer for a copper concern having mines in South America. The young man had the travel urge and was anxious to see something of the land to the south, but he looked dazed.

"Say, I want a job as a stenographer, not a ball player or a prima donna," he replied.

"Yes, yes, I know all that. But down there in Peru the men are living in a community separated from the rest of civilization by about one hundred miles of railroad track, running up the steepest grades in the world.

"To make good down there, where they have no amusements except the abilities of the men in the group, a man has to be able to do something else besides his job. There are movies, of course, and a club and occasional dances, but baseball and singing are the best forms of relaxation they get. And the superintendent wrote up last week and said he had lost the star shortstop for the upper mine team. He wants a man who can take his place."

"Well, now you put it in that light, I don't mind telling you," the applicant broke in, "that I do nothing else in my spare time but play baseball. That is, when I am not banging on the piano or singing in the glee club I formed in the last office I worked in."

He got the job.

Magnesium From Sea Water

That sea water contains small quantities of gold has been proved, and a large number of people, now sadder but wiser, have thought at various times that it could be profitably extracted. Gold will have to be worth considerably more than at present for this source to be utilized, but there is a possibility of other metals being obtained from sea water, magnesium for example. The new salt works which are now nearly ready for operation at Bergen, in Norway, it is said will produce 100 tons of metallic magnesium per year, the raw material being sea water, which contains about four-tenths of 1 per cent of magnesium chloride. In this country magnesium liquors obtained in the treatment of saline deposits have generally been wasted, as there was little demand for any product which could be made from them. Increased use of the metal in airplane construction, coupled with cheap electric power, no doubt induced the Norwegian company to undertake its manufacture. The company's "ore" reserves should be ample!

Stale News About the Weather

We have read a report of a certain rock in Mexico which changes color with the weather, thereby acting as a barometer for the neighborhood. The trouble with these color barometers is that they tell what we already know. When it is raining they say it will be wet, and when it is dry they indicate fair weather. It has also been our experience that ordinary barometers, as individual instruments, are poor weather forecasters. As the weather begins to look stormy, the barometer begins to go down. It is only when reports from different sections of the country can be compared that the reading is valuable. Even then the Weather Bureau has been known to make mistakes.

CONSULTATION

The Metallurgy of Ferromolybdenum

"Will you kindly tell me how ferromolybdenum and calcium molybdate are manufactured? Is there any literature upon the subject? Also, is there any market at this time for molybdenite concentrates containing 65 to 85 per cent MoS_2, and, if so, can you tell me where that market is, and what use is made of this ore, and about what price is obtained? What is the importance of the industry?"

Ferromolybdenum and calcium molybdate are generally manufactured in an electric furnace. During the early days of manufacture, the ferro-alloy was made from roasted molybdenite in a crucible, but this method has been superseded by reduction in the electric furnace. When the other source of molybdenum, wulfenite or lead molybdate is used, it is fused with soda ash and carbon to produce lead bullion and sodium molybdate slag. The slag is then treated in the electric furnace, carbon and suitable fluxes added, and the charge smelted to produce ferromolybdenum.

The principal methods of reducing molybdenum concentrates have been outlined by Keeney[1] thus:

1. Reducing the ore, concentrates running 60 to 70 per cent MoS_2 (molybdenite, wulfenite), or sodium molybdate slag, with carbon, excess of lime and fluorspar according to the reaction:

$$2MoS_2 + 2CaO + 3C = 2Mo + 2CaS + 2Co + CS_2$$

The reaction works out closely to the theoretical, and there is no difficulty in making a product containing about 0.1 per cent sulphur; the product will contain 1.3 to 3 per cent carbon. The crude metal may be broken up and refined with an oxidizing slag of iron ore, if a lower carbon alloy is desired. The quantity of iron in the ferromolybdenum is varied by the addition of iron turnings in the smelting furnace or iron oxide in the refining furnace.

2. Silicon metal may be used as a reducing agent according to the chemical equation:

$$MoS_2 + Si = Mo + Si + S_2$$

This method has been used in the production of 50 per cent ferromolybdenum, although when this grade of product is made ferrosilicon may be used. The addition of lime helps to slag the sulphur as calcium sulphide.

In using sodium molybdate slag to manufacture the alloy the following equation expresses the reaction:

$$Na_2 + MoO_3 + 3C = Mo + 3CO + Na_2O$$

According to Keeney, the use of sodium molybdate requires considerably more electric power than the other reactions, because very little reduction occurs until all free soda salts which may be in the slag are driven off. The regular grade of sodium molybdate slag used for this purpose contains 30 to 40 per cent MoO_3. The slag from the smelting of wulfenite crushed to about one-half inch pieces is smelted in a single-phase electric furnace of the Siemens type, lined with magnesite. Iron ore may be added to produce an alloy containing 60 to 65 per cent molybdenum.

[1]"Manufacture of Ferro-Alloys," R. M. Keeney, *Transactions* of the American Institute of Mining and Metallurgical Engineers, Vol. LXII, pp. 28-82.

If the ferromolybdenum contains 80 per cent molybdenum and under 1 per cent carbon it cannot be regularly tapped from the electric furnace, because of its high melting point. For this grade of alloy, a furnace of the knock-down variety must be used to facilitate removal of the bullion—slag being tapped out first and the metal dug out. A 50 to 60 per cent low-carbon product can be tapped and a considerable quantity of this grade is made in tapping furnaces.

The largest producer of ferromolybdenum in the United States produces two grades of ferromolybdenum, both containing 50 to 60 per cent metallic molybdenum. The "Regular" grade is guaranteed to contain a maximum of 2 per cent carbon and the "Special" 0.5 per cent. The "Regular" grade is the commoner. The calcium molybdate produced contains about 42 per cent of metallic molybdenum, with no free carbon or sulphur, the remainder being lime.

Ferromolybdenum is usually packed in kegs containing about 400 lb. net, whereas calcium molybdate is packed in sheet-iron drums or sacks.

Ferromolybdenum is added to the steel as a fixed addition. Nearly all of the molybdenum remains in the steel. It has been stated that the addition of ferromolybdenum produces the same effect as the addition of ferrotungsten, with the important distinction that lesser amounts of molybdenum are necessary. A high-speed steel ordinarily containing 18 per cent tungsten may require only 6 to 9 per cent of molybdenum and have the same properties. Proper heat treatment of the alloy-steel is necessary.

The production and sale of molybdenum concentrates has increased tremendously during the last six years, as figures given by the U. S. Geological Survey indicate:

	Quantity Sold, Pounds	Value
1914	1,297	$1,297
1915	181,769	114,866
1916	206,740	205,000
1917	350,200	495,350
1918	861,637	1,253,700
1919	(a)	(a)

(a) Survey not at liberty to publish figures, as there were less than three producers in 1919.

The molybdenum production of the United States is almost entirely confined to the large deposits of the Climax Molybdenum Co. at Climax, Col., near Leadville. The New York market for molybdenum at present is dull, and quotations made are purely nominal. Buyers maintain that 50c. is a reasonable market price for high-grade concentrates, whereas the seller's conception is 60c. per unit.

The literature on the metallurgy of molybdenum is scant. The article by R. M. Keeney, referred to elsewhere, is very informative. Bulletin 111 of the U. S. Bureau of Mines, "Molybdenum, Its Ores and Their Concentration," covers thoroughly the milling of molybdenum minerals, and contains a valuable and selected bibliography. It can be obtained for 30c. from the Superintendent of Documents, Washington, D. C. The U. S. Geological Survey in a pamphlet on molybdenum in 1918 gives a later bibliography upon the subject.

THE PETROLEUM INDUSTRY

The Diamond Drill as an Aid to Oil Prospecting

Methods Similar to Those Used in Determining the Extent and Value of Ore Deposits Offer Possibilities in the Petroleum Field—Considerable Saving Can Be Affected in Reducing the "Dry Hole" Hazard

By Albert H. Fay
Mining Engineer, Washington, D. C.
Written for *Engineering and Mining Journal*

THE diamond drill has been successfully used in prospecting for coal, iron, and copper deposits, and has made it possible to estimate closely the quantity, value, and actual dimensions of ore deposits having no surface outcrop. Therefore, why not use the diamond drill that has proved so successful in metal mining to locate geologic structures capable of containing oil?

The production of oil is rapidly approaching the stage where the best engineering talent must be brought into play. In the matter of recovery of oil from oil-bearing sands this industry lags far behind either coal or metal mining. Principles and methods that have been successful in actual mining must be extended to petroleum mining, so that the ultimate recovery shall be 90 per cent, instead of 15 or 20 per cent, as at present. Production costs per unit must be lowered by increased efficiency. Development costs can be lowered by reducing the number of needless dry "wildcat" wells, and this may be done by utilizing the diamond drill of the iron or copper country.

Lack of Surface Indications Hampers Exploration

The geologist and engineer realize the difficulty of tracing anticlines, domes, or terraces where surface outcrops are few or possibly not in evidence at all, as in the Red Bed country of Oklahoma, where the Red Beds are from a few hundred to 3,000 ft. thick. The oil companies also realize the excessive expense involved in thoroughly drilling a country so destitute of reliable surface indications as is central and western Oklahoma.

In checking up the logs of a few wells drilled in the Red Beds, it is noticeable that at varying depths of 300 to 800 ft. there is usually some one stratum that is sufficiently developed to be used as a horizon marker, at least over a small area, of four or five square miles, and perhaps as much as a township.

As examples of these reasonably reliable formations, may be cited the following: A well at Mulhall, Logan County, Okla., where 28 ft. of limestone was found at a depth of 335 ft.; near Oklahoma City, in Sec. 5-11-2, there is a 4-ft. bed of gypsum at 512 ft. and a 5-ft. bed of gypsum at 585 ft.; at Clinton, in Custer County, 12 ft. of gypsum was found at 102 ft. and 10 ft. at 402 ft.; in Sec. 23-18-4, Payne County, there is a 4-ft. stratum of hard limestone at 714 ft., and 10 ft. of hard limestone at 770 ft.; at Gate, Beaver County, is a gypsiferous limestone at 395 ft. followed by 12 ft. of white limestone; at Enid there is a limestone 2 ft. thick at a depth of 830 ft. Other instances could be cited, but the above data are sufficient.

Logs of Standard and Rotary Drillers Differ

It is not unreasonable to suppose that such distinct strata as are indicated above may cover an area of one to three miles in any direction from the drill hole as a center. However, other holes put down in the same section by a different driller may not show the same formation, by reason of lack of uniformity in the way drillers report their logs. A rotary driller would call gypsum a "soft" rock, whereas a standard driller would likely term it a "hard" or "tough" rock. Gypsum, being soft, cuts readily with the rotary type of drill, whereas with the standard tools progress depends upon the percussive effect of the drill upon the rock. A gypsum bed does not lend itself to shattering when struck, and especially so when confined under pressure, as in its original bedding. The true character of the rock may be established beyond doubt by the use of the diamond drill and a thorough study of the core which it is possible to obtain. There can be no mistake in the identification of rock specimens as obtained from drill cores; they are large enough to contain fossils if any are present and of sufficient size to be determined readily by the naked eye. Should this fail, the high-powered microscope will tell the truth, and the chemical laboratory may be used as a last resort. The diamond drill makes available a complete core from the surface to the bottom of the hole, except possibly where the formation is soft.

How can this be applied to structure study? A standard or rotary drill hole, at an enormous cost, reveals, at a depth of 3,000 ft., one of two things—a dry hole or an oil well. No structure is defined, for the hole represents only one point in a plane and a certain sand or rock at a specified depth. A second well near by may be a little deeper or shallower to show the same information. The two holes may indicate a monocline, or one limb of an anticline. It therefore requires at least another well of about equal depth to possibly show a structure, and the true structure may not be determined unless six or eight wells are drilled.

As pointed out in an excellent paper by George E Burton, of the Oklahoma Geological Survey, the money

spent for a standard or rotary drill hole 3,000 ft. deep is sufficient to put down twelve diamond-drill holes to a depth of 800 ft. This number of holes, judiciously placed, would determine with a reasonable degree of accuracy whether any well-defined structure existed, whereas with the churn drill it would be necessary to put down several additional deep holes to prove the territory good or bad. It will be seen, therefore, that by properly using the diamond drill for determining underground structure, a comparatively large area can be mapped at the cost of one deep test by standard or rotary drills.

Once a structure is outlined the standard or rotary drill would be brought into service and holes drilled according to underground conditions. It is not likely that the diamond drill would be used in drilling production wells, although the manufacturers are confident it is possible to make drills large enough to utilize a 3-in. casing at depths which extend from 3,000 to 5,000 ft.

Drill Holes Identify Stratum

The geologist should not relax his studies based on surface indications, but should assemble every evidence available that would indicate the possibility of a subsurface structure. This possible structure being partly identified, a series of four or five holes at intervals of 500 to 1,000 ft. apart, placed across the supposed structure, would be drilled by diamond drill to a stratum that could be considered as a reliable datum plane. The correct elevation of the horizon marker would be ascertained in each diamond-drill hole, and from these a fairly reliable contour or contours could be drawn and the structure defined. Two elevations would usually indicate an inclined structure, as a monocline or one limb of an anticline or syncline, and three or more would indicate the existence of an arch or dome. The stratum would, by reason of a good core, be identified absolutely, and the true structure indicated. If desired, holes at lesser intervals could be placed to determine still more detail and possibly identify and locate the crest of the structure, when production drilling would be initiated.

Diamond-drill work of this nature is being done in Illinois by some of the large companies, in co-operation with and under the direct supervision of the state geologist. It would seem that much money would be saved by adopting this method of prospecting instead of putting down so many "wildcat" wells where surface indications are unreliable. The Geological Survey of Oklahoma is collecting data on this subject by making a study of diamond-drill operations in exploring coal beds in the eastern part of the state. The Survey believes that such information will soon be of much value to the oil industry.

The sooner the operators realize the value of the diamond drill, just that soon will they reduce the "dry-hole" hazard, and thereby reduce development and production costs.

October Oil Production in U. S. Reaches Top Mark

THE following statistics of the production of petroleum in the United States east of California in October, 1920, and the two preceding months, based on reports filed with the U. S. Geological Survey, show the quantity of oil received from producers by pipe-line and other marketing companies and by refineries that receive petroleum through private pipe lines or in tank cars directly from the wells. Data concerning oil consumed on the leases and producers' storage cannot be obtained in time for use in the monthly reports, but are used in compiling the annual figures showing production. The production reported for California is the average shown by figures collected by the Standard Oil Co. and by the Independent Producers' Agency, and includes all petroleum brought to the surface.

Production of petroleum in the United States during October reached the highest mark yet attained, being nearly 40 million barrels, or 6½ million barrels more than in October, 1919. The daily average production exceeded that of September by more than 22,000 barrels. This increase in domestic production, however, was nearly offset by a decrease in net imports of Mexican oil, even though these exceeded 10½ million barrels. Fortunately, however, there was also a decrease in the daily rate of consumption, which resulted in an appreciable addition to stocks, amounting to more than half a million barrels during October. This net increase was nearly all in domestic stocks, the large losses in stocks of California, North Louisiana and Lima-Indiana grades being more than counterbalanced by increases in stocks of Oklahoma-Kansas and North Texas grades.

The production of Texas during October, amounting

PETROLEUM PRODUCED IN THE UNITED STATES IN AUGUST, SEPTEMBER, AND OCTOBER, 1920

(Barrels of 42 U. S. Gallons)

State	August, 1920 — Total	August, 1920 — Daily Average	(a) September, 1920 — Total	(a) September, 1920 — Daily Average	October, 1920 — Total	October, 1920 — Daily Average
California	8,997,000	290,226	9,128,000	304,267	9,459,000	305,129
Oklahoma	9,371,000	302,291	9,093,000	303,100	9,345,000	301,452
Central and Northern Texas	(b) 6,148,000	198,322	5,743,000	191,433	6,654,000	214,645
Coastal Texas	2,264,000	73,033	2,144,000	71,467	2,615,000	84,355
Kansas	3,721,000	120,032	3,615,000	120,500	3,605,000	116,290
Northern Louisiana	(b) 3,371,000	108,742	2,644,000	88,133	2,508,000	80,903
Coastal Louisiana	144,000	4,645	132,000	4,400	150,000	4,839
Wyoming	1,524,000	49,161	1,573,000	52,433	1,693,000	54,613
Illinois	924,000	29,806	903,000	30,100	870,000	28,064
Kentucky and Tennessee	775,000	25,000	766,000	25,533	760,000	24,516
West Virginia	688,000	22,194	672,000	22,400	673,000	21,710
Pennsylvania	640,000	20,645	626,000	20,867	646,000	20,839
Central and Eastern Ohio	469,000	15,129	453,000	15,100	446,000	14,387
Northwestern Ohio	189,000	6,097	187,000	6,233	182,000	5,871
Indiana	77,000	2,484	86,000	2,867	85,000	2,742
New York	76,000	2,451	78,000	2,600	82,000	2,645
Montana	(c) 9,000	290	37,000	1,233	56,000	1,807
Colorado	10,000	323	9,000	300	9,000	290
Total	39,397,000	1,270,871	37,889,000	1,262,966	39,838,000	1,285,097

(a) Revised. (b) Includes some petroleum drawn from producers' storage, which was produced in previous months, but not heretofore credited to production.
(c) Cat Creek field not included.

to 9,269,000 barrels, a daily average of 299,000 barrels, makes that state a close third in rank as compared with Oklahoma, whose daily average was 301,000 barrels, and California, with 305,000 barrels. Production increased during October in California, Wyoming, Montana, and New York as well as in Texas. Slightly decreased daily average production is reported for the other states.

Method for Determining Water in Petroleum*

The Pittsburgh petroleum laboratory of the Bureau of Mines has recently developed an improved method for the determination of water in petroleum emulsions which has been described in detail in an article entitled "A Convenient Method for the Determination of Water in Petroleum and Other Organic Emulsions," by E. W. Dean and D. D. Stark (*Jour. Ind. and Eng. Chem.*, Vol. 12, May, 1920, p. 486). It is a modification of the familiar procedure of "distillation with an immiscible solvent," the improvement consisting of the use of apparatus that is much more convenient than any previously employed. The method has been extensively employed for determining the water content of heavy fuel oils, but has been applied also to several other types of emulsions, including shale oils, tars derived from coal, greases, and mixtures of powdered coal, oil and water.

The equipment is, with the exception of two items, made of parts that are obtainable from the ordinary stock of chemical supply houses. The two exceptions are, (1) The so-called "distilling tube receiver," and (2) the electric heater. The former is an essential part of the equipment; the latter is a convenient accessory, but it can if necessary be replaced by a gas burner.

Evaporation of Petroleum Stored in Tanks

The results obtained from the many tank experiments, according to A. R. Elliott in the October number of *Reports of Investigations*, U. S. Bureau of Mines, emphasize the fact that evaporation of oil depends on its temperature and the amount of disturbance to which it is subjected. In open tanks much more oil will evaporate on a cool windy day than on a hot still day. A so-called "gas-tight" metal roof is better than one made of timber, because it is a better retainer of the gases that arise from the oil. The atmosphere above the oil in a tank is always saturated with oil vapors and absorbs more vapors only at the rate at which they are escaping through the roof. Therefore, in a tank with a gas-tight roof, as soon as the space above the oil becomes saturated, no more evaporation takes place.

When the sun heats the outside of an unprotected tank the oil and gas inside expand rapidly. In fact, in many of the oil fields the temperature is sufficient to distill the higher fractions from the oil while it is in the tank. This high temperature causes the expansion of the oil and gas and the generation of more gas, which in turn causes a pressure on the roof, resulting in the escape of gases through every accessible hole at a greatly increased rate of speed.

For maintaining a low temperature, the lagged or shedded tank was demonstrated to be the best protection, as it was surrounded by still air that made an excellent insulation. This tank, in consequence, also showed the least amount of loss by evaporation. The other kinds of protected tanks in the order of their low temperatures and decreased rates of evaporation were: (a) The water-sprinkled, white painted tank; (b) the water-sprinkled, black painted tank; (c) the glossy white painted tank; (d) the water-topped tank; (e) the black painted tank; (f) the oil-stained, loose-roofed tank. The rate of evaporation, it was noticed, decreased with the decrease in temperature of the oil under ordinary conditions.

The part of the oil that evaporates is gasoline, which is at the present time the most valuable part of the crude. Such data as were collected show the annual losses in large tankage to range from 5 per cent to as much as 25 per cent.

*Abstract of a paper by E. W. Dean and W. A. Jacobs in Bureau of Mines *Reports of Investigations*.

Recoverable Oil in Byproduct Sands*

A survey of the oil districts of California has been made by the Bureau of Mines, to ascertain whether the visible masses of wasted oil-bearing sands would be a profitable source of supply. From the data collected, it is estimated that 2,359,100 bbl. of oil, valued at more than $3,500,000, could be obtained from the sand piles about producing wells and from the outcroppings in the vicinity of the fields. Also, many times that amount of oil, scattered over nearly the total oil-producing area, might be recovered from seepage. Seepage, in this case, is the oil that is permitted to return into the ground or remain on the surface of oil-saturated ground.

As possible means of recovering a large amount of oil from these wastes, the following should be considered: Recovering oil left in the sand that is produced with the oil; reclaiming the oil that seeps into the ground through waste in production; and mining and treating the material in oil-bearing outcrops and asphalt beds that occur in some parts of the state.

*Abstract of a paper by A. R. Elliott appearing in Bureau of Mines *Reports of Investigations*.

Some Geography Maps Misleading

Geographers have long realized the advantages of making a series of maps of the world on a uniform scale. It is unfortunate for school children that the geographies do not show all countries by maps on a single, uniform scale, for unless a student observes carefully the figures showing the scale of each map or those showing the area of the country mapped, he is likely to get the impression that distant lands, which are generally mapped on a small scale, are smaller than those with which he is most familiar. For example, in maps of Australia most geographies show the country on a small scale—about one-third as large as that used for the map of the United States; yet Australia is in fact nearly as large as the United States—only about one-fortieth (2½ per cent) smaller. China is generally shown smaller in area than the United States, yet it is about one-third larger.

The preparation of maps of the entire world on a uniform scale of one to one million—that is, maps on which one unit (any unit—inch, centimeter, millimeter) represents one million like units on the ground—has been under way for several years, and the U. S. Geological Survey has made considerable progress in its work on the parts of this map that were assigned to the United States. The principle used in preparing these maps, if adopted by the publishers of school books, will make it possible to present to the student an accurate impression of the relative sizes of the countries of the world.

NEWS FROM THE OIL FIELDS

New Field in Texas Attracting Attention

From Our Special Correspondent

North Texas oil production is decreasing, the largest falling off being in the Burkburnett district and in Iowa Park, followed by Desdemona. This decrease is partly offset by an increase in the Eastland-Ranger district and by the new shallow wells in the Kemp-Munger-Allen section of Wichita County. These wells are only 1,500 to 1,600 ft. deep while the older wells produced from a sand at 1,750 ft. The new South Bend field in Young County is also producing, but has no pipe-line connections yet. Recently the No. 3 McClausky well of the Panhandle Oil & Refining Co. and the M. K. Graham well of the Oklahoma Petroleum Co. were completed, both making 800 to 1,000 bbl. per day. The McClausky No. 2 well is making 25,000,000 cu.ft. of gas daily. About 30 rigs are in place, several of them drilling. More than one sand is said to occur in this field between 1,875 and 2,250 ft.

The total production of the Texas Gulf Coast fields has decreased 20,000 bbl. from its peak of a few weeks ago. The major part of this decrease is in the West Columbia field. The big wells there are not only producing less oil but showing some salt water for the first time. The Hogg No. 49 well of the Texas Co. is making about 21,000 bbl., of which 25 per cent is salt water and sediment. All the wells in the Jackson 50-acre tract, or what is known as the north extension of the West Columbia field, are showing more or less salt water. The far east side of the old field continues to look good; there the production is found at about 3,600 ft. Productions from Hull and Goose Creek have also fallen off because no new wells have been brought in recently to offset the normal decrease. In general, development work on the Gulf coast is greatly hindered by wet weather and extremely bad roads.

Rock Creek, Wyo., Field Has 15 Producing Wells

From Our Special Correspondent

Well No. 4 of the Elk Basin-Ohio Oil Co. in the Rock Creek field came in recently making 600 bbl. and increased later to 1,200 bbl. This well is on Sec. 34, on land leased from the state. The field now has fifteen producing wells, four from the top sand, five from the middle, and six from the deepest sand, which is likewise the best producing.

The pipe line to Laramie is now carrying an average of 6,000 bbl. per day.

The Iowa-Wyoming Oil Co., now has a daily output of 1,000 bbl. from the Bolton Creek field south of Casper. Four more wells are being drilled by this company and four additional wells will be spudded in soon.

The Buck Creek well No. 29 in the Lance Creek field, at one time the largest producer in the field, gradually ceased flowing. Examination of the casing showed it to be choked with paraffin, and upon removal of this obstruction it began flowing again. A new joint well is being drilled here by the Buck Creek, the Ohio and the Western States Oil companies.

New producers have been completed recently in the Osage field by the Sinclair Co., Chugwater Oil & Gas Co., and the Arksarben Oil & Gas Co. The completion of the pipe line of the Illinois Pipe Line Co. has solved the transportation problem, and refining companies are now bidding for the field's production.

Mexican Oil Activities

From Our Special Correspondent

Another of Mexico's big producing wells have gone into the discard, Well No. 1 of the Empire Co. on Lot 114, Chinampa. This well has been showing a trace of sediment lately and on Nov. 21 went to 25 per cent salt water. The well was brought into production the later part of July this year and has been producing at the rate of 25,000 bbl. per day ever since that time. On the same day "Deacon" Thompson brought in his third well on Lot 114, Chinampa. This well is within eight hundred feet of the Empire well and will probably last about two months. The pay was struck at about 1,950 ft. When the lime was first encountered the well flowed under heads at irregular intervals, but at the end of four hours it was flowing quite steadily, throwing the oil several feet over the top of the derrick. The well was then shut in and a pipe line connected up to take the production at once. The well is good for a production of about 30,000 bbl. a day.

The Aguila Co.'s well on Lot 245, Amatlan, has been pinched in due to the showing of salt water. This well was good for 30,000 bbl. but is now flowing at the rate of 10,000 bbl. per day.

The Mexican Gulf Co. have the tools jammed in the hole on Lot 146, Amatlan, and it will be necessary to pull all the casing to withdraw the tools. The company was about ready to bring the well in when this accident happened. It will cause a delay of about a month in getting the production from the well, which will be a great handicap, as the Aguila Co. has a hole going down offsetting this well and the Cortez Corporation has a hole down 1,800 ft. on Lot 148 adjoining.

Lee County Leads in Kentucky Production

From Our Special Correspondent

A total of 746,818.61 bbl. of oil was produced in Kentucky during the month of October, according to a report recently issued by the Kentucky Oil Men's Association. This is the first complete report for one month's production that has been made in Kentucky, so no comparative estimate is possible. It is believed, however, that this represents the highest mark in production in the state thus far. Lee County led the list with 440,912.69 bbl.

Beverley & Ramsey struck a flow of gas on the Roberts farm in Johnson County and are nearing the sand with every indication for a big well. The well of J. K. Charles and associates on the Rice farm is in the sand with a good showing.

The well on the Waller lease, Warren County, is flowing at a rate of one and one-half barrels a minute. This lease is located southeast of the Madison lease. The Big Boone Oil Co. reports a good well on the Tarrants lease. The well flowed 400 bbl. the first twenty-four hours. Cramer and associates have drilled in their No. 2 well on the Bud Taylor lease, estimated at 100 bbl.

The Velvet Oil Co.'s No. 2 on the W. T. Bertram lease, Wayne County, came in and is estimated to be a 500-bbl. producer. This is the fifth big well that has been drilled in this territory in the past few weeks.

Heavy Flow Expected in Cat Creek Well

From Our Special Correspondent

West Dome Oil Co. financed by Con F. Kelley, president of the Anaconda Copper Mining Co., has brought in a production in the Cat Creek field of 350 bbl. daily, although the sands have not yet been reached. First reports were that the sands have been encountered, the oil rising to a heigth of 1,000 ft. in the casing. The bottom of the well is heaving heavily under the pressure shown and it is expected that the sands will be reached within 40 ft. Precautions are being taken to receive a heavy oil flow and until these are completed the sands will not be drilled into.

The Frantz Corporation, a subsidiary of the Elk Basin Consolidated, brought in its No. 4 well recently in the Cat Creek field, with an estimated production of more than 1,000 bbl. Some estimates placed its flush output as high as 2,500 bbl.

Ohio Oil Co., a subsidiary of the Standard Oil of Indiana, drilling in the Ragged Point field, southwest of the Cat Creek, has struck a heavy flow of wet gas.

Book Reviews

Political and Commercial Geology and the World's Mineral Resources. Edited by J. E. Spurr. First edition; cloth; 9¼ x 6; pp. 562. New York. McGraw-Hill Book Co., Inc., 1920. Price, $5.

This compilation is the fruit of a systematic, carefully thought out and applied study of the world's chief metal and mineral products, and of the political, industrial, and commercial factors controlling their production and distribution. The respective papers are by specialists in the technical subjects covered. In each chapter, the uses, geological distribution, geographical distribution, political and commercial control, and position of the leading nations are treated with respect to the metal or mineral discussed. During the war, the lack of such information in concrete, available form was keenly realized, and an effort was made under the direction of Mr. Spurr to compile the needed data. A series of confidential papers on the governmental and financial control of the world's mineral resources was published, but the information was not available to the general public. After the conclusion of hostilities, the papers were edited and condensed by Mr. Spurr, and are now published in this compact form.

Anyone who has had occasion, say, to investigate exactly what portion of the world's production of manganese Brazil is responsible for, or what the chief copper-producing interests in the United States are, or how deeply foreign capital is interested in Mexican lead production, has usually been forced to conduct exhaustive and time-consuming search in an effort to obtain such information; for most books, pamphlets, papers, and bulletins upon such subjects have failed singularly to give an all-inclusive and broad view. Usually, the information presented is of a dry statistical nature, and its correlation to the wider aspect of a world survey has ordinarily been disregarded.

The mineral resources of the world are presented in Mr. Spurr's book in logical order. First, a study of petroleum, an extraordinarily important fuel, is followed by coal and iron, "the backbone of all our mechanical achievements." Then come the metals used in steel making—chromium, manganese, and the rarer substances of the ferro-alloys. The major metals (exclusive of iron)—copper, lead, zinc, tin, antimony, and aluminum—follow. Next are presented the non-metallics, abrasives, and refractories — magnesite, corundum, mica, graphite, and others—followed by the important fertilizer group—phosphate, nitrogen, potash, pyrite, and sulphur. Last, but not least, the precious metals—gold, silver, and platinum—are treated; and a final survey, "Who Owns the Earth?" by Mr. Spurr, completes the volume.

The outstanding features of the book are its practicability and usefulness. With a minimum amount of effort at research, the business man or any one else interested in the world's mineral resources can quickly ascertain the principal economic features of any general mineral situation. It is a sound attempt at a practical adaptation of economic geology to commercial and general business uses, and it is unquestionably the only work of its kind extant. It should be upon the reference shelf or table of every man whose business or financial interests or professional needs require condensed and authoritative data on important commercial and financial matters with relation to the subjects treated, the volume being patently designed to serve both the commercial and professional requirements of all interested in the production, marketing, and utilization of commercially important metals and minerals, and in the political and commercial developments incident to the recurrent and recent attempts to direct their exploitation and control.

As with all pioneering, the hewing of a path is difficult, and it is only after the course has been definitely mapped and retrod that its roughness disappears. "Political and Commercial Geology" is essentially an initial attempt in a field untouched collectively by American authors, and for any minor shortcomings that the volume may possess, no apology is properly to be required.

No doubt, some users of the book may feel the need of a bibliography upon each subject, and others a few pages on minor minerals whose treatment is, by design, omitted in this first edition; or the lack of further information on an important subdivision of an article. To them, the brief notation on the title page of the work, "Royalties received from the sale of this book will be assigned to an institution of learning to finance further studies along the lines followed in this volume," should prove enlightening, as it furnishes an earnest that means will be provided for perpetuating the studies suggested by the work.

F. E. W.

Industrial Oil Engineering. By John Rome Battle. Limp binding, 5½ x 7½, pp. 1,131. J. B. Lippincott Co., Philadelphia, Pa. Price, $10 plus postage.

This book is a handbook of industrial oil engineering. It also deals with the practice of lubrication. Like many other handbooks, there is assembled in the volume a considerable amount of useful information related to the field. Of special interest to the mining industry are chapters on air compressors, mine-car lubrication, mine pumps, and air drills. Necessarily concise, treatment of these subjects is not sufficiently thorough to be of use in any more than a general way. It is a book, however, that should be of interest to the master mechanic as well as to the mechanical engineer.

G. J. Y.

Technical Papers

Colloids in Metallurgy—*Chemical Engineering and Mining Review* for October (90 William St., Melbourne, price 11d.) contains the first instalment (three pages) of an article entitled "Metallurgy From the Colloid Chemical Standpoint." Colloids are of more importance in physical chemistry than in metallurgy, but the author points out, among other things, the manner in which a study of this degree of dispersion of matter may help in reducing slag losses.

World's Zinc Trade—The November number of *Commerce Monthly* published by the National Bank of Commerce, New York, contains a six-page article on the "Zinc Trade of the World." America has become the world's chief source of zinc since Germany and Belgium have been practically eliminated.

Ontario Mining—Part III of the twenty-ninth annual report of the Ontario Department of Mines, Toronto, ninety-five pages, is devoted to the Ben Nevis Gold Area, the West Shiningtree Gold Area, the Matachewan Gold Area, the Argonaut Gold Mine and the Gowganda Silver Area. It is obtainable on request. Colored geological maps of the Argonaut Mine and West Shiningtree district are included.

Petroleum Bibliography — Bulletin 180 of the Bureau of Mines (for sale by the Superintendent of Documents, Washington, D. C., for 25c.) is a bibliography of petroleum and allied substances for 1917. The arrangement is similar to that of Bulletins 149 and 165 for the two preceding years, and includes references to published articles and patents throughout the world.

Alaskan Mineral Resources—U. S. Geological Survey Bulletin No. 712, 204 pages, obtainable upon request from the Survey, is a report of the investigations into the mineral resources of Alaska conducted in 1918. The first part of the book discusses the mineral production from the various fields in the years under review. Decreases are generally noted from the figures of preceding years. Other chapters are devoted to water-power investigations in southeastern Alaska; the Copper River nickel deposits; chromite on the Kenai peninsula; the Matanuska coal field; lode developments in the Willow Creek district; placer mining in the Tolovana district, and mining in northwestern Alaska. A few sketch maps are included.

Sewage Disposal—Bulletin No. 6 of the Purdue University Engineering Experiment Station (Lafayette, Ind.) is a thirty-five-page pamphlet discussing sewage disposal for small or isolated dwellings and small institutions. The information has a valuable application in many small mining camps.

ECHOES FROM THE FRATERNITY

Concrete Mixing Studies Summarized

Water Must Be Carefully Chosen and Proportioned — Thorough Mixing and Protection Early Demanded

[Lieut.-Col. H. C. Boyden's address to the Engineers' Club of San Francisco on "Recent Developments in Concrete" held the interest of so many engineers that we here present an all too brief abstract of his report on experiments in mixing concrete.]

The studies indicate that it is best to consider concrete's ingredients as cement, aggregate, and water. There is no particular advantage in dividing the aggregate into "fine" and "coarse," and it would be much better to consider the aggregate as a whole, with proper proportions of various sizes. The fine aggregate should be "hard" rather than sharp, as sharp sands give lower results than rounded or smooth sands. It is of great importance that the aggregate is actually clean, and free from vegetable matter. An appropriate test should be applied to determine this condition. Again fine sand behaves as coarse sand except that it requires more water to produce a plastic workable mixture. The excess of water reduces the strength of the concrete. Concrete with the same quantity of water, providing a plastic mix is obtained, would be of the same strength whatever the grading of the sand.

When studying the characteristics of the coarse aggregate one conclusion has been brought out sharply; namely, that the hardness of the aggregate is a secondary consideration as compared with other factors in developing high crushing strength in concrete, and of less importance than ordinarily supposed in developing wearing qualities.

The reason for high compressive results where a light, soft aggregate is used, is the reduced water content, due to the porosity of the aggregate. The water content is found to be the governing factor.

The remaining ingredient, water, is of equal importance with the cement in obtaining good concrete, and yet it is generally not mentioned in specifications and frequently not even reported in test data. It is safe to say, however, that strongly alkaline waters should not be used and marsh water should be looked upon with suspicion until tested in concrete and found satisfactory.

The temperature of the mixing water was found to have very little to do with the strength of the concrete at seven days to one year. Hot water may be safely used in removing frost from the aggregate.

Proportioning

The present method of using arbitrary volumes is wrong. There is one single proportion which will give the best results with a certain mixture of given fine and coarse aggregate. The water-ratio, the ratio of volume of water to the volume of cement, is the most important element of a concrete mix. If one cubic foot of water (7.5 gal.) is used for each sack of cement, the water ratio is 1:1. The use of more cement in a batch does not produce any beneficial effect except to reduce the water ratio for a workable mix.

Fineness Modulus

The fineness modulus is a very simple function of the sieve analysis of the aggregate used for any particular concrete. The sand and stone are analyzed with a set of Tyler standard sieves, each one of which has a clear opening double the width of the next smaller. The following sizes are used: 100, 48, 28, 14, 8, 4, $\frac{3}{8}$ in., $\frac{3}{4}$ in. and $\frac{1}{2}$ in. The percentages (by volume or by weight) of the total aggregate coarser than each sieve are added together, the sum of these percentages is divided by 100 and the result is the fineness modulus. The fineness modulus of any combination of the fine and coarse aggregates may be found in exactly the same manner.

In order to make this more easily available to the engineers of the country, Prof. D. A. Abrams has worked out a table[1] containing 135 proportions with different combinations of aggregates, which if used with materials acceptable as to quality, will give a concrete with a compressive strength, at twenty-eight days, of approximately 3,000 lb. per square inch. In conformity with present practice, the aggregate is divided in the table into fine and coarse, and covers combinations of five classes of fine aggregates with twenty-seven classes of coarse aggregates. This table shows a considerable reduction in the amount of cement required as compared with previously published tables, especially when combined with the larger sizes of aggregates.

Water Content

A study of the water content has brought the most radical change in the design of concrete mixtures. There is probably no other one factor which has so great an effect upon the strength as the water content. It has been found that the less water used, down to a certain point, the stronger will be the concrete, but in actual construction one may not reduce it to the point giving the maximum strength shown in laboratory tests. The workability of the mix must also be considered, and in general terms the lowest amount of water should be used that will give a workable mix. In a one-bag batch the addition of one pint of water more than is necessary to give a workable mix produces the same loss in strength as if we had left out two or three pounds of cement. On the other hand a very lean mix with a small amount of water will not give as strong a concrete as a rich mix with the same amount of water. This is because it will require a higher water ratio to produce a workable mix with the lean mixture, thereby causing a loss in strength.

The very wet, sloppy mixtures that are being used in building construction are extremely wasteful, 50 to 60 per cent of the possible strength of the concrete being thrown away. By cutting down the water to the proper ratio, a factor of safety of five or six can be secured, and the allowable unit stress raised.

Slump Test

A simple method for determining the proper consistency in the field is the slump test. A frustum of a cone 4 in. at the top, 8 in. at the bottom and 12 in. high has been adopted as a standard. This cone is filled with the concrete to be tested, which is carefully worked with a metal rod while it is being placed, the form is immediately lifted off, and the amount of settling or slump measured. The proper slump for a mixture to be used for a concrete road surface is from $\frac{1}{2}$ to 1 in.; for mass work, from 1 to $1\frac{1}{2}$ in., and for walls with reinforcing bars, $1\frac{1}{2}$ to 2 in. In some classes of reinforced concrete work it may be deemed advisable to sacrifice a portion of the compressive strength of the concrete in order to obtain increased plasticity, in which case a slump of from 4 to 6 in. may be used, but in no case should it exceed 6 in.

Manipulation of Ingredients

It is necessary to mix the concrete at least sixty-five seconds. There is no question as to the advisability of using a batch meter on the mixer, provided one can be found that cannot be tampered with, in order to avoid controversy over the time of mixing and to insure a full minute mix for all ingredients together. The speed of the mixer within limits of 12 to 25 r.p.m. has but slight importance.

The time that can be allowed between the time of mixing and the time of placing has not as yet been made the subject of extensive tests at the laboratory. It is undoubtedly governed to a certain extent by the kind of cement used, by the temperature of the ingredients, and by the temperature of the mixed concrete. The economical haul for the job will be the governing factor rather than the fixing of a time limit.

Protection

The proper protection of concrete during the early hardening period is too often overlooked and frequently indifferently carried out. The essential re-

[1] These tables are issued by Portland Cement Association, 111 West Washington St., Chicago, Ill.

quirements for proper hardening are warmth and the presence of moisture, especially the latter. The tests showed a less increase in wearing resistance and strength after twenty-one days have elapsed, and a constant rate of increase during this period. The forms and all exposed surfaces should be kept thoroughly wet, or at least very moist continuously for not less than fourteen days, and whenever possible for twenty-one days or more.

Barytes Market in England

Harrison Watson, Canadian Trade Commissioner in London, in reply to inquiries from Nova Scotia as to the feasibility of shipping Canadian barytes to Great Britain, states that several firms have expressed a willingness to handle Canadian barytes of a quality suited to the market, if prices are competitive. Before the war the chief source of supply was Germany, and though home manufacturers have since largely increased their output the domestic supply is far below the demand. Imports during 1919 amounted to 408,248 cwts., valued at £241,896, the principal sources of supply being Spain and the United States. The demand is solely for the ground and refined article, and although there are considerable deposits stated to be of high quality in the Maritime provinces and others parts of Canada development and production have so far been small. Were the industry developed competition in the British market at present prices is considered feasible, but with a drop in prices the cost of transportation would make it difficult for Canadian barytes to be laid down in England at a profit to shippers.

Geologic Instruction in Demand at Oklahoma University

The session of 1920-21 at the University of Oklahoma promises to be a banner year for the Department of Geologic Engineering, which reports an enrollment of a thousand students and the addition of three teachers to its faculty. Both laboratory and classroom space has become altogether too cramped for the purposes of good instruction. Additional accommodations will have to be provided in the immediate future if students are not to be inconvenienced. The quality of work is being improved in all courses this year, and new special courses are being offered. Director Joseph B. Umpleby announces, among other important innovations, instruction in special microscopic study of oil-well cuttings. The Roxanna Oil Co. has contributed a large number of cuttings from the Healdton field, and it is hoped to secure material from other fields through other companies. New courses by new instructors are the economic geography of the United States, Oklahoma, and Latin America, by C. J. Bollinger; economic geology and mineralogy, by O. F. Evans; and stratigraphy, by R. A. Wilson.

Eastern Canadian Provinces Desire Control of Natural Resources

The question of transferring to the Provinces of Manitoba, Alberta and Saskatchewan the control of their natural resources, now exercised by the Dominion government, is being brought prominently forward, and unless settled in the meantime will become an issue at the next general election. The Dominion government has expressed its readiness to make the transfer as soon as the terms can be agreed upon by the other provinces. The eastern provinces contend that they have an interest in the matter, having paid for the lands when they were taken over from the Hudson Bay Co., and that the western provinces now receive annual cash subsidies from the Dominion as compensation for the revenue which would otherwise be derived from the public domain. They claim that if the western provinces are granted control of their natural resources the subsidies received by the other provinces should be increased. Several inter-provincial conferences held from time to time have considered the question without coming to an agreement, and it is intimated that another conference will be called, in view of the action of the government of Alberta, which is preparing to press its claims by a law suit.

Mica from South America

The imports of mica from South America prior to the war were practically negligible, according to *The World's Markets*, relatively and as an item of trade exchange, but the war stimulus directed attention to the possibilities of securing regularly a part of the large imports of this special raw material from this new source of supply. The principal countries which are now known to have available deposits of mica of desirable quality and size for import are Brazil and Argentina. In Brazil the deposits, mainly in the contiguous states of Bahia, Goyaz, Minas Geraes, and Sao Paulo, are extensive and are now fairly accessible to railroads for transport to the ports. The quality is good and compares well with the Indian mica. Some of the large plates are 20 x 10 in., and large supplies of material 6 x 6 in. are procurable.

In the interior Province of Goyaz mica is so plentiful that the natives have used it for window panes from time immemorial. The output of the Brazilian mines is steadily increasing. The proportion coming to the United States has always been large and is becoming greater. There is a prospect of a steady and increasing supply of good mica from Brazil if the American buyers will take the trouble to encourage the relation and to seek out the producers, who are not well advised as to market requirements.

The Argentine mica deposits are mostly in the mountain provinces of Cordoba and San Luis. They are not systematically developed, and the shipments so far made have not been of so good a quality as those from Brazil.

Brazil produced from 1902 to 1913 about 113 short tones of mica. In 1916 the production was 59 tons; in 1917 106 tons, and in 1918 and 1919 the output was estimated at 135 tons yearly. The Argentine production began in 1908 and increased to 70 tons in 1917 and to 80 tons in 1918.

Small shipments of mica from Peru were made during the war, and irregular shipments have come from Guatemala for a number of years. The product of the latter country has a green shade and is not so desired for some purposes as other grades in the market.

Institute of Mining & Metallurgy Awards Two Medals

"In recognition of his eminent services in the advancement of metallurgical science, with special reference to the metallurgy of gold," writes C. McDermid, secretary, "the gold medal of the Institute of Mining & Metallurgy, London, England, has been awarded to Sir Thomas Kirke Rose, D.Sc., Assoc. R.S.M., M. Inst. M. M. This is the highest distinction in the power of the council to bestow.

"The gold medal and premium of forty guineas founded by the Consolidated Rand Gold Fields of South Africa, Ltd., the council has awarded to H. Livingstone Sulman for his paper 'A Contribution to the Study of Flotation,' which was published in the Transactions of the Institute, Vol. 29, 1919-20, and discussed in the Bulletin in 1919 and 1920."

Brief Course for Highway Engineers Offered by U. of P.

In anticipation of a greatly increased demand for engineers, as a result of the many millions of dollars now becoming available for highway construction, Towne Scientific School, of the University of Pennsylvania, is offering a "Brief Course in Highway Engineering," for men who have had experience in highway construction, and who desire to become familiar with recent methods in design, construction, and material testing. This course will be given from Jan. 24 to Feb. 11, 1921. The first two weeks of the course will be devoted to intensive instruction in highway engineering, a study of engineering materials, the design and construction of highway structures, and the testing of materials used in road construction. The third week of the course will be devoted to a Highway Engineering Conference, at which papers will be given by eminent specialists on all the phases of the design and construction of roads. A copy of the bulletin describing the course may be secured by addressing Prof. M. S. Ketchum, Department of Civil Engineering, University of Pennsylvania, Philadelphia, Pa. The program of the conference will be ready about Dec. 15.

MEN YOU SHOULD KNOW ABOUT

Representative Marion E. Rhodes of Potosi, Mo., has been selected as chairman of the Committee on Mines and Mining.

H. R. Robbins has been visiting iron-ore dressing plants in Minnesota, Ontario, and Pennsylvania.

J. M. Libbey, manager of the Arizona United Mining Co., has gone to Mexico to examine mining property.

Capt. C. G. Collins has been examining the C. Amory Stevens ferromanganese property at Silver City, N. M.

M. W. von Bernewitz has rejoined **W. H. Weed** in compiling Vol. 15 of "The Mines Handbook," at Tuckahoe, N. Y.

A. R. Gordon, manager of the New York & Honduras-Rosario Mining Co., San Juancito, Honduras, is in New York City.

Col. John C. Greenway, of the Calumet & Arizona, is inspecting recent developments at the 85 Mine, at Lordsburg, N. M.

H. Foster Bain, mining engineer, landed in San Francisco, Cal., on Nov. 27, and was expected to reach Washington, D. C., early in December.

James W. Swent, mining engineer of the State of Coahuila, Mexico, is surveying new claims in the San Dimas district for E. H. Townsend.

Errol MacBoyle, mining engineer, of San Francisco, Cal., went to Mexico early in November. He will examine a number of mining properties.

Robert Linton, president of North Butte Mining Co., who has been in Butte, Mont., looking over the properties of the company, has returned to the East.

Alfredo Frey, mining engineer, formerly of Mapimi, Mexico, has moved with his family to San Juan de Guadelupe. He is operating mines in the Reyes district.

Henry Hinds, petroleum geologist, formerly with the Geological Survey and more recently with the Sinclair Oil Co., is now with the Pantoteck Oil Co. of New York City.

G. F. Loughlin, head of the division of Mineral Resources of the U. S. Geological Survey, has completed a reconnoissance of the recent development in the Tintic district of Utah.

Andrew White Newberry, mining engineer, of New York City, is on a brief visit to his home prior to an early departure for Nicaragua, where he will examine some mining properties.

Enoch Henderson, superintendent of the Franklin Mining Co., has returned to Houghton, Mich., from Detroit, where he was temporarily connected with the Rockwood Silica Sand Co.

Rush T. and Harley A. Sill, mining engineers of Los Angeles, Cal., have gone to Arizona and Mexico to examine several properties. They expect to return to Los Angeles about Jan. 1.

F. W. Sperr, professor of mining engineering, Michigan College of Mines, has been selected as chairman of the recently formed informal organization of Copper Country mining engineers.

Lyman F. Barber, recently of Prescott, Ariz., is now in charge of the construction of the C. O. D. Mining Co.'s new mill at Kingman, Ariz., where he should be addressed, care of P. O. Box 173.

C. B. Holmes, formerly chief auditor for the War Mineral Relief Commission, has formed the firm of C. B. Holmes & Co., consulting mine, mill, and smelter accountants. His office is 434 Continental Trust Building, Washington, D. C.

Bradley Stoughton, of New York City, spent Nov. 28, 29, and 30 in Houghton, Mich., where he addressed a meeting of mining engineers at the Houghton Club. **L. D. Cooper**, of Minneapolis, Minn., accompanied Mr. Stoughton.

A. W. Tucker, consulting mining engineer, of Salisbury, N. C., has completed his work with the Bureau of Mines in connection with the War Minerals Relief claims, and is resuming private practice in matters relative to mineral deposits of the Southern Appalachians.

J. C. Hartness, formerly superintendent for the Bowe-Burke Mining Co., has resigned his position and will open an office in Eveleth, Minn., as a consulting engineer. For the last two years Mr. Hartness has had charge of the Burns, Moriska, and Morrow mines for the Bowe-Burke company.

Arthur Howe Carpenter, formerly of Denver, who was for some years assistant research chemist for the American Vanadium Co., Pittsburgh, Pa., and more recently metallurgist for the Colorado Vanadium Corporation, Sawpit, Col., has accepted a position as professor of metallurgy at the Armour Institute of Technology, Chicago, Ill.

Fritz J. Frank, vice-president of Iron Age Publishing Co., has been elected its president, following William H. Taylor, president and general manager for more than ten years, who is resigning because of ill-health.

William H. Taylor came to *Iron Age* as general manager when it was sold by David Williams. Mr. Taylor already had fifteen years' experience with trade and engineering publications. For a time he was vice-president of the McGraw Publishing Co., and, later, president of the Taylor Publishing Co., of Chicago, which consolidated *The Engineer* and *Steam Engineering*. He and his associates, on acquiring *Iron Age*, elevated the hardware department of that journal into *Hardware Age*.

Fritz J. Frank, who succeeds Mr. Taylor, has been with the Iron Age Publishing Co. since 1910, after an active association with other trade publications, including *Colliery Engineer* and *Mining & Scientific Press*.

SOCIETY MEETINGS

The Society of Economic Geologists holds its first annual meeting at Chicago, Ill., Dec. 28 to 30, 1920, in conjunction with the meeting of the Geological Society of America. Society headquarters and a registration book will be at Rosenwald Hall, University of Chicago.

OBITUARY

Emilio Stalknecht, mining engineer, of Parral, Mexico, and widely known throughout northern Mexico, died there the third week in November. Mr. Stalknecht had held important positions with various mining companies in Mexico, but met with a serious mine accident several years ago, injuring his health and eventually causing his death.

Regis Chauvenet, mining engineer and president emeritus of Colorado State School of Mines, died on Dec. 5, at Denver, Col., in his seventy-ninth year. Professor Chauvenet, who was born at Philadelphia, Oct. 7, 1842, graduated with the B.S. degree from Harvard in 1867; became chemist to the Missouri Geological Survey in 1872, and took the chair of chemistry and metallurgy at the Colorado School of Mines in 1883. From 1883 to 1902 he also served that school as its president, resigning in the latter year to resume private practice as mining engineer. In 1911 he published his volume "Chemical and Metallurgical Calculations."

While engaged in geologic work in northwestern India for S. Pearson & Son of London, **Ralph W. Howell**, formerly with the Land Classification Board of U. S. Geological Survey, was killed by savages in the Baluchistan-Punjab district. The British authorities have offered a reward of $5,000 for the arrest of those responsible for Mr. Howell's death. Mr. Howell served with the Geological Survey from 1913 to 1919. In October, 1919, he had been granted a leave of absence to accept a position offered him by the British oil concern, and had worked for them with D. Dale Condit, oil geologist, in British North Borneo early in the present year. Mr. Howell was a native of Washington, D. C., and the only son of the late Edwin E. Howell, a naturalist and geologist distinguished for his geologic relief maps of the chief physical features of the United States. Young Howell was a past student of Columbian College (George Washington University), at Washington, and was only thirty-four years old at the time of his death.

It is understood that **D. Dale Condit**, chief of Mr. Howell's party at the time of the attack, has escaped to safety.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

Annual Report of the Mint

Decrease in World's Gold and Silver Production—Mints of the Country Made a Record Coinage in 1919-1920

The annual report of the Director of the Mint, just made public, states that during the fiscal year ended June 30, 1920, the mints of the United States manufactured more coin than during any other year in their history; and Mr. Baker states that they are still running twenty-four hours a day to keep up with the enormous demand. The total number of pieces executed in the last fiscal year was over 809½ million, of which about 76 million pieces were for foreign governments, the balance, over 733½ million pieces, being domestic. The total exceeded by 43 million pieces the previous high record, made in the fiscal year 1918; it exceeded the record of 1915, a normal year, when 148 million pieces were made, by 446 per cent.

The seigniorage (profit incident to greater face value of coin than cost of metal contained) on silver coin below the dollar piece amounted to over $3,896,000, and on five-cent and one-cent pieces exceeded $8,218,000, giving total profits on coinage during the fiscal year of over $12,114,000. No silver dollars have been made since 1904. Gold coin to the value of $16,990,000 was made last year, this being the first domestic gold coin (other than memorial issues) minted since 1916.

The world production of gold during the calendar year 1919 is estimated by the Director of the Mint to have been $365,166,077, a reduction from that of 1918 by about $18,500,000. The production of the United States was $60,333,400, or about $8,000,000 less than in 1918. The gold consumed in the arts and industries of the United States during 1919 is stated to have been $75,490,349, of which $56,135,951 was new material. By far the larger part of gold consumed in domestic industries is purchased from the New York Assay Office, New York being the center for industries using gold. The electrolytic refineries of the Mint and Assay Service produce metal of very high fineness, above 999/1000 pure, much desired by industrial users.

The world production of silver in the calendar year 1919 is estimated to have been 174,517,414 oz., a reduction from that of 1918 by about 23,600,000 oz.; domestic production of the United States was 56,682,445 oz., a reduction of over 11,000,000 oz. from the output of 1918. It will be noted from the above that the United States produces about one-third the world's silver. Domestic silver consumption in the industries continues high, over 26¾ million ounces of new metal having been used during 1919.

The gold monetary stocks of the principal countries of the world at the end of 1919, as compiled from data available to the Director of the Mint, aggregate $8,339,185,000; silver totals $1,877,691,000; and unclassified metal, $576,208,000. Paper currency stock totals $69,929,698,000.

WEEKLY RÉSUMÉ

The annual report of the Director of the Mint estimated the world's gold production at $365,166,077 and silver production at 174,517,414 oz. in 1919, a decrease from the previous year. The mints of the country have been running to capacity. A labor and power shortage combined with low metal prices has caused a slump in Cobalt mining activities. The Temiskaming mine has ceased operations. The Lake shipping season is practically complete, and few boats remain to be loaded. The International Nickel Co. intends to cut production of bessemer matte to 2,000 tons monthly. The Minnesota Fair-Tax Association will protest the tonnage tax in Minnesota. Congress is being pressed by Colorado miners to increase the time for completing assessment work. International Mining Congress to meet in Portland early next year.

Unemployment is creating a problem in Arizona. Salt has been discovered in Northern Alberta. The students of the University of Utah have organized a mining society.

A Congressional effort is to be made to reduce the needlessly large number of Federal Agents in Alaska. The War Minerals Relief Commission is expected to conclude its work in three months, with an unappropriated balance of over $5,000,000. The Bureau of Mines and Geological Survey ask increased appropriations for the fiscal year 1921. Manufacturing and interest in the non-metallics is increasing in the West. American capital is urged to seize in foreign lands opportunities that are being captured by other countries.

I. C. C. Holds Up Increased Sulphur Freight Rates

Proposed increases in the rates on sulphur in carloads from Sulphur Mine, La., to the principal points of shipment have been held up by the Interstate Commerce Commission pending an investigation of the proposed increases. The proposed schedule reduces the minimum weight from 80,000 lb. to 40,000 lb. The increase amounts to 10c. per hundred pounds to representative destinations.

Slump Noticeable at Cobalt

Labor and Power Shortage, Combined With Low Metal Price, Causes Curtailment in Canadian Camp

The recent decline in the price of silver has had a serious effect on the Cobalt camp, and this, together with the shortage of power, is already showing results. The Temiskaming mine has ceased operations until spring. The company had developed a considerable tonnage of medium-grade ore, which was profitable at higher prices of silver, but which cannot be handled at a profit under present conditions.

The directors of the Mining Corporation have passed the regular quarterly dividend of 12½c. per share, which would ordinarily have been paid on Dec. 15. The directors issued a statement in which they said that the net earnings from Jan. 1 to the end of September were slightly less than the amount disbursed in dividends during the period and that the earnings for the current quarter would not be sufficient to justify paying a dividend for the quarter. The reduced earnings were due to a shortage of labor for the first nine months of the year and to a shortage of power in the last three months; also to a heavy decline in the price of silver without any decrease of the cost of production.

The McKinley-Darragh has also passed the regular quarterly dividend of 3 per cent, which would ordinarily have been paid on Jan. 1. This company has sold no bullion since last June, and, as a consequence, a considerable portion of the cash surplus has been tied up in this manner.

With the surplus of labor there has been a marked increase in efficiency, which has helped, to some extent, to offset present conditions, but, unfortunately, not enough to make operations at most of the mines profitable. As a matter of fact, probably not more than three mining companies in Cobalt can operate at a profit under present conditions.

Lake Shipping Season Practically Complete

The ore season is practically over for the Lake Superior iron mines, as few boats remain to be loaded at any of the docks. All insurance expires for the boats on Nov. 30, which officially closes navigation on the Great Lakes, although indications are that the closing of the season may be postponed for a period of ten days or more. Ex-

tension of insurance on Lake carriers depends upon weather conditions at the close of the official season.

At the Missabe docks of the Duluth and Superior harbor the last boat cleared on Nov. 30. Only three boats remain to be loaded at the Allouez docks of the Great Northern. The Northern Pacific and Soo docks in Superior have already closed their seasons. The Ashland, Wis., ore docks of the North-Western are still loading, and at present have fifteen boats to load before the close of the season. The boats of the Pittsburg Steel Co. generally close their season Nov. 15, but owing to the heavy demand for ore at the blast furnaces they are pushing their vessels later than usual. It is reported that the North-Western docks will keep their ore supply moving as long as boats can get in and out of the harbor. The Duluth & Iron Range docks at Two Harbors closed on Nov. 27.

The amount of ore handled this season at the Allouez docks of the Great Northern R.R., according to the officials of the Peppard and Fulton contracting firm, which handles the ore for the railroad, has been one of the greatest in the history of local maritime circles. The tonnage will exceed 12,500,000 of ore shipped during the season, exceeding the 1919 shipments by more than 3,500,000.

Extensive repairs and new construction are to be carried on this winter on the Allouez docks. The outer portions of dock No. 3 are being rebuilt and a new approach to dock No. 1 is under construction.

Further Cut in Production at Copper Cliff, Ont.

The International Nickel Co., Copper Cliff, Ont., has decided to curtail operations further. About a month ago the production of bessemer matte was cut from 4,000 to 3,000 tons per month and it is now to be reduced to 2,000 tons. Two blast furnaces will be operated, in addition to the one reverberatory. Curtailment will also be made at the Creighton mine to accord with the reduced smelter production. Labor is no longer scarce and the company is releasing the less desirable workmen. A great increase in labor efficiency has been noted since the supply became more plentiful.

Association To Protest Tonnage Tax in Minnesota

A strenuous campaign has been mapped out by the Minnesota Fair Tax Association, in southern Minnesota, to convince that part of the state that a tonnage tax is unjust and unfair to the entire state. G. H. Lommen, of Biwabik, Minn., is presenting arguments against the tonnage tax and meeting with various organizations in the southern part of the state, and it is the plan of the association to conduct an aggressive campaign until the Legislature meets. To this end a large force of speakers will be in the field in the near future throughout the lower half of the state.

Occurrence of Salt Proved in Northern Alberta

Drilling operations carried on under the direction of the Alberta government at Fort McMurray in the northern part of the province have definitely proved the occurrence of an extensive bed of high-grade salt, the well having been sunk through 30 ft. of pure salt at a depth of 650 ft. The well was begun about twelve months ago but the work has all along been attended with mechanical difficulties. At the present time with the drill in the salt vein to a depth of 35 ft. work has again been halted owing to trouble with the equipment. The strike bears out the opinion of geologists that a large field of salt occurs along the Athabasca River in the McMurray region.

Colorado Miners Petition for More Time

Petitions are being circulated and signed by mining claim owners in Colorado, asking Congress to extend the time for completing assessment work from Jan. 1, 1921, to June 1, 1921. It appears that it has been particularly difficult this year to secure miners to perform the necessary work to keep mining claim locations in good standing, because the men find it more congenial to work at lower altitudes, and where high wages are offered for less strenuous work. For example, coal-mining companies have been paying wages of $10 per day, and even more in some cases, and, as a result, the metal-mine operators have been unable to secure the men for assessment work. Metal mine owners do not ask for exemption from assessment work, but simply sufficient extension of time to protect their properties against mining claim jumpers, who are likely to be active in many localities under the present circumstances. It is understood that Congressman W. N. Vaile will prepare and introduce a resolution designed to secure relief.

Unemployment a Problem in Arizona

The local smelting plants at Douglas, Ariz., are receiving little custom ores, either in copper or silver. Small properties throughout southern Arizona are stopping operations, being unable to pay expenses on any but the best of ores, such as ordinarily would not be taken out in the course of development. All over the state a general shrinkage of mining operations is noticeable. For the first time in years unemployment has become a problem, hundreds of miners having been dropped in a season when there can be no relief further north. In Sonora the unemployment problem would be a serious one had not there been a draft of about 12,000 laborers for the cotton fields of the Salt River Valley and other Arizona points.

The Dolores and La Paz mines in San Luis Potosi, Mex., have been obliged to close, owing to a lack of fuel.

International Mining Congress Organized

Organization of the executive committee for the International Mining Convention to be held at Portland, Ore., early in 1921 has been completed. Henry M. Parks, director of the Oregon Bureau of Mines and Geology, is general chairman, and Robert M. Betts, general manager of the Cornucopia Mines Co., is secretary. The following sectional representatives have been chosen: Western British Columbia, Hon. William Sloan, Minister of Mines; A. M. Whiteside and Nichol Thompson; eastern British Columbia, S. S. Fowler, of Riondel; Fred A. Starkey, of Nelson, and J. P. McFadden, Sandon. Alaska is represented by G. T. Jackson, of Juneau, and Col. B. F. Millard; eastern Washington by L. K. Armstrong, of Spokane; western Washington, M. J. Carrigan, of Seattle; northern Idaho, Stanly Easton, of Kellogg; and southern Idaho, by Robert N. Bell. Chairman Parks in a communication says that exact dates have not been set, but early April may be selected.

Utah Students Organize Mining Society

Students of the school of mines of the University of Utah and the department of geology have organized a society, which is to be known as the Utah Mining and Metallurgical society. The organization will petition for affiliation with the American Institute of Mining and Metallurgical Engineers. Thomas P. Walsh, a junior associate member of the American Institute of Mining and Metallurgical Engineers, was elected president; John F. Byrne, vice-president; and R. R. Hall, secretary and treasurer. An executive committee was formed, consisting of Dr. R. H. Bradford, of the metallurgical department; Dr. F. J. Pack, of the geological department; Prof. R. S. Lewis, of the mining department; Thomas Varley, superintendent of the Salt Lake station of the United States Bureau of Mines; J. T. Norton, ore dressing engineer, Salt Lake station.

Alberta Coal Mine Quadruples Tonnage

It is understood that the developments at the Blue Diamond coal mines, in Alberta, which were purchased recently by the McIntyre and Temiskaming companies, have been satisfactory Within three months of taking over the property improvements made have resulted in the daily tonnage being increased from 200 to between 700 and 800 tons. It is understood that early in the new year the output will be increased to about 1,500 tons per day. New machinery is being installed and surface buildings and housing accommodation are being provided.

A vanadium property in Sinaloa, Mex., belonging to ex-governor Ramon F Iturbe, and known as the "Chichi," is under option to capitalists in Mexico City.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

To Eliminate Red Tape in Alaska

Congressional Effort Is To Be Made To Reduce the Needlessly Large Number of Federal Agents

Much of the red tape which is hampering Alaska's development is to be done away with, in the opinion of Representative Charles F. Curry, of California. Mr. Curry is a chairman of the House Committee charged with the consideration of Alaskan matters. Mr. Curry says that thirty-five different Government agencies have jurisdiction over Alaskan interests of one kind or another, and as result the greatest difficulty is experienced, he declares, in establishing any type of enterprise large or small. Before a farmer can make sure of his title, an expenditure entirely beyond the resources of the average farmer is required, to make preliminary arrangements with the different bureaus. The same is true of the large enterprises, Mr. Curry says, and he cites an instance of an American wood-pulp manufacturing concern investing large capital in Canada after having become discouraged in its efforts to obtain a working arrangement in Alaska. Mr. Curry predicts the enactment of legislation at the extra session, if not during the short session, which will eliminate most of the existing red tape.

Mr. Curry is in favor of placing the government of Alaska in the hands of a board to be appointed by the President, but composed of residents of the territory. He says he is opposed to a continuation of a government of Alaska by Federal agents.

Increase in Manufactures in the West

Trend Believed To Be Partly Due to High Freight Rates

The West is emerging from the mining and agricultural stage of its development. Manufacturing is beginning to play an important part in its commercial activities. Present plans everywhere throughout the West include enlargement of manufacturing facilities. These are the observations of G. F. Loughlin, the head of the Mineral Resources section of the U. S. Geological Survey. Mr. Loughlin just has returned to Washington after an extended trip through the West. Though Mr. Loughlin believes this is due largely to the natural evolution in the development of the West, he thinks it is being hastened by various changes brought about by the new economic situation, the least of which is not the increase in freight rates.

The coming of many new manufacturing plants, Mr. Loughlin believes, will stimulate both mining and agriculture. Throughout the West, Mr. Loughlin found many signs of underlying strength in the position of the mineral-mining districts, induced largely by the decreases in commodity prices. The trend toward manufacture has aroused widespread interest in non-metallic resources. For the most part, the work of the Federal Government in the Western States has been on its metals. Now, with the promised rise of chemical industries and activities in connection with the construction industry, there is need for a more definite knowledge of the non-metals. In fact, the Los Angeles Chamber of Commerce has made a formal request that the Survey undertake a thorough study of the non-metals in the region tributary to that city. Mr. Loughlin is convinced that this work would be helpful to the public, and he will recommend that it be undertaken.

American Capital Urged To Enter Foreign Fields

Although throughout the world cards are falling in a new deal, American capital and American mining engineers, for the most part, are preoccupied with efforts to devise methods to make lower-grade ores pay and to increase operating efficiencies, to the exclusion of the opportunities that are offered in foreign fields. This seems to be the conclusion of numerous students of the present situation as it affects the mining industry. So far as oil is concerned, much is heard of the efforts of foreign countries and certain foreign governments to extend their acquisitions of petroleum lands.

Rapid progress is being made by English, Japanese, French and even Belgian capital in the acquisition of such deposits in China, Siberia, continental Russia, Africa, and even South America. Where one American dollar is looking for a foreign mineral investment, hundreds of foreign dollars are being exchanged for valuable mineral rights.

Some go so far as to predict that, within fifteen years, we shall lose our pre-eminent position in copper. Another prediction is that the next decade will make necessary a high import tariff, if our iron-mining operations are to continue at anything like their present scale. Lead and zinc are placed in practically the same category. To hold its own, it is declared, American capital must acquire rights and prepare to conduct large-scale mineral operations in those countries having practically virgin deposits, as well as proved properties, but whose present economic necessities have placed those resources on the bargain counter.

W. M. R. Commission Soon To Complete Awards

If Present Rate of Adjustment Is Carried to a Conclusion an Unused Balance of $5,500,000 of the Appropriation Will Remain

Two awards were recommended by the War Minerals Relief Commission during the week ended Nov. 22. The total of awards was $20,557.59. In the claim of the Mount Tory Mining Co., the award was $11,007.89. This was 25 per cent of the amount claimed. The company was engaged in a manganese operation. Another manganese claim was that of the Eagle Mine. In that claim $9,549.70 was awarded. This was 89 per cent of the amount claimed.

Up to Nov. 27, 1920, the War Minerals Relief Commission had made recommendations in 1,124 cases out of 1,203 legally before it, leaving 83 claims remaining for consideration. It has recommended awards of $2,357,491.35.

The total appropriation	$8,500,000.00
Awards and expenses	2,687,092.42
Balance	$5,812,907.58
The amount asked in the 83 claims yet remaining	802 703 83
Apparent balance	$5,010,203 75

If the same ratio of award (32.9 per cent) shall obtain in the 83 cases yet to be dealt with, as in the past, the amount yet to be awarded will be $272,412.76, in which event an unused balance of about $5,500,000 will remain.

The commission expects to complete its work within sixty to ninety days. The administrative expenses of the commission have been 2.07 per cent of the amount involved in the claims settled.

Bureau of Mines and U. S. Geological Survey Ask Increased Appropriations

Congress has been requested by the Bureau of Mines and the U. S. Geological Survey to appropriate $5,938,778 for their activities during the coming fiscal year. The total of the appropriations requested by the Bureau of Mines is $3,469,638. The Geological Survey's total is $2,469,140. The principal subdivisions of the Bureau of Mines appropriations are as follows:

For investigations as to the causes of mine explosions, methods of mining appliances best adapted to prevent accidents, improvements of conditions under which mining operations are carried on, the use of explosives and electricity and other inquiries and technologic investigations pertinent to the mining industry, $551,353. This is an increase of $142,288 over the amount appropriated for the current fiscal year.

For inquiries and technologic investi-

gations concerning the mining, preparation, treatment, and utilization of ores and other mineral substances, with a view to improving health conditions and increasing safety, efficiency, economic development and conserving resources through the prevention of waste in the mining, quarrying, metallurgical, and other mineral industries, and to inquire into the economic conditions affecting these industries, $352,271. This is an increase of $227,271 over the appropriation which was made for similar purposes during the current fiscal year.

For inquiries and investigations concerning the mining, preparation, treatment and utilization of petroleum and natural gas, $453,840. This is an increase of $318,840.

Expenses mining experiment stations, $270,000. This is an increase of $70,000 over the appropriation allowed for the current fiscal year.

Operating mine rescue cars, $198,650. This is an increase of $43,983 over the current appropriation. In addition, $45,000 is asked for the purchase and equipment of an additional mine rescue car.

For supervision of mining on the public domain, $132,390 is asked.

The subdivisions of the Survey estimates which apply directly to the mining industry are as follows:

Geologic surveys, $500,000. This is an increase of $148,000 over the appropriation for the current fiscal year.

For continuation of the investigation of the mineral resources of Alaska, $190,000. This is an increase of $115,000 over the current appropriation.

For preparation of the report of the mineral resources of the United States, $200,000. This is an increase of $75,000 over the current appropriation.

For chemical and physical researches relating to the geology of the United States, including researches with a view of determining geological conditions favorable to the presence of deposits of potash salts, $60,000. This is an increase of $20,000 over the money appropriated for the current year.

NEWS BY MINING DISTRICTS

Special London Letter

Shadow of Politics Brings Gloom to Mining Interests—Cornish Miners Migrating—Cape Copper Co. Floating 8 Per Cents at Par

BY W. A. DOMAN

London, Nov. 23.—Political and financial influences are upsetting the business world. It is scarcely credible that Russian, Greek, and Irish affairs should in any way affect the mining community; but such is the case. There is nothing whatever to engender confidence at the moment. Prices of metals are tumbling because of the slackness of trade and the difficulty of getting banking accommodation, and in the case of some metals because of the excessive stocks, the Allied governments apparently not having disposed of all they had contracted for while the war was in progress. Tin in one day fell £8 10s. per ton, and at the time of writing is quoted at £231 5s. At such a figure some of the Cornish mines find it very difficult to work at a profit. In fact, Cornwall seems to be getting in a bad way, and some of the tin miners are migrating to other and better-paid fields—to South Wales for coal mining, for instance. Various schemes are being worked out to set the tin-mining industry of the duchy on its legs again. One of them is a return to the old cost-book system, and another is an amalgamation of different companies in different districts, so as to avoid heavy overhead charges, and to introduce various economies that may be possible under certain combinations of big business.

The Cape Copper Co., which has invested a large amount of capital in a copper property in the Rakha Hills in India, has appealed for £120,000 in registered convertible 8 per cent debentures of £100 each at par. This is one of the few companies, whether mining or commercial, that has had the temerity to ask par for its new issue. The value of the assets in India is approximately £440,000, whereas the £120,000 of debentures offered to the public are covered by the Briton Ferry Smelting Works in South Wales alone. The issue deserves to be successful. Already there are proved in the reserves 11,370 tons of copper. Just at present, of course, the red metal is not the thing to conjure with as it was a few years ago. But there is a good local market that can take care of most if not all of the production.

The Nundydroog, another Indian mining company, has got its reconstruction scheme through. One of its neighbors, the Ooregum, is said to be considering additional capital outlay, but that the money will be found apart from reconstruction. The price of the shares, of course, has been unfavorably affected.

Since the Burma Corporation has become an Indian registered company, its shares have gradually fallen away in price, until now they are under 10s. Previous to conversion they reached £14, and at the time of conversion stood at £9 15s., the holders receiving 14 of the rupee shares as the allotted basis of the exchange.

As a star Esperanzas has faded for the time being. Speculators rushed up the price of the shares unthinkingly, and the public, ever keen on a gamble, got in and is now nursing the baby. Had it not been for the high Descubridora values, Esperanzas, in all probability, would be quoted above the present figure. But, once disappointed, the public is not keen to come along again.

The South African market is being upset not only by foreign selling but also by realization of enemy-owned shares, these latter being peddled out by the Public Trustee on this side and the Custodian of Enemy Property at Capetown. There would be no difficulty in forming a syndicate to relieve the officials of the shares, but apparently those gentlemen think they can do better by trickling them out. Each day means that they set the market against themselves still further and thus forestall a good margin of profit.

Austrian Industries Need Upper Silesian Coal

Germany Would Supply This If Abundant Saar Production Was Shared With Her

From Our Vienna Correspondent

Vienna, Austria, Nov. 10.—Recent reports have been to the effect that England was trying to persuade France to release coal from the Saar district for the use of German industries. This would enable Germany to deliver large quantities of coal to Austria from the fields of Upper Silesia. Arrangements with the Polish government are being discussed, also, with the object of furnishing from Austria the machinery and operating supplies needed by the still inactive Polish mines, that the latter may increase their yield. These are the only practical methods for relieving the coal situation in Germany so that the latter can deliver large supplies of coal to Austria.

So far, Germany has faithfully fulfilled her part in the Spa agreement, and as a result of the German coal deliveries to the Entente in recent months, her own industries have had to substitute large quantities of lignite for the missing coal. Of course the full amount of this loss can not be made up. Dispatches at hand indicate that France enjoys a superfluity of coal supply, and that the coal situation in Paris is particularly favorable. Thus it would be possible at any time for France to release coal to German industries from the steadily improving deliveries from the Saar district, thereby releasing larger supplies of Upper Silesian coal to Austria.

France's domestic coal production also is increasing, amounting to 2.40 million tonnes in September, as against 2.37 million in August, which is already at the annual rate of two-thirds of the normal peace-time yield. Furthermore, the conditions in the wrecked mines of northern France are steadily improving. The coal supplies now being taken out of the Saar mines by the French

amounted to 702,680 tonnes in August, to 860,108 tonnes in July (the decrease was due to the railway strikes), to 811,314 tonnes in September, 1920, and is steadily rising. In January, 1920, the deliveries amounted to only 727,465 tonnes. The Saar district needs but little coal for its own industries and disposes of nearly the whole yield by sale and export monthly, so that it is clear that the present coal situation in France permits that country to dispense with the greater portion of the Saar coal. In fact, several hundred thousand centner of coal are left monthly at the depots of the Saar district, which shows that France is not actually in urgent need of the Saar coal.

The prices of Saar coal for France, Luxemburg and Switzerland have been greatly reduced since Oct. 1, 1920, another fact testifying to the favorable condition of that district and its ability to support exportations. The prices are given below.

PRICES OF SAAR COAL SINCE OCT. 1, 1920, COMPARED WITH EARLIER QUOTATIONS

Kind	Today, Francs	Former Prices, Francs
Washed, lump	124 to 105	136 to 115
Nut, No. 1	124 to 100	136 to 110
Nut, No. 2	118 to 93	130 to 110
Unwashed, lump	116 to 93	128 to 108
Run-of-mine	85 and 75	83
Coke, broken	150	160

Concerning Poland, Austria could indeed aid in increasing the Polish coal yield by supplying machinery and blasting supplies, whereby there would also result advantages to the Austrian supply of coal.

MEXICO

Annual Production of Durango Listed —Encouraging Reports From Cusihuiriachi—New Export Duties Lower

City of Mexico—One of the last official acts of President de la Huerta was to sign the decree lowering export duties on all classes of minerals and also reducing the taxation on pertenencias (claims) as an immediate aid to the industry, which has been hard put these last weeks because of the low prices on silver, copper, zinc and lead. The new tax is not a fixed one but is applied differently in distinct camps and also according to the value of ores. It was devised with the assistance of committes from various mining centers, and it is believed that it will at least relieve the situation.

The new administration has under study a complete revision of the mining laws (including petroleum), but it will probably not reach Congress before the first weeks of the new year.

Chihuahua

Conception de Oro—It is claimed here that over 500 smaller mining properties have recently been obliged to close because of the low price of silver. Half of this number is in the Conception de Oro district. Within a radius of twelve miles of the center of this district there are not fewer than 300 mines, with an abundance of silver ores, but low grade, running from 6 to 900 gr. to the ton. At this assay 80c. silver produces only 45.80 (Mexican) per ton, and the miners claim that the actual cost of mining treatment and shipment amounts to 45.60. In addition to this dismal situation 540 other properties in this same district are about to be forfeited for failure to pay taxes. The owners apparently prefer to abandon their holdings under the circumstances.

Cusihuiriachi—On the other hand, reports from Batopilas, Santo Domingo, San Juan and the Cusi Consolidated, in the Cusihuiriachi district, are very satisfactory. All are high-grade ores. Increased activity is reported likewise from Parral and at San Pascual de las Adargas, near Jimenez, where a number of American companies are going in.

Durango

The state government has recently issued some interesting statistics regarding the mineral resources of that section, giving the following properties now in operation, with their approximate annual production in gold, silver, copper and lead (in thousands of pesos):

Penoles	1,796
Velardena	2,600
San Andreas	742
Promontorio	651
Avino	559
Vacas	494
Bacis	457
Candelaria	433
Soto	267
Ventanas	248
New Australia	240
Hilario Lozoya	183
Lustre	180
Nuevo Porvenir	179
Fundidora de Coahuila	150
Descubridora	134
Ambrosius Hermanos	127
Salvador Lopes Suc.	122
Huahuapan	120
San Luis Mining Co.	113
Carmen Copper Co.	106
Fundidora Mapimi	76
La Trinidad	72
Luis Guerrero	52
Animas	41
San Luis	40
El Potrillo	40
San Juan	37
Siderita	37

These with twenty-eight other properties running from 18,000 to 30,000 pesos make a total production of gold 1,664,000; silver, 11,031,000; copper, 864,000, and lead, 237,000 pesos. Many other mines are being prepared for development, but there has been a temporary let-up owing to the coal strikes and inability to get material or transportation. Expert opinion holds that with a reasonable restoration in the price of silver and other metals and with labor troubles settled the production ought to be doubled in 1921.

Guanacevi—Reports from this district are encouraging also. There are about a thousand tax-paying claims in this camp, twelve mills (in operation before the revolution) and enormous dumps of ore which, it is claimed, are profitable for treatment.

Topia—The Mines Selection Co., a development syndicate, including C. L. Despard, Frederick G. Corning, George B. Hutchings, all of New York City, and W. J. Loring, of San Francisco, has taken an option on La Perla mine, in the Topia district, Durango. This property is owned by a company in which Bernard and M. E. MacDonald, formerly extensive operators in Mexico, are largely interested.

Coahuila

Torreon — The Cia. Minerales & Metales, owner of the local Torreon smelter, has purchased a large portion of the Mercado iron mountain in Durango, the consideration being several million dollars. It is probable that a new smelter will be erected at the base of the mountain.

Owing to the low price of silver, high taxation of low-grade ores, and a general shortage of fuel, nearly every smelter in Mexico will be closed by the first of the year. As a natural consequence practically all of the producing mines will be forced to suspend operations. There are only a few smelters now in operation. Over six hundred producing mines in the northern part of the republic closed down during November.

David G. Farias, a prominent attorney of Torreon, has filed a group of silver-lead mines in the San Juan del Rio district. The properties adjoin the old producing mines La Palma, Otilia and El Chaiz.

J. P. Steele has suspended operations on the Trovador mine in the San Diego district. He has several cars of ore on the platform at Trinidad station and a large tonnage on the dump. His properties will remain idle until the smelters resume operations.

San Juan de Guadalupe—The district continues to add new shippers to its list and seems to feel no ill effects from the coal shortage or low price of silver. The ores carry considerable values in gold and are being received by the smelters regardless of the fact they are not operating at the present time. The most recent property taken up in this district is the Plateros group, in the Ramirez Mountains, which is being worked by Alejandro Gaitan.

Zacatecas

Zacatecas—In the mining agency at Conception del Oro 540 mining properties are listed for forfeiture on account of non-payment of taxes. Many of these delinquent mines are capable of producing large quantities of low-grade silver-lead ores which cannot be mined under the present conditions of the low price of silver and exorbitant taxation.

A number of new properties have been taken up in the Reyes district, in the northern part of the state, by Luis Campa. The mines are contiguous to the Escondida, which has produced large quantities of high-grade gold and silver ores.

Word has been received here from Mexico announcing an immediate reduction of taxes on low-grade ores as well as other advantages to be given the mining industry. Unless the coal mines in the State of Coahuila are operated within the near future the government will permit the importation of coal and coke free of duty.

CALIFORNIA

Another Gold Dredge Sent to Mexico—Yankee Hill Dredge at Work on the Stanislaus—Good Ledge at the South Star

Sonora—The Yankee Hill Mining Co. has placed a dredger in operation on the Stanislaus River between Oakdale and Knight's Landing. The company has about ten miles of the river channel under lease, and thorough tests made by the management show considerable gold.

Angels Camp—Work of unwatering the Victor Gravel mine, formerly called the Rainier, near Angels Camp, is being rushed day and night in the rehabilitation of the promising old property. Regardless of the heavy rains of the last three weeks work of carrying the water from the mine in tank-skips is progressing rapidly. The shaft will be dry in three weeks if present dewatering work continues unchanged. Superintendent Montreeville is planning on drifting and breaking out gravel as soon as the underground conditions permit. Hoisting operations are expected to begin by the first of the year.

Grass Valley—A. W. Johnson, principal owner and manager of the South Star mine, in the Deadman's Flat district, reports that a fine ledge has been cut in that property at a depth of about 100 ft. The ledge is stated to be from three to four feet in width and to carry free gold. Johnson believes that it will be possible to place the famous old mine on a record producing basis again. About two years ago several thousand dollars was taken out in shallow diggings, but work was soon afterward discontinued.

Oroville—Purchase of Exploration dredger No. 3, which operated in the Oroville field for a number of years, was made recently by W. H. Hyland, a representative of a Mexican dredging company. The dredge will be sent to Mexico, where it will again be placed in operation. This is the second dredge to be sent to Mexico in the last few months.

Amador City—At a regularly called stockholders' meeting of the Bunker Hill Consolidated Mining Co. the following were chosen directors: N. W. Hyler, O. D. Rohlfs, H. A. McQueen, T. G. Negrich and John Eudey. Charles E Bunker, who has been superintendent of this well-known property for several years, tendered his resignation, and the new directors appointed as his successor Robert Christensen, who filled the position of foreman heretofore.

Jackson—V. S. Garbarini has been appointed general manager of the Argonaut mine at Jackson. He fills the place vacated by N. S. Kelsey, who resigned to accept a position in Colorado. At present all endeavors at the mine are being concentrated on the removal of water from the underground workings.

The Kennedy mine is working steadily in dewatering the old workings. It is expected that mining will be resumed some time in the spring of 1921.

Happy Camp—Since the Legrange mine, in Trinity County, shut down, the Davis Consolidated mine at Happy Camp is believed to be the largest active hydraulic placer mine in the state. It is operated about nine months of the year with three giants, receiving water through a 32-in. pipe. Over 5,000 miner's inches of water is delivered through two ditches having their sources in Indian and Grider creeks respectively. The mine is now owned and operated by Reeves Davis, of San Francisco, who purchased it in 1908 from the estate of O. H. P. Belmont. The property consists of 1,200 acres of rich placer ground.

COLORADO

New Freight Rates on Dec. 20—Silver King Installs New Concentrating Table—Gold Rock Finds Rare Minerals

Idaho Springs—New freight rates on low-grade ore shipped from the Clear Creek district, over the Colorado & Southern Ry., will become effective on Dec. 20, 1920, as follows: On ore up to $20 gross value, $1.75 a ton; from $20 to $30 gross value, $2 a ton; from $30 to $41 gross value, $2.50 a ton; from $41 to $61 gross value, $3 a ton; from $61 to $100 gross value, $3.80 a ton. This rate is equivalent to a reduction of 75c. a ton on the first two classes of ore above mentioned, which include the bulk of the ore shipped from this district.

A drift on the 600-ft. level of the Gem mine has opened a pocket of sulphide ore about 5 ft. wide. The drift will be advanced to connect with the Franklin shaft.

The Lord Byron is being developed under the management of Kenneth Matheson. A 300-ton lot of milling ore has been shipped to the Hudson mill.

A new concentrating table, invented by Henry W. Bolthoff, has been installed in the Silver King mill, where tests have been made. The demonstration table is about 7½ ft. long by 30 in. wide. The top of the table is covered with linoleum, which in turn is covered with a layer of 12-gage, 20-mesh wire screen, set about $\frac{5}{8}$ in. above the top of the table. It has both a lateral and a vertical motion. The table is equipped with a 5/5 in. pipe arranged along the side, from which flows a steady spray of water. One-quarter horsepower is required to operate the table. The inventor claims an 80 per cent saving of the values in the ore fed to the apparatus.

The Gold Rock property is being developed by W. P. McLean and associates. Recently a streak of high-grade gold ore has been opened, and small shipments to the sampler assay 3 oz. gold. Milling ore is being shipped to the Hudson mill. A pocket of gold-copper ore was recently opened, and the material is reported to contain 16 per cent uranium oxide. Pitchblend has been identified, and the discovery is regarded with considerable interest by mining men who are on the alert for rare minerals. The vein is 12 in. wide and was opened at a depth of 450 ft.

Telluride — The Vanadium Corporation of America has shut down all of its works at Vanadium, Fall Creek, and Placerville, west of Telluride. About 350 men have been thrown out of employment.

IDAHO

Wood River—The Golden Glow mine at Boulder Basin has just completed and put in operation a very substantial 50-ton lead-silver concentrating mill, conveniently tied to the lower adit of the property. The property is situated near the summit of the Sawtooth range at an elevation of 9,500 ft. The steam power is developed with coal hauled in at an excessive cost but the company plans to install a hydro-electric plant on Boulder Creek next season, and thereby greatly reduce the operating cost.

Independence mine, owned by Federal Mining & Smelting Co., Wallace, Idaho, is working 75 men, and has been supplying an 80-ton concentrating mill for the last six months. This is an old plant that has been operated, however, at a decided advantage for several seasons with an extremely limited water supply of spring water. The mill was built to treat a very complex zinc ore during the war but has been shut down through lack of market for its product. It is now being overhauled and put in shape for the exclusive treatment of the Independence Mine and has a capacity of 200 tons per day. This property carries one of the cleanest and richest silver-lead ores ever mined in the Wood River district.

Soda Springs—The new phosphate mining and milling enterprise of the Anaconda Copper Co. on the main division of the Oregon Short Line in southeastern Idaho makes excellent progress. The grading for a railway has been completed and the steel is already laid for nine miles, or half the distance from Soda Springs to the mine. Machinery for a 1,100-cu.ft. compressor is on the ground and the concrete foundations are now being laid. A crosscut tunnel 9 x 9 ft. in the clear, to be laid with 60-lb. rails and equipped with 15-ton storage battery motors and 10-ton bottom dump cars, is already in 200 ft. and has already cut one of a series of rich phosphate veins. This tunnel is to have an ultimate length of two miles as a crosscut and will penetrate three separate ore courses of rich rock phosphate 70 per cent or better and each 5 to 8 feet wide that stand at angles varying from 45 to 70 degrees and are traceable at the surface for miles. The big tunnel will give stoping backs to a maximum height of 1,000 feet on the steep dip of the veins. Much of the machinery for the first 1,000-ton unit of a dehydrating mill is on the ground. An electric power transmission line from the main line of the Utah Power and Light Co., near Grace, has been completed to the mine and also an inde-

pendent telephone line. It is expected to have the first unit of the mill, with a daily capacity of 1,000 tons, completed by next August. The plans also involve the plotting of a model mining town on a desirable site in a sheltered cove in the mountains near the portal of the mine for the accommodation of the company's employees. Subsequent mill units are to be installed as the market for the product is created.

Montpelier—The American Phosphate Co. are installing a 500-ton milling plant for the crushing and drying of their phosphate rock, and are already shipping at the rate of 50 tons a day from their contingent mine development, principally to the Pacific Coast market. The Waterloo mine in the same section of Bear Lake County has been shipping 100 tons of rock a day for several months past to San Francisco. The ore is hauled on motor trucks 4½ miles at a cost of $1.25 per ton. Near Paris, Idaho, the Western Phosphate Co. have a 3-mile spur completed, also a 500-ton mill, and are shipping 200 tons of rock a day. The Bear Lake Mine, a new enterprise in the vicinity, has extended a double-track tunnel on a 5-ft. vein of high-grade rock phosphate 700 ft. This property has recently been equipped with a 500-cu.ft. angle compound air compressor and is making excellent development progress.

MONTANA

Some Developments Under Way—New Mill at the Alta—Western Power & Smelting Completes Matte Smelter

Butte—Though the Anaconda Copper Mining Co. has reduced its working forces somewhat since the closing down of three of its zinc properties about two weeks ago, there has not been further suspension of mining activities on any material scale and Manager John Gillie has announced that for the present the Anaconda would continue without further curtailment. No statement as to the future however was forthcoming.

Further curtailment of output to the extent of one-third by the North Butte company, which had been operating on a 70 per cent basis, emphasizes the depression prevailing in metal-producing circles in the Butte district. North Butte has been putting out about 1,500,000 lb. of copper monthly, and it was officially stated that production will be kept within 500,000 lb. monthly. The company is continuing development work but on a reduced basis.

Tuolumne Copper has started sinking at the Main Range shaft from the 1,200-ft. level with the 2,000 the objective, according to the local office of the company.

Aside from raising out of No. 3 shaft from the 2,300 level, little development work is being done at the Black Rock mine of the Butte & Superior, the suspension of production being necessary in view of the poor condition of the zinc market.

Davis-Daly Copper Co.'s development work is limited to raising an airshaft from the 1,700 level to the surface at its Colorado mine. Production had not been materially lowered below the 70 per cent point, but it may be further lowered unless the copper market improves.

Barnes-King directors decided to pass the dividend for the third quarter, the explanation being that it was desired to conserve the company's resources for the acquirement of new property.

Neihart—At the Moulton the concentrator is handling about 170 tons of ore daily and a number of surface improvements are being made.

Federal Mining & Smelting Co. is reported to have concluded a deal whereby it will take over the development of the Silver Dike property. Silver Dike is a large low-grade proposition embracing ten claims.

Clancy—Jefferson & Teton Mining Co. is installing new machinery and equipment at the Willard mine. Operations will continue throughout the winter.

Sinking is in progress on the Pay Back Mining's Old Timer mine and a good width of high-grade ore is reported.

Corbin—Foundations for a new mill for the old Alta mine are going forward. Old buildings are being torn down and remodeled.

Cooke City—Western Power & Smelting's smelter, with a capacity of 250 tons, was completed this year; it is of the copper matte type.

MINNESOTA

Mesabi Range

Pickands-Mather Co. Makes Safety Awards—New Washing Plant Commences Operation

Hibbing—The Pickands-Mather Co. each year awards prizes to the department officials of the mines in their districts who have the least number of disabilities at the end of the year. The rewards this year were watches, of which four hundred were distributed to the men employed at the Majorca and Albany mines. According to the system of marking, the two mines were so close that only a few points separated the winner. The Elba mine, on the eastern end of the range, won first prize for the least number of injuries. George Martinson has charge of the safety-first and mine rescue work for the company on the Mesabi Range.

The Boeing mine of the Cleveland-Cliffs Iron Co. has reduced its surface labor to a minimum, but an aggressive program has been outlined for all underground development and operation, as all ore shipped next season will be from underground operations.

Gilbert—The new washing plant of the Bowe-Burke Mining Co., at the old Mariska mine, has started to wash its first ore. Although the plant is only a small one, with a capacity of 50 tons per hour, great interest has been aroused, and its successful operation will be noted by many companies, as it will be the first installation of its kind in the immediate vicinity.

The flow sheet is simple, as the ore is dumped direct into the mill bin from the mine skips. From the mill bin it is carried by a belt conveyor to the trommel, the oversize from the trommel falling directly into a chute, from which it is fed to a conveyor belt below and conveyed to the railroad receiving bin from which the railroad cars are loaded The undersize from the trommel, which has one-half inch perforations, is fed to a Dorr classifier and the overflow from the classifier is laundered off as the tails; the underflow of the classifier is fed to the belt conveyor going to the railroad receiving bin. The trommel is of such construction that by reducing the diameter of the discharge end, a certain level of water is maintained which allows the trommel to be partly submerged. This arrangement permits a great saving in the consumption of water, as only 150 gal. of water are required per minute.

MICHIGAN

The Copper District

Reductions in Force and Wages Continue—Wolverine Copper Is Removing Shaft Pillars

Houghton—The Quincy Mining Co has announced a reduction in all departments of 15 per cent on wages and salaries, effective Dec. 1.

The Copper Range group of mines have also announced a cut in wages and salaries to take effect on Dec. 1. This reduction varies for the different classes of labor. In the case of trammers it amounts to about 24 per cent; with company account miners it amounts to 17 per cent. It is also announced that soft coal will be supplied to employees at $7 per ton instead of the prevailing rate in the district of $9 to $9.50 per ton.

The Wolverine Copper Co. is steadily increasing production and within a few weeks will be back to the pre-war normal. No. 4 shaft has been completely idle for several days, due to an accident in the shaft between the 29th and 31st levels. This is about repaired The Wolverine has started to remove the shaft pillars for about 100 ft. on either side of the shaft. When this work reaches some of the upper levels it should result in materially enriching the yield of Wolverine rock.

The Mohawk Mining Co. is also steadily increasing production. No. 1 shaft is now operating one shift after a year's idleness, and No. 5 shaft is again operating two shifts.

The Seneca Mining Co. is increasing its working force underground, and now has two shifts of miners working in the headings of the third, fourth, and fifth levels north, and the fifth level south and in sinking to the sixth level. They are not accumulating a stockpile at the mine, but are shipping all the rock to the Baltic mill of the Copper Range Co.

The management of the Arcadian Consolidated has decided to continue development work throughout the winter. It expected to cut the plat at the 750-ft. level early in December. A sump has been cut out at the 600-ft. level and will be bailed by means of the skip hoist.

Gogebic Range

Bessemer—The Charcoal Iron Co. of America, operating the Yale mine, has announced a cut in wages of 20 per cent, applying to all classes of labor and taking effect Dec. 1. It is understood that a similar cut has been made at the company's logging camps and at the mill in Marenisco, as well as at its furnaces. The local officials of the other large mines of the range deny knowledge of any wage reductions being planned by their companies. However, at a few of the small properties men have been let off and then rehired at lower rates.

Since the closing down of additional mines in the Copper Country, quite a number of miners have come to the Gogebic Range, and, added to those laid off at the local mines, furnish an adequate supply of labor. A number of the men leaving the mines have found employment in the woods, so there is no great amount of unemployment.

It is expected that the skips will be hoisted through H shaft of the Pabst mine some time this month. The last of the idler stands will soon be up, and the ropes are already being strung. The grading for tracks and stockpiles is about completed.

Marquette Range

Large Stocks Cause Labor Curtailment, Although Wages Are Maintained

Ishpeming—The Cleveland-Cliffs Iron Co. reduced operations on Dec. 1 by releasing several of the single men employed in the company's mines. This was done to make places for the married men and men with dependents who had to be transferred from the Mackinaw-Gardner mine, at Gwinn, which was closed. The working force at the Cliffs Shaft mine, Ishpeming, was reduced by 210. Large stocks of ore at most of the mines was given as the reason for the curtailment. The Cliffs has over 200,000 tons of hard ore in stock, with little demand for hard ores at this time. The Mary Charlotte mine of the Marquette Ore Co. has closed down for an indefinite period, instead of for a week, as announced at first. The high wage scale is being maintained.

Menominee Range

Alpha—Thirty-five miners and laborers were received by Pickands, Mather & Co. this week for work at their Balkan and Amasa mines. This is the first instance since the war that men have been imported for mining work.

Iron River—Although the Tully mine has been idle for three years, the property is kept in good condition. Men are now at work repairing the two shafts, and it is planned to erect a new steel headframe over the No. 1 shaft.

NEVADA

Nevada Silver Horn of Great Promise —Virginia Louise and Others Increase Output—Ely District Still Slowing Down

Pioche—Operations at Jackrabbit on the old Cutts property, owned by the Pioche Bristol Mining Co., have begun. The present two-compartment shaft will be sunk to the 100-ft. level where a drift will run to the fissure mined a few years ago. John Gilmer, who has a lease on the Onondago mine at Jackrabbit, is taking out ore carrying good values in silver and lead from a point about 100 ft. from the collar of the main incline shaft. He has about forty tons of ore now ready for shipment.

The Nevada Silver Horn property, situated twenty-three miles west of Pioche, has recently been examined by T. W. France and other mining engineers representing New York capital.

The results of the sampling have demonstrated that large sections of the big cropping carry satisfactory values in silver. The building of a 40-ton pilot cyanide mill will be deferred and an increased amount of development will be started on the property with a view to increasing and substantiating the reserves of milling ore.

Everett Wade and Earl T. Godbe, leasing on the Detroit and Iron mines of the Bristol Silver Mines Co., are now having their initial ore shipment hauled by wagon to the bins at Jackrabbit. The ore is a good lead carbonate. The recent strike of higher-grade ore at the property of the Black Metals Incorporated is holding up well. The high lead content carried by the ore when first struck has dropped to normal, but the silver content is greater. Operations at the Bristol mine have been curtailed on account of a breakdown of the compressor plant. Conditions underground continue satisfactory and an improved grade of ore is being mined. During the last three months seven lessees have ceased operations owing to the increased cost of mining, lower metal prices and increased freight rates. All the larger properties in the Pioche district are putting on men, however, and a brighter future can be clearly foreseen, but unless an equitable freight rate is granted on the higher-grade ores the small operator will perforce stay out of the game.

The Virginia Louise Mining Co. is now shipping an increased output of ore. A new stope in good fluxing ore was opened up this week on the 400-ft. level at the south end of the fourth-level drift.

The Prince Consolidated is shipping its entire product to the American Smelting & Refining Co. smelter at Murray, Utah. It has been arranged to discontinue shipments to the International smelter at Tooele, Utah. The promised restoration of the $2.20 freight rates on ores of $6.50 in value will give much needed relief to the future operations of the property.

Ore shipments from the Pioche district for the week ended with Thanksgiving Day showed a total of 2,910 tons, derived as follows: Prince Consolidated, 1,740 tons; Virginia Louise, 535; Black Metals, 310; Combined Metals, 200; Mendha Mine, 40; Bristol Silver, 45; Pioche Assay Office, 40.

Ely—A large number of men have been laid off in all departments of Nevada Consolidated Copper Co., the reason for this being naturally the low price in copper. The reduction in payroll is apparently still continuing.

The properties held by the Consolidated Copper Mines Co. at Ely are practically closed down. Pumping and maintenance work is still being done both in the Morris shaft at Kimberley and at the Giroux shaft over the Kimberley summit. The Giroux shaft is well equipped and the pumping station and machinery constitute one of the most expensive and complete installations in the West. Although little mining is being done it is necessary to retimber continually, as the ground is very heavy.

George H. Ryan, who is working a deposit of zinc ore on the Willard lease from the Consolidated Copper Mines Co., received returns on a car of zinc ore last week. The shipment averaged 47 per cent in zinc content with a small amount of gold and silver in addition. Ryan intends to ship one car a week of this grade of zinc ore, and will increase his tonnage should conditions permit.

Articles of incorporation were filed this week by the Penn Star Mining Co., which owns property in the Cherry Creek mining district near Ely and expects to start development in the near future.

The demolishing of the big trestle at Nevada Con.'s concentrator at McGill is now under way. This structure, which was recently condemned as unsafe, contains about $175,000 worth of lumber which will be utilized underground in the Ruth mine. The trestle has been replaced by a grade that runs back of the mill, the crushing plant being situated adjacent to this new grade and being connected with the mill proper by large conveyor belts.

Tonopah—The mines of this district are practically all working at capacity; the Tonopah Belmont is mining about 400 tons of ore per day and the Tonopah Mining, West End and Tonopah Extension mining about 150 tons per day each. In addition, regular development is being performed, with no discoveries of importance reported. The Victor shaft of the Tonopah Extension has reached a total depth of 1910 ft., leaving only 20 ft. to sink before starting to crosscut on the 1,885 level, where the station has already been completed. The Tonopah "76" Co. has announced that development work performed by the West End company in "76" ground totaled 107 ft. in October, all work being in West End rhyolite, which rocks at times forms the foot wall of the Ohio and West End veins. It is planned to prospect the rhyolite by

means of raises in the hope of encountering trachyte, and possibly a vein on the contact. West End profits for October were $48,043.98, derived from 4,897 tons of West End ore, of an average value of $21.82 per ton, and 552 tons of Jim Butler lease ore. In the Rescue mine the east drift on the new discovery on the 1,100 level shows ore for 30 ft. and in the face. The vein is not so wide as when first encountered but is of good grade.

Divide—On the 800 level of the Tonopah Divide mine the southeast drift shows no change. Crosscutting has been resumed on this level.

Manhattan—In the White Caps mine the west orebody has been cut on the 500 level. The ore so far developed has a width of at least 16 ft. and an average value of about $20 per ton. This ore is said to be of much less refractory character than the ore in the east orebody, which contains a high percentage of arsenic. The east orebody is being developed below the 800 level by a winze.

ARIZONA

Washing Plant to Treat Sodium Sulphate for Paper Manufacture

Jerome—The Western Chemical Co. has decided to erect a washing plant on the sodium sulphate deposit near Camp Verde, lately leased from the state. The material heretofore has been hauled to San Pedro, Cal., for cleansing before being shipped to Finland, where it is used in the manufacture of coarser grades of paper. The sulphate, after being ground, floated, precipitated and dried, is sawed into regular blocks and shipped by rail to the seaport. The deposit has been developed by a 50-ft. shaft and by open cuts and several tunnels.

Most of the water flowing from the U. V. Extension tunnel is said to come from the surface. At times the flow has amounted to 1,500 in. and now approximates 500 in. Copper is carried in solution, but so diluted that its recovery by precipitation is hardly practicable.

Bisbee—Stoping operations at the property of the Night Hawk Leasing Co. were discontinued Dec. 1. Development work is being continued on the contract system. Results at this property have been encouraging during the last two months, the ore shipments averaging about 9 per cent copper.

Thus far the Copper Queen and the Calumet & Arizona Mining companies have not laid off any of the men working underground. At the mine of the Arizona Bisbee Copper Co. the drift on the 400 level has passed from limestone into leached material. This ground lies under siliceous croppings on the surface, and further developments are being watched with great interest. At the property of the Higgins Development Co. shipments of ore have been discontinued, and work is being confined to prospecting.

Globe—It is stated that a high degree of success has attended experiments made at the Inspiration mill, at Miami, in handling low-grade carbonate and oxide-copper ores by a new process. It is described as practically a resulphurizing of the crushed ores by means of sulphurous gases, as the charge is passed through chambers. Thereafter, it is told, the ore may be handled successfully by flotation. The necessary surphuric acid is to be made at Miami, by a plant such as that operated by the Calumet & Arizona Co. at Douglas, primarily for the needs of the New Cornelia leaching works at Ajo.

A new vein, about 10 ft. wide, has been cut in the operations of the White Metal property at Pioneer, in the Pinal Mountains, on the line of the old stage road. Parts of the vein are claimed to sample 100 oz. silver. The ledge, the third cut by the new management, lies parallel to the Pioneer ore shoot and is believed even larger and richer. Pioneer camp has known little activity since about 1882, when it had two silver mills in operation.

The Warrior company, on its property beyond Miami, will drill at least three development holes, exploring the Diamond II group.

Humbolt—The 100-ton concentrating mill of the Big Ledge Copper Co. has had its first test run. As soon as metal market conditions warrant, mining and development operations will be resumed, and the plant put into commercial operation.

NEW MEXICO

Steins Pass—The Steins Copper Co., composed of local capitalists, is developing a promising property three miles south of town adjoining the Johnny Bull. C. G. Perry is in charge.

The D. & H. owners are opening a wide area of mineralized ground on the surface, showing good zinc ore. This property adjoins the McGee ground where the main shaft has been sunk to 300 ft. A crosscut of the orebody here shows a width of about 100 ft.

Pinos Altos—The work of dismantling the plant of the Cleveland mine of the Empire Zinc Co. is about completed. This machinery has been installed in the Hanover plant of the same company. It is reported that there are ample ores still in the Cleveland, but those coming in are unprofitable with the present mill.

The Calumet-New Mexico mill, which shut down some time ago on account of the dullness of the zinc market, has started up again, handling dump ores from the Manhattan mine. The ores carry gold, silver, copper.

Silver City—A syndicate of local capitalists has organized the American Fluorspar Co. to develop fluorspar property eighteen miles north of Hatch, N. M., where it holds 240 acres having good spar showings. C. A. Farnsworth, Santa Rita, N. M., is president, Judge Porterfield, vice-president, and C. B. Hickman, secretary-treasurer, both of Silver City. Joseph W. Bible is in charge.

Steeple Rock—Black sulphide of silver has been found 200 ft. from the mouth of the tunnel on the Billali property owned by George F. Utter. This mine adjoins the Norman King, which has produced some very high-grade silver ores.

UTAH

International Exchange Rates Upset Lead Exports—Chief Consolidated Finished 1,900-Ft. Shaft—Smelters Lack Usual Surplus

The Salt Lake Valley smelters, as stated by W. A. Howard, manager of smelters for the United States Smelting Co., have not this year received the usual surplus above capacity from production during the summer months. In other years the smelters have been able to stock fairly large tonnages to make up for the shortage in receipts during the winter months. During the war period of high metal prices most of the large mines marketed their developed ore as rapidly as possible, and development work—owing to the heavy expense—was largely allowed to lapse. The mines were therefore left during the year just ending in a condition such that production could not be much increased. For the same reason the prospecting for and development of new mines was neglected. Prospectors and miners have been unwilling to take up the work of opening up new ground, as the risk is twice as great as in normal times, and also it will cost twice as much to do the work, with a resultant loss—if ore is not found, which happens more often than not—twice as great. The recent advance in freight rates—25 per cent from points outside of the state and 33⅓ per cent on bullion from the smelters to the Eastern market, this latter having had to be charged back to the mining companies at the rate of 1c. for each ounce of silver in their ore and 3c. for each pound of lead paid for—has aggravated the situation and tended further to decrease shipments. The present rate of exchange has caused an influx of considerable lead ordinarily exported. The recent fall in the price of both this metal and silver is a result of the abnormal exchange rates.

Park City—Shipments for the week ended Nov. 5 were 1,843 tons, as compared to 1,634 tons the week preceding.

The Judge company's new office building and bunk house are expected to be completed by Christmas. The Judge properties—now including the Judge proper, the Daly West, Park-Utah and Daly—are furnishing a large weekly tonnage and doing much development work. Besides the ore produced on company account a considerable number of lessees are working in various blocks of ground.

Bingham Canyon—Ore is reported in a drift on the tunnel level of the Silver Shield, 200 ft. south of the old Miracle stope.

Alta—The Columbus-Rexall is developing its territory and saving ore for shipments, which will be made regularly as sooon as the roads are open.

Eureka—Tintic shipments for the week ended Nov. 5 amounted to 166 cars, as compared with 129 cars the week preceding. Those for the week ended Nov. 27 amounted to 173 cars. The increasing output reflects the better labor supply.

The new shaft of the Chief Consolidated has been completed to 1,909 ft. and sinking will be discontinued. Work on the shaft was begun two years ago. It is a double-compartment, concrete-lined shaft. The deepest level from the new shaft will be the 1,880 and drifting will be started soon.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

Ontario Smelting Co. Changes Hands—Skelton Lead & Zinc Closes—Lucky Jew Company To Use Gas Engines

Joplin, Mo.—Jesse G. Starr, of Joplin, has purchased controlling interest in Ontario Smelting Co., whose smelter is near Hockerville, Okla. He will succeed O. Longacre, Jr., of Joplin, as president and manager. F. M. Sparks, of Galena, Kan., will continue as plant superintendent and Harry G. Stephens, of Joplin, will continue as ore buyer. The company will establish a new office in the Independent Building, Joplin, Mo. An investigation this week disclosed that 70 mines are still operating, as against 119 six months ago, and few mines are still operating double shift.

Picher, Okla.—The New York Mining Co. has about completed its new concentrator south of the Black Hawk mine and will start it in operation about Jan. 1. The sludge department includes twelve tables.

Douthat, Okla.—The Skelton Lead & Zinc Co. shut down its eight mills on Nov. 27 and will keep them down indefinitely. Most of the miners employed left the district for the Oklahoma coal fields. The Admiralty Zinc Co. is putting down a new shaft. It will erect a derrick and hopper and connect with its No. 3 mine by surface railroad.

Treece, Kan.—Miners of this section are raising a fund to be matched by the Lucky Jew Mining Co., the whole to be offered as a reward for the arrest and conviction of the murderer of Lloyd Cox, a miner at the Lucky Jew property.

Gas engines are being installed at the Lucky Jew property, replacing steam engines. New equipment includes a 200-hp. engine to operate mill, two 150-hp. engines with Ingersoll-Rand compressors to furnish air, and a 65-hp. engine that will be used to run sludge plant.

Miami, Okla.—A suit against J. F. Robinson and the Commerce Mining & Royalty Co. for $200,000 damages and recision of deed to a valuable tract of mining land in the Oklahoma field was thrown out of court on a demurrer without hearing the evidence of the defendants by Judge E. F. Laster, sitting as special judge at Miami on Nov. 26.

CANADA

Alberta

Edmonton—The existence of an extensive field of high-grade salt at Port McMurray has been definitely established by drillers operating under the direction of the provincial government of Alberta. The drill has been driven through 30 ft. of pure salt at a depth of 650 ft.

British Columbia

Princess Royal Island—Considerable excitement has been created by recent discoveries on Princess Royal Island. There has been quite a bit of staking. Development on some of these new properties will go forward throughout the winter.

Alice Arm—The Moose Group Mining Co., Ltd., of Vancouver, B. C., has done much work in the opening up of its properties and in the construction of a permanent camp. Development has been pushed forward by means of open cuts and the driving of tunnels. The upper tunnel is in 40 ft., with the face in ore. On Nov. 1 the lower tunnel, 310 ft. lower, was in 21 ft. and the vein is now being crosscut. The mineralization shows gray copper, a little galena, and a considerable amount of manganese.

Howe Sound—The Britannia Mining & Smelting Co., Ltd., will discontinue the shipping of concentrate from its mine at Howe Sound to the Tacoma, Wash., smelter until either the price of copper advances or working conditions so change as to make it possible to produce copper at a reasonable profit.

Nelson—Purchase of the Exchequer and Athabasca groups of gold-bearing mineral claims at Nelson, by the California Mining Co., operators of the California group of mines in the same region, was announced by J. W. E. Cassin, president of the California company. The negotiations for the merger of the properties, forming a solid block of claims on Toad Mountain two and a half miles from Nelson, has been in progress for two years.

With the Athabasca group was purchased a 10-stamp mill, cyanide plant, and compressor operated by water power. Mining and development work will be continued on the California and Exchequer groups, and a geologist will make a preliminary survey of the Athabasca group.

Windermere—Mining continues active in the Windermere district. Australian interests have opened the Isaac mine at Briscoe and the same people have reopened the Nip-and-Tuck. From the latter a considerable tonnage of high-grade ore has been packed down from the mine for shipment. The Paradise mine still is producing. It is the most consistent producer of the district.

Poplar Creek—Ores of the Poplar Creek region are being tested by the Tacoma, Wash., smelter. Returns have gone as high as 624 lb. of arsenic to the ton. Without considering the gold values this makes the material of commercial value.

Ontario

Cobalt—The Nipissing mine has shipped a special car of bullion direct to Shanghai. The car contained 193 bars and aggregated 250,865 oz. of silver.

It is understood that the Crown Reserve has decided to explore its claims in Larder Lake by diamond drilling.

The Beaver mine has again resumed operations at full capacity, following a short shutdown, during which the mill was overhauled.

Kerr Lake is sending dump ore to the Dominion Reduction mill at the rate of 3,500 tons a month. The ore averages about 8 oz. to the ton and, at the present rate of treatment, the dump will last two years. One of the veins recently discovered on the surface has been cut at the 90-ft. level, but the values are not encouraging.

The Lake Shore mine, at Kirkland Lake, is still maintaining an average tonnage.

The Ontario Kirkland has opened up some new ore at the 250-ft. level, and general conditions throughout the property are stated to be very satisfactory.

It is understood that plans are under way for the reorganization of the Teck-Hughes. This company had a considerable amount of bonds outstanding, which expired last October, and on which the interest had not been paid for some time. Fears were expressed by some of the shareholders that they would be squeezed out, but it is understood that the plans proposed will protect everybody. The mill is handling about 70 tons of $10 ore per day. This could be increased were it not for the curtailment of power.

Gowganda—The Sanderson Mines Syndicate, the head office of which is in Montreal, has taken over a group of ten claims in the Townships of Lawson, Nicol, Chown and Haultain. A company will be organized with a capital of $3,000,000.

Boston Creek—A. G. Burrows and P. E. Hopkins, of the Provincial Bureau of Mines, have been making an examination of the formation exposed by extensive development at the Miller Independence mine. Considerable attention was given to a study of the "faulting" to be seen at the 500-ft. level, which is probably the continuation of the fracture as found in the "D" or Telluride shaft, where rich showings of gold tellurides were opened.

Manitoba

Rice Lake—At the Gold Seal the shaft is down 182 ft. The vein, which came into the shaft at a depth of 160 ft. is 2 ft. wide. Lateral work will be done when the 210-ft. level is reached.

The survey for the railway to the Flin Flon copper mine, in northern Manitoba, has been begun, with Major Wilcox in charge. The route lies from Mile 7 on the Hudson Bay Ry., to Lake Athapapuskow, a distance of 53 miles, thence on the north side of the lake for 32 miles to the Flin Flon. Four miles of the railway are already built as a spur line of the Hudson Bay Ry.

THE MARKET REPORT

Daily Prices of Metals

Dec	Copper N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc St. L.
2	13.25@13.50	32.00	33.75@34.00	5.00	4.85@5.00	5.60
3	13.35@13.50	33.00	35.00@35.25	5.00	4.85@5.00	5.85
4	13.50	33.00	34.50@34.75	4.90@5.00	4.85@5.00	6.10@6.15
6	13.50@13.75	32.00	34.00@34.25	4.90@5.00	4.75@5.00	6.20
7	13.75	32.50	35.00@35.50	4.90@5.00	4.75@5.00	6.20@6.25
8	13.75	33.25	35.75@36.25	4.90@5.00	4.75@5.00	6.25

*These prices correspond to the following quotations for copper, "delivered": 13.50 @13.75, 13.60@13.75, 13.75, 13.75@14, 14, and 14c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller paya the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.06c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Dec	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
2	78½	78¾	88	214	219	28¾	29½	30½	32¼
3	79¾	80	88½	221	224½	27¼	28	31½	33¼
4									
6	79¾	79½	89½	218½	222½	26½	27½	30¾	32½
7	80½	80	90	223½	227¾	26	26¾	31¾	33
8	81½	81¼	91	225¾	229½	26¼	27	32½	33¾

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Dec	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
2	348	99½	69⅝	44⅜	6	346	99½	68	43⅞
3	347½	99½	70	44¾	7	342¼	99½	65⅞	43⅜
4	346¾	99½	69	44¼	8	344	99½	65⅞	43

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Dec. 8, 1920

A much better feeling exists in the metal market. There seems to be no definite reason other than a desire to discount better business conditions, which are expected by the end of next summer at the latest. Sales of metal have not in general been large, but have been satisfactory as compared with recent business, and prices have tended firmer. There has been considerable speculative demand for copper, lead, and zinc, which would indicate that those who follow the market closely do not expect further marked declines and believe the present strengthening to be not merely a flash in the pan. There is one governing factor, however, which must be kept in mind: European deflation has not progressed to the extent that it has in this country, and should metal prices go much lower in London they would act as a brake on any advancing market here. Zinc, for example, is already not far from the point where it would pay to make importations. London prices have been a little stronger recently, but that this strength will continue is by no means certain. It has also been offset partly by lower sterling quotations.

Copper

An occasional sale of 500 or 1,000 tons has been made recently, but most of the business has been confined to small orders. The total volume has not been great. Producing interests today are holding firmly at 14c. delivered for spot copper, and they are not willing to take less than 14¼c. for delivery in the first quarter. Outsiders have no copper to offer except small lots of spot, and are not cutting prices. Rather, are they anxious to buy at current prices, but producers of course prefer to sell direct into the hands of consumers, so that they are having some difficulty in picking up as much as they would like. Bids of 14¼c., f.o.b. refinery for February shipment, have been made in these quarters and turned down by producers.

Our prices represent metal for delivery during this and next month. For later deliveries a premium of ¼ to ½c would be asked.

Lead

On Friday, Dec. 3, the A. S. & R. official price was reduced from 5.50 to 5c., this being the fifth reduction in less than a month, from 7.25c. On receipt of the news, the outside market did not make the customary recession under the Smelting company's price.

Consumers have come into the market in a very satisfactory manner during the last week, and considerable business has been done. They feel the price to be a satisfactory one, even though they may not be getting in absolutely at the bottom. Electrical and cable companies are among those that have shown the most interest in providing for their requirements. There is little demand for forward metal, and the price is little if any different from that of spot. Supplies for immediate delivery are not large, but appear to be adequate for the present demand.

In St. Louis the market is reported as dull, and Granby and similar brands are offered slightly below the New York price, although from 5 to 5¼c. is asked for chemical lead.

Zinc

The price of zinc has suddenly bounded upward, and demand has been comparatively active at sharply advancing prices. Importation is again being thought of, and Belgian zinc could now be delivered here at 6c. or slightly under. However, it contains too much lead to satisfy most American consumers, and would have to be sold at a discount. Galvanizers are now the principal consumers on the open market. The brass business continues very depressed.

American production of zinc is probably now at the rate of about 250,000 to 275,000 lb. per year, which is somewhat less than the pre-war figure. Belgian production is gaining gradually, but in November was only about 9,000 tons, so the market should not be glutted by over-production even with the Australian metal coming on soon.

Tin

The situation in this metal is practically unchanged locally, though the action of the government of the Federated Malay States in contracting to buy all of the production of those states at not less than $110 per picul (equivalent to about £225, New York or London) is expected to have a stabilizing influence, for about one-third of the world's production will thereby be taken off the market should the price go lower than the present figure.

Straits tin for future delivery: Dec. 2d, 34.75@35c.; 3d, 36@36.50c.; 4th, 35.50@36c.; 6th, 35@35.75c.; 7th, 36@36.75c.; 8th, 37@37.50c.

Arrivals of tin in long tons: Total for November, 3,170. Dec. 1st, China, 10; 4th, London, 10; 6th, Straits, 700; 7th, Straits, 775.

Silver

The trade balance of India, which has been seriously adverse since June of the current year, continues to affect the exchange rate of the rupee, which was quoted today at a new low of 1s. 5¾d. China exchanges are also weak, with the result that demand from that quarter continues apathetic. Silver in New York fell to a new low today at 65⅝c.

Mexican Dollars—Dec. 2d, 53½c.; 3d, 53½c.; 4th, 53½c.; 6th, 52c.; 7th, 50c.; 8th, 50c.

Gold

Gold in London: Dec. 2d, 117s. 4d.; 3d, 117s. 6d.; 6th, 118s. 2d.; 7th, 118s. 9d.; 8th, 118s. 7d.

Foreign Exchange

A tendency toward a general decrease in the value of foreign money was evident during the last week, although the market was narrow. On Tuesday, Dec. 7, francs were 5.88c.; lire, 3.52c.; and marks 1.31c. New York funds in Montreal advanced to 15¾ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c. Outside sales reported at as low as 22c.

Antimony — Chinese and Japanese brands, 5¾@5¾c.; market very quiet; W.C.C. brand, 6½@6¾c. per lb. Cookson's "C" grade, 11@12½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony[1] (200 mesh), 7½c. per lb. Market dull.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 8c.

Bismuth—$2.40 per lb., 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb. Market steady.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100-lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

[1]**Palladium**—$85 per oz.

Platinum—Firm at $85 per oz.; nominal.

Quicksilver—Market quiet; $48@$49 per 75-lb. flask. San Francisco wires $52@$55. Barely steady.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

[1]**Manganese Ore**—45@50c. per unit, seaport; chemical ore (MnO_2) $65@$70 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

[1]**Tungsten Ore**—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.50, f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.25, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 4—Zinc blende, per ton, high, $35.25; basis 60 per cent zinc, premium, $32; Prime Western, $30 @$31; fines and slimes, $30@$27.50; calamine, basis, 40 per cent zinc, $35@ $30. Average settling prices: Blende, $36.73; calamine, $30; all zinc ores, $36.52.

Lead, high, $69.60; basis 80 per cent lead, $75@$47.50; average settling price, $69.27 per ton.

Shipments for the week: Blende, 6,154; calamine, 197; lead, 1,677 tons. Value, all ores the week, $349,150.

Lead dropped from offerings of $55 last week to $47.50 this week. The $75 basis noted was paid in some settlements. Blende dropped to $30 basis, with considerable ore sold, advancing to $31 basis yesterday under pressure of largely increased demand. Purchases were 2,100 tons larger than last week. Approximately 30 per cent of production is suspended owing to the lowest price since December, 1907.

Platteville, Wis., Dec. 4—No ore sales in open market were made this week. The National plant again made the only shipment of high-grade blende, four cars going to the Illinois Zinc Co. and two cars of Prime Western on contract schedule. The National has started its acid department again after three weeks' shutdown. Shipments for the week: Blende, 308; lead, 50 tons. Shipments for the year: Blende, 59,281; calamine, 2,534; lead, 4,523; sulphur ore, 1,342 tons. Shipped during week to separating plants 2,228 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@ $3,500; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@ $75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $8@ $12; washed, $12@$15; powdered, $18@ $22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@ $30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@ $23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

ical or enameling purposes, $60; lump, $17, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$18 per ton carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block; No. 6, 55c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25; all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150 @$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.40 per lb.; No. 2, $1.25. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices being f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18; all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 12@12½c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 17@18c. per lb. of chromium contained; 4 to 6 per cent carbon, 16@17c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $150, freight allowed; $145, f.o.b. seaboard bases; English, $135@ $140, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $60@$65, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2.25@$2.50 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $80@$85; 75 per cent, $160.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 23½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9¾c. in quantity, mill lots.

Nickel Silver — Unchanged at 35¾c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 22½c.; sheathing, 22½c.; rods, ⅜ to 3 in., 19½c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Dec. 7, 1920

Wire products and sheets have followed tin plate, bars, shapes, and plates in the decline of the independent market to the Steel Corporation or Industrial Board level. The independent market on pipe remains at $7 a ton above the Steel Corporation level. The reductions have brought the independents little additional business, nor was it expected that they would.

The Steel Corporation continues to operate substantially as well as formerly, at 85 to 90 per cent of capacity. Independent operations hardly average over 50 per cent, and are declining. There will probably be extensive closings the last week or two of the year, to allow orders to accumulate.

Last Thursday the American Sheet & Tin Plate Co. (Steel Corporation) opened order books for the first half of 1921, at regular prices, $7 for tin plate, 3.55c. for blue annealed sheets, 4.35c. for black sheets and 5.70c. for galvanized sheets, but on account of about three months of work carried over, the new contracts will really be for approximately the second quarter.

Pig Iron—There are offerings of bessemer at $35, Valley, or $2.50 decline, and of basic at $33, or $2 decline. Foundry remains nominally $37.

Semi-finished Steel—The independent market is nominal at about $50 for billets or sheet bars.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls. hardwood, 5½c. per lb., in 250-lb. bbls Barrel charge is 35c. additional.

Connellsville — Furnace, $10@$12; foundry, $8@$10.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Curtailment in the Copper Industry

Relatively Small Decrease in Output So Far—Tendency of Most Producers To Lower Costs Rather Than Production—Surplus Stocks Still Huge and Export Trade Poor

THE extremely low prices of copper are having their inevitable consequences. Operations are being curtailed by some of the country's largest producers, and there is a growing determination in the trade drastically to readjust the industry in an effort to meet the causes of the present depression in the market. This was to be expected, in view of the great forces that have been bearing down upon the price of copper and the impossibility of meeting today's prices by immediately lowering costs.

Ten years ago it was conservatively estimated[1] that no copper can be produced in North America at a profit for less than 10c. per lb. Copper today can be had at 14c. per lb. delivered, so that it is not difficult to realize the situation in which practically every copper company in the country finds itself. It was further estimated ten years ago that 11c. copper meant only half the production for the period; 12c. copper an interchange of a "new dollar for an old one," and at 15c. "the business is profitable and prosperous only to an entirely legitimate degree." Although this estimate should possibly have been slightly modified in 1913 and 1914 by the records of some of our great low-grade porphyry coppers and the results of improvements in the metallurgy of copper during the last ten years, the modification up to the beginning of hostilities would probably not have been large, but at this time an upward revision of perhaps 50 to 75 per cent is evidently necessary. Present costs, based, as they are, on a labor payment compatible with a war price for copper, are very much higher than ten years ago.

To meet the acuteness of the situation producers have taken a logical step. They have begun to curtail their output and to lower their costs through a readjustment of the elements that enter into the cost of production—chiefly labor. Greene Cananea has announced it will suspend operations indefinitely on Dec. 15; North Butte has dropped production two-thirds, or from 1,500,000 to 500,000 lb. monthly, and other announcements are momentarily expected. The desire has been more to decrease wages than to lessen production in meeting the situation. The Copper Range Mining Co. in Michigan has reduced wages about 17 per cent, but the reduction is slightly compensated by concessions in the price of fuel to employees. The American Smelting & Refining Co. has reduced wages 50c. per day at its Tacoma plant, and is considering similar action at the East Helena smelter. Quincy Mining Co., Michigan, has also made a reduction of 15 per cent in wages. Calumet & Hecla has already made a wage cut. The Lake Superior copper mines have no compensating silver production which would help to lower production costs, as in the Butte district, and are relatively high-cost producers. It was but natural that they should first feel the pinch of low copper prices.

Although labor is one of the items that is amenable to a reduction, transportation charges, which have been greatly increased during the last year, admit of only an indirect decrease. Not only have the increased freight rates added to the marketing cost of copper, but to a considerable extent to other items of production cost, as the prices of mine supplies also reflect the increased rail rates. A successful attempt has been made by western companies to ship their product by rail to Pacific Coast ports and then by boat via the Panama Canal to Eastern points.

Operating companies are naturally reluctant to abandon operations entirely, and it is largely a question of what entails the greater cost—a complete shutdown, partly curtailed operations, or production at a rate which produces copper at the cheapest figure but which nevertheless necessitates marketing copper at a certain loss per pound. It is no easy matter to decide exactly what procedure is best suited for the individual mine, particularly as the future price of copper is uncertain. Judging from the announcements of many important companies and partly referred to above, the copper producers in general prefer to decrease their costs by reductions in wages and other items rather than by drastic curtailment. This is not all to be desired, as neither domestic nor export business is upon a scale which bodes well for the industry; whereas production is still above the pre-war rate. In fact, an estimate of October production shows a rate slightly higher than that of September.

MONTHLY SMELTER PRODUCTION OF COPPER IN 1920

In Pounds

		Average New York Price			Average New York Price
Jan.	121,900,000	18.92	July	109,730,000	18.58
Feb.	117,450,000	18.57	Aug.	116,430,000	18.35
Mar.	120,310,000	18.33	Sept.	104,920,000	18.14
Apr.	116,100,000	18.66	Oct.	105,100,000	15.93
May	115,000,000	18.48	Nov.	.....	14.26
June	116,100,000	18.07			

AVERAGE MONTHLY COPPER PRODUCTION

Year	Average Monthly Production	Average New York Yearly Price	Year	Average Monthly Production	Average New York Yearly Price
1910	90,500,000	12.74	1916	162,000,000	27.20
1911	90,500,000	12.38	1917	160,300,000	27.18
1912	103,400,000	16.34	1918	161,500,000	24.63
1913	102,400,000	15.27	1919	100,800,000	18.69
1914	91,000,000	13.60	1920 (a)	114,300,000	
1915	118,600,000	17.28			

(a) Estimated.

A glance at the figures will show how slightly copper production has declined in the current year and that it is still above the pre-war rate.

It is well known that stocks of both refined and crude copper are still very large, and that despite the dent that was made in the copper surplus earlier in the year the stocks are still formidable—in fact, the key to the situation. Estimates vary widely as to their amount, but it is safe to say that there is enough copper in crude and refined form to be equivalent to three-quarters of the normal annual production in this country. Such large stocks carry an interest charge that serves to aggravate the effect of the supply. Consumers are fully aware of the existence of this surplus and the improbability of decreasing it in a short space of time.

It is hoped that foreign trade in raw copper will help to diminish the heavy copper surplus, but from the record made so far this year no hopeful impression is gained. Although earlier in the year exports of copper considerably exceeded imports, of late the trend has changed, and for the last two months reported more copper has been imported than has been exported. During the first ten months of the current year approximately 543,150,000 lb. of copper in various forms was exported. At the same time about 406,440,000 lb. was imported, which leaves a favorable net balance of about one and a half month's production that has been exported—not a very encouraging rate for the period.

How the present policy of the copper industry will meet the situation it is difficult to say. Economic forces have caused the industry to contract its production and will likely cause further contraction, no matter how distasteful the process. There has been a relatively small effort on the part of the country's largest producers to conserve their output by decreasing production, and further curtailment is not only logical but inevitable should present low prices prevail. Until the heavy surplus stocks of copper are lessened, or the foreign exchange situation rights itself, there is no need of producing on a basis which implies satisfying the wants of a world which is not prepared to purchase.

[1] J. R. Finlay's survey in "Cost of Mining."

COMPANY REPORTS

Chino Copper Co. Shows Deficit

Copper: New Mexico

A statement of the operations of Chino Copper Co. for the third quarter of the calendar and fiscal year 1920 shows that the gross production of copper contained in the concentrates from milling operations for this and preceding quarters of the year 1920 was 12,354,752 lb., 11,980,615 lb. and 10,621,276 lb. respectively.

In addition to the copper derived from the concentrating ores, there was a total of 221,462 gross pounds of copper in crude ore shipped direct to the smelter, making the total gross production for the quarter 12,576,214 lb., as compared with 11,989,451 lb. for the second quarter and 10,621,276 lb. for the first quarter. The net production of copper after smelter deductions for the quarter was 12,023,444 lb. as compared with 11,411,178 lb. and 10,159,566 lb. respectively, for the second and first quarters.

The total amount of ore treated for the three months was 498,376 tons, which is an average of 5,417 tons per day. This average daily tonnage is 257 tons per day less than for the second quarter of 1920. The average copper content of the ore treated by the mill for the third quarter was 1.82 per cent copper, as compared with 1.67 per cent copper for the previous quarter.

The recovery per ton of ore milled for the third quarter was 24.79 lb. gross, compared with 23.204 lb. gross for the second quarter. There was produced a total of 36,861 dry tons of concentrates averaging 16.76 per cent copper.

The cost per pound of net copper produced from all sources in the third quarter was 15.01c., compared with 15.90c. for the second quarter. This cost includes plant depreciation and all other items excepting charges for Federal taxes. Income from precious metals and miscellaneous sources amounted to $57,703.13, equivalent to 0.48c. per lb. of net copper produced, which being credited to the cost of producing copper reduces the net cost for the quarter to 14.53c. per lb.

The financial results of the company's operations for the quarter under consideration compared with the second and first quarters of 1920 are shown in the following table:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Net income from copper production only	$51,079.70	$260,031.67	$737,605 40
Miscellaneous income, including payments for precious metals	57,703.13	70,120.39	72,121 75
Total	$108,782 83	$330,152 06	$809,727 15
Distribution to stockholders	326,242.50	326,242 50	326,242 50
Net surplus		$3,909.56	$483,484 65
Net deficit	$217,459.67		

The earnings for the third quarter of 1920 are based on a price for copper of 15.43c. per lb., compared with 18.175c. per lb. for the second quarter of the year. The total net income for the nine months amounted to $1,248,662.04, or $1.435 per share. A distribution to stockholders, amounting to 37½c. per share, was made at the end of the third quarter.

During the quarter there was removed by steam shovels at the Santa Rita mine a total of 1,026,570 cu.yd. of material, equivalent to an average of 342,190 cu.yd. per month, compared with a total of 1,018,784 cu.yd. of material, or an average of 339,595 cu.yd. per month, for the second quarter. Of the total material removed, 688,580 cu.yd. were stripping, the remainder being equivalent to 662,609 tons of ore of an average grade of 1.68 per cent copper, according to mine sampling and assaying. The difference between the tonnage mined and the tonnage milled or shipped direct to the smelter during this quarter is due to oxidized and partly oxidized ore which it was necessary to remove in connection with stripping and mining operations and which was sent to ore stockpiles.

Ray Consolidated Copper Co.

Copper: Arizona

The thirty-seventh quarterly report of Ray Consolidated Copper Co. covering the third quarter of the year 1920 indicates that the gross production of copper contained in concentrates for the third quarter, as compared with the previous quarters of 1920, was 13,029,427 lb., compared with 12,880,605 lb. in the second quarter and 11,547,103 lb. in the first quarter.

The net production of marketable copper derived from this gross output for the quarter, after allowing for smelter deductions, was 12,631,222 lb., as compared with a net production of 12,553,623 lb. for the quarter ended June 30, and of 11,259,534 lb. net for the quarter ended March 31, 1920. During the quarter 443,100 dry tons was milled.

The cost per pound of all net copper produced was 15.47c., including the customary charges to cover depreciation of plant and equipment, all administrative and general expense, and also a fixed charge of 15c. per ton of ore treated for the retirement of mine development expense, and after crediting miscellaneous income (including gold and silver values) amounting to .486c. per lb.

The financial results of operations for the quarter, compared with the previous quarters of 1920, are as follows:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Operating profit or loss (o)	$113,518 89	$343,650 73	$587,165 50
Miscellaneous income	61,369 96	43,604 72	50,134 39
Total (o)	$ 52,148 93	$387,255 45	$637,299 89
Disbursement to stockholders	394,294 75	394,294 75	394,294 75
Net surplus for quarter			$243,005 14
Net deficit for quarter	$446,443.68	$7,039 30	

(o) Loss.

The average carrying price of copper for the quarter was 15.057c., as compared with 18.426c. for the previous quarter. All costs as shown and the financial results as stated are exclusive of any charge for or reserves set up to cover Federal income and profits taxes. A quarterly distribution to stockholders of 25c. per share was made Sept. 30, 1920.

Mining Dividends for November, 1920

The following is a partial list of dividends paid by mining companies during November, 1920.

Mining and Metallurgical Companies of U. S.	Location	Per Share	Totals
American Zinc, Lead & Smelting, pfd	U. S.	$1 50Q	$120,810 00
Anaconda Copper Mining	Mont.	1 00Q	2,331,250 00
Chief Consolidated Mining, c	Utah	10Q	88,422 30
International Nickel, pfd.	U. S.-Can.	1 50Q	133,689 00
Miami Copper	Ariz.	50Q	373,557 00
Mohawk Mining, c.	Mich.	1 00Q	100 000 00
New Jersey Zinc	U. S.	4 00Q	1,680 000 00
United Verde Exten., c.	Ariz.	50Q	525,000 00
Utah-Apex Mining, c.	Utah	25K	132,050 00
Mining and Metallurgical Companies of Canada and Mexico			
Amparo Mining, g. s.	Mexico	05QX	100,000 00
Conagas Mines, Ltd., s.	Ontario	12½Q	100 000 00
El Oro Mining & Ry., g. s.	Mexico	1 sh.	£57 375 00
Greene-Cananea Copper	Mexico	.50Q	$250,000 00
Hollinger Consol. Gold	Ontario	05X	246,000 00

A, Annually. Q, Quarterly. X, Extra. K, Irregular.

American Zinc, Lead & Smelting Co. failed to declare a dividend on its common stock at this time, and the condition of the copper market has caused Calumet & Hecla to withhold a dividend declaration usually made, and Mohawk Mining to drop to $1, from the $1.50 paid in August. On the other hand, Utah-Apex Mining resumes after an interval of two years, and Amparo Mining maintains its extra of 2c. El Oro is still able to pay its annual shilling (tax free), and Hollinger Consolidated Gold Mines, Ltd., of Canada, is able to bring out 5c. extra, in addition to the regular bimonthly payment made in October. Arizona Copper Co., Ltd., voted on Nov. 17 not to pay an interim dividend.

MINING STOCKS

Week Ended December 4, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	*60	*50	*50	
Ahmeek	Boston	49	46½	46½	Sept. '20, Q .50
Alaska-B.C.	N. Y. Curb				
Alouez	Boston	19½	18½	18½	Mar. '19, 1.00
Anaconda	N. Y.	40½	38½	38	Nov. '20, Q 1.00
Ariz. Com'l	Boston	7½	6	7½	Oct. '18, .50
Big Ledge	N. Y. Curb				
Bingham Mines	Boston	10	8½	8½	Sept. '19, Q .25
Calumet & Ariz.	Boston	46	44½	45	Sept. '20, Q 1.00
Calumet & Hecla	Boston	247	230	230	June '20, Q 5.00
Canada Copper	N. Y. Curb			*20	
Centennial	Boston			7½	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	33½	29½	29½	Dec '20, Q 1.00
Chief Consol.	Boston Curb	3½	3	3½	Nov. '20, Q .10
Chile Copper	N. Y.	12½	7	9	
Chino	N. Y.	19½	18¾	18½	Sept. '20, Q .37½
Colu mbus Rexall	Salt Lake	*35	*34½	*34½	
Con. Ariz.	N. Y. Curb				Dec. '18, Q .05
Con. Copper M.	N. Y. Curb			2½	
Copper Range	Boston	28½	27	27½	Sept. '20, Q .50
Crystal Copper	Boston Curb	*46	*41	*44	
Davis-Daly	Boston	6	5¾	5½	Mar. '20, Q .25
East Butte	Boston	8½	8	8	Dec. '19, A .50
First Nat'l	Boston Curb	*80	*78	*78	Feb. '19, SA .15
Franklin	Boston	2½	2½	2½	
Gadsden Copper	N. Y. Curb			*70	
Granby Consol.	N. Y.	20½	19	20	May '19, Q 1.25
Greene Cananea	N. Y.	23	20½	20½	Nov. '20, Q .50
Hancock	Boston			3	
Houghton	Boston Curb			*45	
Howe Sound	N. Y. Curb	2½	2½	2½	Oct. '20, Q .05
Insp iration Con.	N. Y.	34½	32	32½	Oct. '20, Q 1.00
Iron Cap	Boston Curb	7	6	7	Sept. '20, K .25
Isle Royale	Boston	21	19½	21	Sept. '19, SA .50
Kennecott	N. Y.	19½	18½	18½	Sept. '20, Q .50
Keweenaw	Boston	1½	1¼	1¼	
Lake Copper	Boston	2½	2	2½	
La Salle	Boston	2	1½	1½	
Magma Chief	N. Y. Curb			*21	
Magma Copper	N. Y. Curb	20½	19	19½	Jan. '19, Q .50
Majestic	Boston Curb	*12	*11	*12	
Mason Valley	Boston	*99	*99	*99	
Mass Consol	Boston	2½	2	2	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	3½	3½	3½	
Miami	N. Y.	17	16	16½	Nov. '20, Q .50
Michigan	Boston			2½	
Mohawk	Boston	46	43½	44	Nov. '20, Q 1.00
Mother Lode (new)	N. Y. Curb	5½	5½	5½	
Nevada Con	N. Y.	9½	8½	9	Sept. '20, Q .25
New Arcadian	Boston			2½	
New Baltic	Boston Curb			3	
New Cornelia	Boston	15½	15	15½	Aug. '20, .25
Nixon Nev.	N. Y. Curb			*5	
North Butte	Boston	10½	10	10½	Oct. '18, Q .25
North Lake	Boston	*25	*25	*25	
Obio Copper	N. Y. Curb			1¼	
Oilbway	Boston			1½	
Old Dominion	Boston	19½	17½	17½	Dec. '18 Q 1.00
Osceola	Boston	23½	22	23	June '20, Q .50
Phelps Dodge	Open Mar.	†175	†150		Oct. '20, Q 2.50
Quincy	Boston	39	35	35	Sept. '20, Q 1.00
Ray Con	N. Y.	12	11	11½	June '20, Q .25
Ray Hercules	Boston Curb			*61	
St. Mary's M. L.	Boston	31	29	30	June '20, K 2.00
Seneca Copper	Boston	17½	17½	17½	
Shannon	Boston	1	1	1	Nov. '17, Q .25
Shattuck Ariz.	N. Y.	5½	5½	5½	Jan. '20 Q .25
South Lake	Boston		2		
South Utah	Boston	*8	*6	*6	
Superior Copper	Boston	4	3½	4	Apr. '17, 1.00
Superior & Boston	Boston	2	1¾	1¾	
Tenn. C. & C.	N. Y.	8½	7¾	8½	May '18, I 1.00
Tuolumne	Boston	*40	*33	*40	May '13, .10
United Verde Ex.	Boston Curb	25	23	24	Nov. '20, Q .50
Utah Consol	Boston	3½	3	3½	Sept. '18, .25
Utah Copper	N. Y.	52	50½	52	Sept. '20, Q 1.50
Utah M. & T.	Boston	1½	1	1	Dec. '17, .30
Victoria	Boston	1½	1½	1½	
Winona	Boston	*50	*35	*35	
Wolverine	Boston	10½	10	10	Jan. '20, Q .50
LEAD					
Heca Mining	N. Y. Curb	4½	4¾	4½	Sept '20, QX .15
St. Joseph Lead	N. Y.	14	13½	13½	Sept '20, QX .50
Stewart	Boston Curb	*10	*10	*10	Dec. '15, .05
Utah Apex	Boston	3½	2½	3½	Nov. '20, K .25
ZINC					
Am. Z. L. & S.	N. Y.	7½	7	7½	May '17, 1.00
Am. Z. L. & S pf.	N. Y.	32	31½	31½	Nov. '20, Q 1.50
Butte C. & Z.	N. Y.	5½	5½	5½	June 18, I .50
Butte & Superior	N. Y.	11½	10½	11	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	8	7½	7½	Sept. '20, Q .50
New Jersey Z.	N. Y. Curb	151	147	147	Nov. '20, Q 4.00
Success	N. Y. Curb	2½	1½	2	July '16, .03
Yellow Pine	Los Angeles	*50	*50	*50	June '20, Q .03

Stock	Exch.	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1½	1	1½	
Alaska Juneau	N. Y.	1½	1½	1½	
Carson Hill	N. Y. Curb			22½	
Cresson Consol. G.	N. Y. Curb	1½	1½	1½	June '20, Q .10
Dome Ex.	Toronto	*45	*45	*45	
Dome Mines	N. Y.	11½	11¼	11¼	Oct. '20, Q .25
Golden Cycle	Colo. Sprgs.			*73	Sept. '20, Q .02
Goldfield Con.	N. Y. Curb	*7½	*6	*7	Dec. '19, .05
Hedley	Boston			4½	June '19, .10
Hollinger Con.	Toronto	5 70	5 55	5 55	Dec. '20, BM .05
Homestake	N. Y.	53	52	53	Sept. '19, .50
Kirkland Lake	Toronto	*40½	*38	*38	
Lake Shore	Toronto	1 05	1 02	1 05	Oct. '20, K .02
McIntyre-Porcupine	Toronto	1 93	1 87	1 88	Sept '20, K .05
Porcupine Crown	Toronto	*20	*19	*19	July '17, .03
Portland	Colo. Sprgs.			*60	Oct. '20, Q .01½
Reorgan. Booth	N. Y. Curb	*4	*2½	4	May '19, .05
Silver Pick	N. Y. Curb	*¾	*1	*6	
Teck Hughes	Toronto	*7	*6½	*7	
Tom Reed	Los Angeles	1 45	1 35	1 38	Dec. '19, .02
United Eastern	N. Y. Curb	2¼	2½	2½	Oct. '20, Q .15
Vindicator Consol.	Colo. Sprgs.			*18	Jan. '20, Q .01
West Dome Consol	Toronto	*6½	*5½	*5½	
White Cape Min.	N. Y. Curb	*8	*7	*8	
Yukon Gold	Boston Curb			1½	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*23	*16	*21	Apr '20, M .03
Beaver Con.	Toronto	*34	30	30	May '20, K .03
Coniagas	Toronto	2.00	2 00	2 00	Nov. '20, Q .12½
Crown Reserve	Toronto	*19½	*19	*19	Jan. '17, .05
Kerr Lake	Bostoo	3	2¾	2¾	Oct. '20, K .12½
La Rose	Toronto	†*26	†*24	*30	Apr. '18, .02
McKinley-Dar.	Toronto	*43	*25	*25	Oct. '20, Q .03
Mining Corp.	Toronto	1 67	1 10	1 25	Sept '20, Q .12½
Nipissing	N. Y. Curb	8½	8½	8¾	Oct. '20, QX .50
Ontario Silver	N. Y.	4½	4½	4½	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅞	¾	⅞	Jan. '12, .10
Peterson Lake	Toronto	*11	*10½	*11	Jan. '17, .01½
Temiskaming	Toronto	*26	*25	*25	Jan. '20, K .04
Tretbewey	Toronto	*23	*18½	*18½	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	*1½	*1	*1½	
Barnes-King	Butte			1.11	Aug. '20, Q .05
Bost. & Mont.	Boston			*63	
Cashboy	N. Y. Curb	*7½	*6	*6½	
El Salvador	N. Y. Curb	⅝	½	½	
Jim Butler	N. Y. Curb	*17	*15	*17	Aug. '18, SA .02
Jumbo Extension	N. Y. Curb	*8½	*4½	*5	June '16, .05
Louisiana Con.	N. Y. Curb			½	
MacNamara M.	N. Y. Curb	½	⅜	½	May '10, .02½
N.Y. Hond. Rosar	Open Mar.	†11½	19½		Oct. '20, QX .50
Tonopah-Belmont	N. Y. Curb	1½	1¼	1½	Oct. '20, Q .05
Tonopah-Divide	N. Y. Curb	1½	1⅜	1⅜	
Tonopah Ex.	N. Y. Curb	1⅝	1½	1½	Oct. '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1	1⅛	Oct. '20, SA .05
West End Con.	N. Y. Curb	1⅝	1	1⅛	Dec. '19 SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*19	*16	*17	July, '20, M .01
Consol. M & S.	Montreal	18½	15½	18	Oct. '20, Q .62½
Daly Mining	Salt Lake	2.00	2.00	2 00	July '20, Q .10
Daly-West	Salt Lake	4½	4½	4½	Oct. '20, Q .25
Eagle & Blue Bell	Boston Curb	2½	2⅛	2⅛	Apr. '20, Q .10
Electric Point	Spokane	†*10	†*4	*12	May '20, SA .03
Fed. M. & S.	N. Y.	6	6	6	Jan. '09, 1.50
Fed. M. & S. pf.	N. Y.	28	28	28	Sept. '20, Q 1.75
Florence Silver	Spokane	†*20	†*20	*25	Apr. '19, .01½
Grand Central	Salt Lake			*37½	June '20, K .03
Iron Blossom	N. Y. Curb			½	Oct. '20, Q .02½
Judge M. & S.	Salt Lake			3.82½	Sept. '20, Q .12½
Marsh Mines	N. Y. Curb	*10	*8	*9	
Prince Consol.	N. Y. Curb	⅛	⅛	⅛	Nov. '17, .02½
Rambler-Cariboo	Spokane	*8	*7½	*7½	Feb. 19, .01
Rex Con.	N. Y. Curb	*5	*4	*5	
South Eureka	Salt Lake			*70	Sept. '19, K .15
Stand. S. L.	N. Y. Curb	⅜	⅛	⅛	Oct. '17, .05
Tamarack-Custer	Spokane	2 00	2 00	2 00	Dec. '19, K .03
Tintic Standard	Salt Lake	3.75	3 52½	3 65	June '20, Q .10
Wilbert Mining	N. Y. Curb	*2½	*1½	*1½	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	15	14	14½	Mar. '19, .50
Internat'l Nick.pf.	N. Y.			83	Nov. '20, Q 1.50
QUICKSILVER					
New Idria	Boston	1½	1⅛	1½	Jan '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb	*5	*5	*5	
VANADIUM					
Vanadium Corp.	N. Y.	45	39½	44½	Oct. '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	82	77	82	Oct. '20, Q 1.50
Asbestos Corp. pf.	Montreal	92	90½	90½	Oct. '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	46½	44	46½	Sept. '20, Q 1.00
Am. S. & R.pf.	N. Y.	88	87	87	Dec. '20, Q 1.25
Am. Sm. pf. A	N. Y.	72	71	71	Oct. '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	43	41½	42	Oct. '20, Q 1.50
U.S.S.R.& M. pf.	Boston	43	40½	42	Oct. '20, Q .87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q, Quarterly.
SA, Semi-annually. BM, bimonthly. K, Irregular. I, Ioitial. X, includes extra

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Volume 110 New York, December 18, 1920 *Number* 25

The Close of the War Minerals Relief Commission

SECRETARY PAYNE of the Interior Department advises that up to Nov. 27 the War Minerals Relief Commission had made recommendations in 1,124 cases out of 1,203 legally before it, and in all has made awards of something over two million dollars on claims asking nearly sixteen million. The remaining eighty-three claims cover an asked-for amount of less than one million. The total amount appropriated by Congress as a figure which must not be exceeded, it will be remembered, was eight and a half million, so that at least five million dollars will remain unexpended when the commission is through with its work, which it expects to be within sixty to ninety days. It is to be hoped that the Secretary will at once return to the Treasury the five million credit remaining for him to draw on, and will a few months later add the odd change remaining, which will be probably in the neighborhood of half a million dollars. This will complete the record of prompt and decisive meeting of problems which has characterized this war minerals matter from the start.

Congress put the adjudication of these claims up to the Secretary of the Interior, without appeal, because it was of the opinion that if referred to the Court of Claims they would drag interminably. Beyond question, the Secretary and his appointees have justified the shrewd judgment of Congress. It is a highly creditable achievement to have disposed of over 1,100 claims in a little over a year, with adequate engineering, auditing, legal, and equitable investigation of each. The examining staff has consisted of experienced mining engineers and the auditing staff of especially selected and experienced mine accountants; and of the commission, two are mining engineers who make their living out of their profession, and the third is an old and tried favorite son of a mining state.

None of the commissioners had any hand in the Government's mineral policy during the war. A more ideal tribunal could not be imagined, and certainly not one to which the mining industry could look with more confidence. No doubt the claimants, with the characteristic sportsmanship of the profession, will thank the Secretary's organization for prompt and just awards, and forget the claims which the commission has found invalid. And we hope that the matter may be closed with a vote of appreciation to the Government for its equitably-meant handling of the war and post-war problems regarding minerals, and that claimants, individually or collectively, will not seek to prolong the matter indefinitely, by securing the permission of Congress to drag out a miserable existence in the Court of Claims.

The Court of Claims is, from the standpoint of fitness and intelligence for these special cases, an inferior tribunal, as it has not the special knowledge concerning the questions involved possessed by the organization which has handled them, and which will never again be available, since it is now breaking up. Furthermore, we are claiming nowadays that the engineer can solve general questions more promptly and equitably than the lawyer, who has long held the reins over us in public life. The record of the handling of the war minerals problem justifies the claim; therefore let us not turn the remains which the engineers have rejected over to the lawyers, to whom procrastination is a source of income.

The Price of Copper in Canada

RECENTLY we were drawn into a discussion as to whether or not the Canadian government paid a bounty on copper refined within the dominion. Several mining men here in New York were very sure that this was being done, and we were informed that it amounted to 1½c. per lb. and had been in effect for about one year. However, inquiry from the Minister of Mines at Ottawa brought the reply that no such bounty under that or any other name is paid by the dominion government or, as far as his information went, by any of the provincial governments. This, of course, proved that any federal bounty was a myth, but looking into the subject further, we found that a Canadian smelter or refiner who settles on a basis of the New York price does enjoy a premium, and we believe the true state of affairs should be known.

Each week the *Canadian Mining Journal* publishes the price of electrolytic copper in Montreal. On Dec. 1 this price was 18.75c. and the New York quotation on the same day was 13.25c. Why this great difference? It is accounted for in this way: Canada imposes an import duty of 1½c. per lb. on copper in blocks, ingots or pigs, and 10 per cent on semi-manufactured forms. As the country consumes, or did in 1918, three or four times as much refined copper as it produces, this 1½c. must be added to the New York price. Then there is the matter of exchange. On Dec. 1 New York funds in Montreal were quoted at approximately 13¼ per cent premium. This would be equivalent to 1.8c. on a pound of 13¼c. copper. Freight would be approximately ¼c. Also, we are reliably informed, though we have not confirmed it, there is an excise tax of 1 per cent on imported copper. This would amount to only about 0.1c. per lb. Summing these up, we have 3.9c. as a differential for copper in Montreal compared with New York, or, with the New York price 13.25c., we would expect the Canadian price to be 17.15c. This is not quite 18.75c., but we hear that Montreal dealers actually sell for less than the figure published by the *Canadian Mining Journal*, which is only supposed to represent less-than-carload lots. It would probably be safe to assume that with the current rates of exchange, Canadian producers would be able to sell their copper for about 4.5c. above the New York price. Freight, of course, say from the Trail

refinery to Toronto or Montreal would be an item of some importance, so that Western refiners would not net as large a premium as this over the New York price.

Curbing Cagliostro

THE way of the bogus stock promoter is hard, but, nevertheless, the field of this modern Cagliostro remains to a considerable degree fertile. His latest invasion is—by virtue of the fact that the unsuspecting public is still very much in the dark concerning it—the promotion of oil-shale stock. What argument could be more persuasive to the gullible prospect, than the mere statement that, though our petroleum resources are dwindling, untold quantities of shale oil await only the investments of those shrewd enough to get in "on the ground floor"? We are invited to take heart, to cease listening to the idle chatter of the pessimist, for, lo and behold, the opportunity of the ages has come, and oil shale—millions of tons of it—is to take the place of our "wasting resources." The prospective investor is shown magnificent mountain views, disclosing a veritable treasure-trove in the form of oil-bearing rock; also photographs of well-ordered plants in full operation, and, hypnotized by the dazzling prospect of out-rivaling a Standard Oil magnate, the stupefied victim subscribes. He is not advised, of course, that a direct air route between the Colorado mountains and the oil-shale refineries of Scotland has not yet been established.

After having pointed out the devious workings of the nefarious promoter for a number of years, we are inclined to take exception to the statement made by David Eliot Day, in his article "Oil Shale and the Engineer," on page 1182, that, "The time for promotion schemes has passed." True, as he says, it is "becoming more difficult"; but it is our general observation that the narrower the eye of the needle the thinner and smoother becomes the promoter. And it is unreasonable to suppose that those of the light-fingered gentry are going to lose the opportunity to make the most of this latest experimentation.

No doubt there will be ample opportunities in the oil-shale industry for legitimate stock issues, but at the present time there is little to attract the moderate and conservative investor, and the experimental and development work will necessarily have to be backed by large financial interests. Such concerns make haste slowly, and usually build on a firm foundation.

Philanthropically speaking, however, we wish that Mr. Day's paper might be accorded wide dissemination in the non-technical press, for he has outlined in excellent fashion the several problems that must be met before the commercial production of oil from shales in this country may be practicably realized. A careful reading is sufficient to convince the most skeptical as to the fallacy of the arguments produced by the spell-binders.

The Unreliability of Iron as a Trade Barometer

THE rapid and striking decline in the price of most commodities was initiated so swiftly that most people, unprepared for the sudden change, were dumfounded. Their unpreparedness might very possibly have been induced by an incorrect reasoning as to the state and effect of underlying economic conditions in this period of readjustment. In other words, their barometer didn't function properly and failed to indicate the advent of an impending storm. It could easily have been the fault of the barometer, as, judging from the indicators that are ordinarily used in forecasting the ups and downs in the general price trend of commodities, it is exceedingly easy to be led astray.

For example, pig iron has been hailed as the exponent of barometrical perfection. Yet glance at the present price of the several grades of pig iron. It has budged but slightly from its high of last September, and compared with copper, lead, zinc, wheat, cotton, leather, and a multitude of other materials, the decline is relatively small. It may be gainsaid that the present period is so abnormal that it is logical to find an exception to what is merely a generality. Perhaps there is something in such reasoning, but from our own observation, consisting, for one thing, of a comparison between the price of pig iron and copper for a span of years, copper has been much more sensitive than pig iron in reflecting impending market changes—and sensitiveness is the paramount essential of a good barometer.

On page 1197 will be found curves comparing the price of basic pig iron with that of New York electrolytic copper, from which the fluctuations in each are clearly apparent.

During the last ten years, pig iron has lagged from one to thirteen months in failing to reflect the market trend in the metals, as compared with copper. In the last twelve critical months, copper has come down in an almost unbroken descent. Pig iron delayed its decline until September of this year; and if pre-war conditions are any criterion of the limit of the drop in metals—it is difficult to determine what is a criterion these days—pig iron is due for a mighty fall.

No doubt it is hazardous to rely upon one single indication in predicting a general trend. Statistical organizations and banks which make a practice of forecasting a trade cycle study railroad earnings, bank clearings and bank conditions, crops, the prosperity of the iron and steel industry, and other economic factors which are considered fundamental. They feature a service founded upon a compilation of such information and call it a business barometer. The average man, however, is more interested in singling out one commodity which is most likely sensitively to reflect a price trend. The pig-iron "barometer" is either exceedingly sluggish or requires calibration—at any rate, our faith in its reliability has been sadly shaken and the reputation of copper considerably enhanced.

Many commodities are endowed with a barometrical halo. Silver is a common example, and it has borne this dignity unusually well. Singularly enough, the price of silver has fluctuated very sensitively with the price of other metals. We have confidence in silver. Its gradual price descent from its phenomenal high of last February not only began earlier than the decline in most other commodities, but has kept abreast of the trend. After the price descent crossed the dollar line, artificial conditions affected its capacity as a barometer.

There are other choices. We recently read in a Bureau of Mines bulletin that "In recent years in the United States, especially in the East, the demand for sulphuric acid for chemical and metallurgical industries has been an accurate and sensitive barometer of general business conditions. The demand for acid responds much more quickly to a general slump or boom in the industrial world than does the demand for iron and steel." Which would indicate that there are other pet barometers—and a lack of faith in pig iron. Which one do you use?

WHAT OTHERS THINK

The Reconciliation of Science and Law

YOUR editorial comment in a recent issue is an excellent illustration of the state of unpreparedness with which some of our editorial critics enter upon the discussion of apex litigation. Many of your readers are sufficiently familiar with the subject to perceive at once the unstable basis for your criticisms and to lay aside your strictures with a smile. But others not so well advised are liable to gain a false impression and to find real wisdom in your sophistries. For their benefit it seems advisable for me to reply.

Having in mind only the textbook definitions and imbued solely with scientific conceptions, you fail to realize that the Federal mining laws and the construction placed upon them by the courts have in many instances compelled the geologist to modify his preconceived and perhaps more scientific definitions.

Let us first glance at the statute itself and then read what the courts have said. The act of May 10, 1872, provides that "all mineral deposits in land belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase by citizens of the United States." Section 2 provides for the location of mining claims "upon veins or lodes of quartz or other rock in place, bearing gold, silver, cinnabar, lead, tin, copper, or other valuable deposits."

Section 3 provides "that the locators of all mining locations . . . on any mineral, vein, lode or ledge situated on the public domain . . . shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their location, and of all veins, lodes or ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of said surface locations." And that is the whole substance of the vexatious extralateral right law. But the courts have been called upon to interpret this law between conflicting claimants. They have given us definitions and rules for our guidance.

More than forty years ago we were told by Justice Field of the United States Supreme Court that "these acts were not drawn by geologists or for geologists; they were not framed in the interest of science and consequently with scientific accuracy in the use of terms. They were framed for the protection of miners in the claims which they had located and developed, and should receive such a construction as will carry out this purpose. The use of the terms 'vein' and 'lode' in connection with each other in the act of 1866, and their use in connection with the term 'ledge' in the act of 1872, would seem to indicate that it was the object of the legislator to avoid any limitations in the application of the acts which a scientific definition of any one of these terms might impose." This language has been frequently quoted with approval by other courts.

The statute refers to "any mineral, vein, lode or ledge" and grants the extralateral right to all such. The dictionaries define these terms in somewhat various ways, among which we find "ledge" defined by the Standard Dictionary as "a metal-bearing rock stratum; a quartz vein."

Von Cotta says, "Veins are aggregations of mineral matter in fissures of rocks. Lodes are therefore aggregations of mineral matter containing ore in fissures."

Dr. R. W. Raymond, many years ago, in one of the first great apex cases, testfied that "The miners made the definition first. As used by the miners, before being defined by any authority, the term 'lode' simply meant that formation by which the miner could be led or guided. It is an alteration of the verb 'lead,' and whatever the miner could follow, expecting to find ore, was his lode. Some formation within which he could find ore, and out of which he could not expect to find ore, was his lode." (Eureka case, 4th Sawyer, 302, 311.) He also refers to the fact that cinnabar is one of the minerals locatable under the statute, and this mineral occurs not in fissure veins but "as impregnations and masses of ore distributed through zones of rock."

Dr. T. Sterry Hunt, an eminent geologist and in 1877 president of the American Institute of Mining Engineers, testified in this same case as follows:

> That this whole mass of rock is impregnated with ore; that although the great mass of ore stretches for a long distance above horizontally and along an incline down the foot wall, as I have traced it, from this deposit you can also trace the ore into a succession of great cavities or bonanzas lying irregularly across the limestone and into smaller caverns or chasms of the same sort; and that the whole mass of the limestone is irregularly impregnated with the ore. I use the word "impregnation" in the sense that it has penetrated here and there; little patches and stains, ore-vugs and caverns and spaces of all sizes and all shapes, irregularly disseminated through the mass. I conclude, therefore, that this great mass of ore is, in the proper sense of the word, a great "lode," or a great "vein," in the sense in which the word is used by miners; and that practically the only way of utilizing this deposit is to treat the whole of it as one great ore-bearing lode or mass of rock.

Dr. C. Le Neve Foster in speaking of the Great Flat Lode in Cornwall says that it is in the main a band of altered rock and that perhaps half the tin ore of the country is obtained from tabular masses of stanniferous altered granite and concludes that "the term lode or mineral vein should include not only the contents of fissures but also such tabular masses of metalliferous rock."

Our great textbook writer on mining law, the late lamented Curtis H. Lindley, says that the terms lode and vein are legal equivalents, and quotes with approval Ross E. Brown's language as follows:

> Originally the word "vein" was narrow in its significance, defining a single clearly marked seam or fissure-filling in the country rock. The word "lode" was a broader term, applied not only to ore-bearing veins in a narrow sense but to various more complicated forms of ore deposits as well.
>
> Under the influence of the mining acts of Congress it has gradually become more and more customary to use the two terms synonymously and to give to the word "vein" the broad definition that would formerly have been regarded

as more properly applicable to the word "lode." Still, the custom is not rigid, and the miner, as a rule, continues to make certain distinctions in the use of the terms. For example, when his deposit contains separate parallel seams, or sheets, of ore, and he regards the whole as a unit, he may call it either a lode or a vein, but the separate sheets he designates as distinct veins within the limits of his lode. He calls the entire mass vein-matter, and his conception is that the word "vein" refers either to the entire mass or to narrow streaks within the mass, while the word "lode" always refers to the entire mass.

In a very general way a lode may be described as a mass of mineralized rock in place, the word "mineral" referring only to commercially valuable constituents. The form is usually more or less tabular or sheet-like, but occasionally too irregular to fit such description.

Now let us see how the courts have treated this subject: In the first place we note that they have been forced to admit that "what constitutes a lode, or vein, of mineral matter has been no easy thing to define." (116 U. S. 529.) One of the earliest court definitions was given in the Eureka case, decided in 1877 (4 Sawyer, 302, 311; 8 Federal cases 4548):

We are of the opinion that the term (lode) as used in the acts of Congress is applicable to any zone or belt of mineralized rock lying within boundaries clearly separating it from the neighboring rock. It includes' . . . all deposits of mineral matter found through a mineralized zone, or belt, coming from the same source, impressed with the same forms, and appearing to have been created by the same processes.

And as Judge Johnson points out in his opinion in the Highland Boy case:

There was a wedge-shaped zone of limestone dipping into the mountain for a distance slightly exceeding a mile lying between quartzite and shale beds which at the east end of the zone approach so closely as to be separated by a bare seam less than an inch in width. From that point they diverged until on the surface in the Eureka mine they were about 500 ft. apart, and on the surface in the Richmond mine about 800 ft. In this limestone zone at different places throughout its length and in various forms, mineral was found, sometimes in a series or succession of orebodies more or less closely connected, sometimes in apparently isolated chambers, and at other times in what would seem to be scattered grains. This limestone zone was broken up, crushed, disintegrated and fissured in all directions so as to destroy, except in places of a few feet each, so far as exploration showed, all traces of stratification.

From a consideration of all the court decisions Lindley finds that "a lode or vein is a body of mineral, or mineral-bearing rock, within defined boundaries in the general mass of the mountain. . . . With ore in mass and position in the body of the mountain no other fact is required to prove the existence of a lode or the dimensions of the ore. As far as it prevails the ore is a lode; and it is not at all necessary to decide any question of fissures, contacts, selvages, slickensides, or other marks of distinction in order to establish its character. . . . It has sometimes been contended that the lode must have a certain position in the earth; that is to say, it must be more or less vertical before this rule which is given in the act of Congress can be applied; but we have heretofore held, and we are still of the opinion, that it applies to all lodes which have an inclination below the plane of the horizon, whatever it may be." (Federal Cases, No. 8158.)

Judge Hawley in the Ninth Circuit Federal Court, after reviewing most of the decisions on the subject, spoke as follows:

This statute was intended to be liberal and broad enough to apply to any kind of a lode or vein of quartz or other rock bearing mineral, in whatever kind, character or formation the mineral might be found. (58 Fed. 106, 120.)

And in a later case, speaking for the Circuit Court of Appeals:

When a locator of a mining claim finds rock in place containing mineral in sufficient quantity to justify him in expending his time and money in prospecting and developing the claim he has made a discovery within the meaning of the statute, whether the rock or earth is rich or poor, whether it assays high or low. (77 Fed. 249, 255.)

In Steven vs. Williams is found the following by Judge Hallett:

As to the word "vein," or "lode," it seems to me that these words may embrace any description of deposit which is so situated in the general mass of the country, whether it is described in any one way or another; that is to say, whether in the language of the geologist we say it is a bed, or a segregated vein, or gash vein, or true fissure vein, or merely a deposit. . . . Whenever a miner finds a valuable mineral deposit in the body of the earth (in place) he calls that a lode, whatever its form may be, and however it may be situated, and whatever its extent in the body of the earth.

The same judge, in another case, held that an impregnation to the extent to which it may be traced as a body of ore is as fully within the broad terms of the act of Congress as any other form of deposit. (29 Fed. 347, 353.)

The Supreme Court of Colorado speaks as follows:

Many definitions of veins have been given, varying according to the facts under consideration. The term is not susceptible of an arbitrary definition applicable to every case. It must be controlled in a measure at least by the conditions of locality and deposit. The distinguishing feature between a vein and the formation inclosing it may be visible. It must have boundaries, but it is not necessary that they be seen. Their existence may be determined by assay and analysis. The controlling characteristic of a vein is a continuous body of mineral-bearing rock in place in the general mass of the surrounding formation. (47 Colo. 473.)

The Land Department of the United States says:

By the term "vein" or "lode" . . . it is not to be understood as having had in mind merely a typical fissure or contact vein, but rather any fairly well defined zone of mineral-bearing rock in place. (40 Land Dept. Rep. 271.)

In the case of Lawson against the United States Mining Co. the United States Supreme Court sustained the finding of the Circuit Court of Appeals couched in the following language, to wit:

A careful examination and consideration of the evidence clearly convinces us that the stratum of limestone constitutes a single broad vein or lode of mineral-bearing rock extending from the quartzite on one side to the quartzite on the other,

and goes on to say:

This stratum of limestone underlies the four claims of the plaintiff, and one of the contentions of the defendant is that there are several independent veins, one of which has its apex within the surface lines of the Kempton and another its apex in the Ashland, that these independent veins continue down through the stratum of limestone beneath the surface of plaintiff's claims, and that it was only from these independent veins that defendants were mining and removing ore. Of course this difference between the conclusions of the court and the contentions of the defendants affects materially the scope of the inquiry. If the limestone is not, strictly speaking, a vein, but a mere stratum of rock through which run several independent veins, then the inquiry must extend to the location of the apex of each sep-

arate vein; whereas if the stratum of limestone is itself a single broad vein, then the inquiry is narrowed to the location of its apex.

And further, with reference to veins so wide as to cover more than one claim at the surface, the same Supreme Court has held (*loc. cit.* p. 76; 11 Pac. 515):

Under the law of 1866 the surface ground was merely for the convenient working of the lode. The discoverer and first locator took the lode in its entirety. The law contemplated its segregation in its length, but not in its width. It refers to lodes between the end lines, not to a part of a lode. No expression can be found in it indicating an intention to limit the rights of a locator to a portion of the lode in its width. The discovery of any part of the apex of a vein is regarded by it as the discovery of the entire apex. And we think that the law of 1872, when all of its provisions are considered together, and in connection with the former law on the subject, as it should be, evinces the same intent. Under this law the discoverer of any part of the apex gets the right to its entire width, despite the fact that a portion of the width may be outside of the surface lines of his claim extended vertically downward. While he has no right to the extralateral surface, he has a right to the extralateral lode beneath the surface.

It may be remarked in passing that the mining claims referred to in the opinion just quoted are in Bingham. The Old Jordan claim, located under the law of 1866, is several thousand feet in length. The Jordan limestone, here held to be a lode, extended still further on the surface for some thousands of feet, containing fissures and scattered orebodies, and has been judicially held to be a lode on still other and more remote claims, such as the Red Rover.

In the case of Keeley against the Ophir Hill Consolidated Mining Co. the district judge of the Federal court also upheld the limestones as lodes against the contentions of surface owners on the dip of the limestone, although fissures containing ore extended from the surface downward into and through the limestone.

In the case of Star Mining Co. vs. Federal Mining Co., involving ore deposits in quartzite in the Cœur d'Alene district, the Court of Appeals for the Ninth Circuit cited with approval the findings of a former decision regarding the Bunker Hill lode (131 Fed. 579):

That within the Bunker Hill claim there is a vein or lode of rock in place, carrying silver and lead, commonly known in the district as the "Bunker Hill Lode," the apex of which is indicated by the outcrop of the foot wall, which traverses the claim in a general northwesterly course from where it cuts the south boundary; that the foot wall is the well-defined and persistent feature of this vein, and enters the Bunker Hill claim at a point on its south line about 300 ft. from the southeast corner, and, extending along its course at the surface northwesterly, passes out of the north line of the claim about 726 ft. from the northeast corner of the claim; that the Bunker Hill lode has no physical hanging wall, no marked line complement to the foot wall, in defining the limit of the fissure; that for its underlying boundary it has a well-defined, continuous bed of barren quartzite, but for its overlying boundary it has only an irregular and vague outline of the limit of mineralization, from which fact, and the peculiar geological formation of the lode, it is very difficult to define this limit with any degree of certainty, for which reason much confusion and some contradiction appears in the testimony upon this point; that the lode or ledge extending from the foot wall into the hanging wall country gradually fades in value until a point is reached 350 or 400 ft. out, where the rock is practically barren.

In the Star case last mentioned the court established by its finding and decision as a lode (under the meaning of the mining laws) a body or mass of quartzite from 100 to 300 ft. wide with a length of more than one mile and containing, according to the testimony, probably over 95 per cent of pure quartzite. From this lode has been taken ore valued at more than thirty million dollars. It is not an ordinary vein; it has no walls; it is not between boundaries of different kinds of rock; it is not continuous quartz; it is simply mineralized country rock. And yet it is a lode located and patented as such under our mining statutes, and no sophistries or pleasantries of theoretical geologists and editorial writers can make it anything else.

From the foregoing it is abundantly evident that, when mineralized, zones and strata of limestone and quartzite become lodes. The "other rock" referred to in my testimony which you have ridiculed so humorously is the monzonite or "porphyry" of Bingham. The Old Jordan lode lies south and the Highland Boy lode north of the great Utah Copper deposit. Fortunately, the holdings of the Utah Copper Co. have been so shaped and consolidated that its character as a lode has never been questioned. But does anyone, even a textbook geologist, in his most exalted mood and hyper-scientific abstractions, ever for a moment venture to question the propriety and common sense of the law under which it was located and patented in many claims and fractions as a mineral deposit, lode or ledge? And how about the other so-called "porphyry coppers"? Even the Calumet and Hecla conglomerate and the cupriferous amygdaloid flows of the Lake Superior region as well as the banket of the Rand would be lodes subject to the provisions of our mining law if situated within the territory to which that law applies. The Treadwell and adjacent gold mines are further examples of lodes of mineralized rock of large dimensions and low mineral content. In all of these the country rock constitutes by far the larger portion of the lode.

And now let us consider for a moment how much valuable mineral there is in these country-rock lodes:

According to the classic monograph on the Eureka district by Curtis, the Eureka-Richmond lode contained about 1 per cent of valuable and minable ground. The testimony in the various Bunker Hill and Star cases was to the effect that the ore minerals in the Bunker Hill and Morning-Star lodes constituted from 1 to 5 per cent of their volume. In the Highland Boy cases the figures were around 2 per cent. In the Utah Copper lode there may be from 2 to 5 per cent of sulphide minerals, but the average copper content is less than 1½ per cent. The Alaska Gastineau and the Alaska Juneau lodes average less than $1.50 per ton in gold, and contain, therefore, a small fraction of 1 per cent of valuable mineral. Under these conditions it would not seem to be a difficult task to "prove that the country rock is the vein."

And finally, it may not be amiss to request our critics to read more carefully the courts' opinions before writing their editorials. You state that "the quartzites which lie between the limestone" (heaven help us! How can quartzites get between a limestone) "in Bingham Canyon also are ore-bearing, as was shown by abundant testimony at the trial." The finding of the court is that "the ores and mineral in controversy in this action are found beneath the surface of the mining claims of the plaintiff in the Highland Boy limestone and only to a limited extent in the quartzite above or below it."

You proceed on the assumption that the court found that the Highland Boy limestone is not a lode, and upon

this supposition you ridicule me for claiming it to be one. The language of the court is as follows:

Up to the dip of the Highland Boy limestone, about one-fourth of a mile from the Leadville orebody, there has been developed and mined an immense deposit of ore. This deposit was made up of a great number of closely associated and related orebodies almost entirely in the limestone and extending in length for a distance of approximately 3,000 ft. in a northeasterly direction, roughly paralleling the Leadville orebody, and from 200 to as much as 1,000 ft. in width. . . . This great deposit. . . is admitted by the plaintiff to be a broad lode.

And further:

I conclude, therefore, that the Eureka case is authority for finding that the upper orebody found in the Highland Boy limestone, developed on its plunge and rake in the limestone, is a lode or vein within the meaning of the statute.

And again:

The orebodies which were the subject of litigation in the Lawson case were found in a body of limestone called the Jordan limestone, separated only a few thousand feet from the Highland Boy limestone, and (as) the Jordan limestone and the Highland Boy limestone are undoubtedly a part of the same sedimentary bed, uplifted at the same time and possibly mineralized from the same mass or similar masses of porphyry lying below.

Do these quotations from the court's opinion uphold your assumption?

Lead us not astray, Mr. Editor. Do not try to hold me responsible for definitions and conceptions which were fixed more than forty years ago. Do not accuse me of a "desire to twist the apex law" to my "own protection or profit." It was framed expressly for the protection and profit of the mining community, and if it be twisted it became so long before I laid my hand upon it. Come down out of the rarefied atmosphere of higher criticism. Get your feet on the firm basis of facts and established principles. You and I are too young to frame definitions and shape the structure of a growth of half a century. Your testimony comes too late. You should have been on the witness stand in 1877 with Rossiter Raymond, Clarence King, Sterry Hunt, and Dr. Newberry. "Geology applied to mining" is more effective if it be seasoned with less humor and better understanding of the mining statutes as already for many years interpreted and established.

Yours very truly,

HORACE V. WINCHELL.

Los Angeles, Nov. 27, 1920.

Cheapening the Mining Engineer

As a graduate and a trustee of the Massachusetts Institute of Technology I read with a good deal of concern the editorial in your issue of Oct. 30 entitled "Cheapening the Mining Engineer." I made immediate inquiries, and found that mining engineering had been used as a generic term to cover a number of things that are no more mining engineering than house wiring is electrical engineering. The University of Kentucky, for example, has a school for coal miners in which certain disabled men are getting training of great value to them, but with no thought, of course, of entering the profession of mining engineering. Again, our receiving school at Tulane University takes in disabled soldiers of all sorts of previous preparation and gives them "try-out" courses along a number of lines, including, I presume, certain elementary work in connection with such mining as is commonly performed in that part of the country.

On the other hand, many of the disabled soldiers for whose training we are responsible are men of high grade intellectually, whose college courses were interrupted by their enlistment in the war and who are now finishing those courses at the expense of the Federal Government. Those men will be competent not only in the ordinary sense of being well educated but in the higher sense of being engineers who have had the added privilege of military discipline and of strenuous war service.

I will ask that, in future statements as to the engineering students in training, closer distinction be made between real mining engineers and those men who are getting training in some particular phase of the mining industry.

You may be interested in seeing the list of schools and colleges in which disabled soldiers under Federal care are pursuing studies in the general field of mining.

Washington, D. C. JAMES P. MUNROE,

Vice-Chairman, Federal Board for Vocational Training

The list kindly sent to us by Mr. Munroe, issued in September last, follows:

SCHOOLS WHERE STUDENTS MAY STUDY MINING ENGINEERING IN THE UNITED STATES

District

1. Harvard University, Cambridge, Mass.; Huntington School, Boston, Mass.
2. Columbia University, New York City, N. Y.
3. Carnegie Institute of Technology, Pittsburgh, Pa.; I. C. S. Scranton, Scranton, Pa.; Lafayette College, Easton, Pa.; Lehigh University, South Bethlehem, Pa.; Mining and Mech. Institute, Freeland, Pa.; Penn. State College, State College, Pa.; University of Pittsburgh, Pittsburgh, Pa.
4. West Virginia University, Morgantown, W. Va.
5. Georgia School of Technology, Atlanta, Ga.
6. Tulane Rec. School, New Orleans, La.
7. Case School of Applied Science, Cleveland, Ohio. University of Kentucky, Lexington, Ky.
8. Michigan School of Mines, Houghton, Mich.; University of Wisconsin, Madison, Wis.
9. Rolla School of Mines Inst., Rolla, Mo.; University of Kansas, Lawrence, Kan.; Kansas State Normal School, Pittsburg, Kans.
10. Montana School of Mines, Bozeman, Mont.; Montana School of Mines, Butte, Mont.; South Dakota State School of Mines, Rapid City, S. D.; University of Minneapolis, Minneapolis, Minn.
11. Colorado School of Mines, Golden, Col.; New Mexico School of Mines, Socorro, N. M.; University of Utah, Salt Lake City, Utah.
12. Stanford University, Palo Alto, Cal.; University of Arizona, Tucson, Ariz.; University of California, Berkeley, Cal.; University of Nevada, Reno, Nev.; University of Southern California, Los Angeles, Cal
13. Oregon Agricultural College, Corvallis, Ore.; University of Washington, Seattle, Wash.
14. El Paso School of Mines, El Paso, Tex.; Receiving Station, Wilburton, Okla.; Texas A. and M. College, Bryan, College Station, Tex.

Where All Good Mules Go

In a Western mining paper of recent date we note the following ad:

FOR SALE—Good tunnel broke mule in excellent condition: now in Golden pasture.

MINE, MILL, AND SURFACE PLANT OF ROSARIO MINE

The Rosario Mines, in Honduras

By an American Engineer
Written for *Engineering and Mining Journal*

THE ROSARIO group of mines, operated by the New York & Honduras Rosario Mining Co., is in the Department of Tegucigalpa, Honduras, not far from Tegucigalpa, the capital. The port of entry is Amapala, on the Pacific side of Honduras. Tegucigalpa is ninety miles from Amapala and is reached by auto road. The mines are twenty miles from Tegucigalpa at San Juancito, and are reached from Tegucigalpa by pack trails and a rough mountain road. The altitude is 5,000 ft. The topography is accentuated and the hills are covered with tropical vegetation. Water is abundant, the rainy season starting about August and lasting until January. There is a heavy precipitation, and floods are not uncommon. A precipitation of five inches in six hours has been recorded. Living conditions are good, and the company has constructed substantial quarters, a clubhouse, hospital, ice plant, and other conveniences. A large library is maintained for the benefit of the employees. There are about fifty white employees on the staff, and the working force is composed of natives. Approximately 1,500 men are employed in and about the mines. Initial operations began in 1882.

Extent of Development

Operations are distributed over a considerable territory, as twenty veins have been worked at different times. During 1919, according to the last report of the company, development consisted of 10,904 ft. of drifts, 3,145.5 ft. of raises and 1,851 ft. of crosscuts, or a total of 15,900.5 ft. The ore broken in the veins was 92,167 tons, ore from development 12,117 tons, and stope-fill material 29,718 tons, making a total production for that year of 134,002 tons. The development ratio is 8.4 tons milled per foot of development. There was treated in the mill 133,900 tons, producing 1,584,579 oz. silver and 10,200 oz. gold, the ratio of silver to gold being 155 to one. Production was made from seventeen veins. The range of production was a maximum of 25,911 tons from the San Miguel vein (South) and a minimum of 213 tons from the Porvenir vein. Development was distributed over twenty-one veins and ranged from a minimum of 71 ft. to a maximum, in the San Miguel (South), of 5,362 ft. during the year in question

Ores Mainly Silver

The ores at the Rosario group are principally silver, the most important silver mineral being stephanite Some native silver occurs. The wall rocks are slate, andesite, and altered granite. The mines are worked through adits. There are over sixty miles of mine track, 20 and 24-in. gage, and forty miles of pipe underground, ranging from 10 to 2 in. in size, and used for compressed-air distribution. The workings are scattered. Shrinkage stoping is largely used. Where wall rocks are bad, overhand stoping on waste fills is practiced. Little timber is needed. Stopers and hammer-type drills are used. A few jackhammers are employed in sinking winzes. The native miners compare favorably with those of America. Labor conditions are good and strikes are unknown.

The ore is transported by electric locomotives of the trolley type. On the two haulage levels there are two six-ton, two five-ton and two seven-ton electric locomotives. In the last ten years the Rosario electric haulage has handled approximately 1,000,000 tons over a distance of about one and one-half miles.

The mill is of the all-slimming cyanide type Primary crushing is by twenty 1,850-lb. stamps to 1-in. screen size. Supplementary crushing is by one ball mill and three tube mills. Four Dorr classifiers are in use in closed circuit with the ball and tube mills. From the classifiers the pulp goes to Dorr thickeners, and the thickened pulp is treated in eight Pachuca tanks, each

CLUBHOUSE, ROSARIO MINE

of 100 tons' (dry) capacity. Merrill zinc-dust precipitation and presses are used. The Crowe process was installed in 1919. In the silver refinery two oil-fired tilting furnaces are in use. Good results are obtained from tube-mill pebbles manufactured at the mine by selecting and cobbing "nigger heads" from the ore. The capacity of the mill is 400 tons per day, and since its installation in 1912 a total of 845,758 tons has been treated.

Mining cost was $5.07 and milling cost $2.65 per ton during 1919. Silver recovery averaged 85.6 per cent; gold recovery, 94 per cent. The mill supplies used were, on the basis of pounds per ton milled: Sodium cyanide, 2.389 lb.; aluminum dust, 0.237 lb.; soda ash, 1.725 lb.; lead acetate, 0.011 lb.; lime (46.2 per cent available), 16.124 lb.; tube-mill pebbles (local), 18.273 lb. The use

SUPERINTENDENT PIERCE AND MEMBERS OF STAFF

of aluminum dust was discontinued. Steel balls are manufactured at the mine from worn-out battery shoes and dies. Another economy practiced is the redressing of the stamp dies in a special machine. This results in from three to six weeks' longer wear.

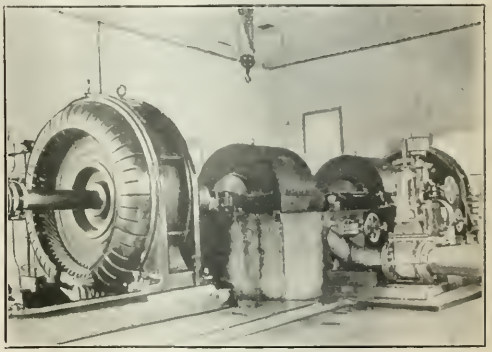
The power required in mining and milling operations is given in the table.

Two hydro-electric power plants, one at San Juancito, two miles from the mine, and one at Guadalupe, five miles from the mine, supply both mine and mill. The total power developed is approximately 1,200. Two air compressors, two-stage Ingersoll-Rand direct-driven by

ROSARIO MINES TOTAL POWER CONSUMPTION AND POWER REQUIRED PER TON OF ORE IN 1919

	Kw.-Hr.	Kw.-Hr. per Ton
Mill	3,621,716	27.048
Mine	2,167,459	16.187
Electric haulage	267,527	1.997
Surface department	88,450	0.661
Surface department lights	37,075	0.276
Mill lights	31,382	0.234
Mine lights	18,829	0.141
Machine shop	25,105	0.187
Laboratory	18,827	0.141
Total	6,276,370	46.872
Cost per kw.-hr., $0.0028		

induction motors, supply compressed air for mining operations. A well-equipped machine shop, together with electric welding outfit, is an important adjunct to

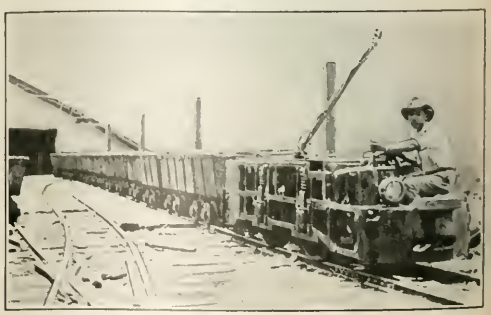


POWER PLANT, ROSARIO MINES

the mine plant. Two Leyner drill sharpeners and accessory equipment are used for tool sharpening. Native blacksmiths are employed. An assay office and laboratory is also part of the equipment.

Supplies are purchased in New York. Explosives are shipped from San Francisco. A six-months' stock is carried. Transportation is effected with difficulty. It is said that it required three months' time to deliver the compressor equipment to the mine, and that sixty bulls were killed in doing the job. Two months' time was needed to haul in the tube mills.

A. R. Gorden is general manager, L. F. Pierce mine superintendent, F. C. Devereux mill superintendent, H. Douglas master mechanic, and C. Walbrecht chief electrician.



ELECTRIC HAULAGE—DUMPING INTO MILL BINS

The Ebb Tide in Gold Mining

High Lights on the Economic Position of Gold and Conditions in the Gold-Mining States, by W. J. Loring, H. N. Lawrie, Fletcher Hamilton, George E. Collins, Milnor Roberts, B. C. Yates, Henry M. Parks and W. B. Phelps. Addresses* Made at Denver Meeting of the American Mining Congress, November 15-20, 1920

IN A LETTER addressed to Representative Louis T. McFadden under date of Nov. 26, 1920, W. J. Loring, president of the American Mining Congress, made the following comments with reference to the seriousness of delaying relief to the gold-mining industry:

The pity will be that if these mines are allowed to remain idle for a lengthy period of time, no matter whether the water is kept from them or not, there will be a collapse of the underground workings in many of them that will render their condition beyond repair, and should the water be allowed to rise in these mines, 80 per cent of them will be practically a total loss.

It must be understood that a mine deteriorates not only underground, but its equipment lying idle deteriorates with much more rapidity than when in operation. The reason for this is that the slightly acid water attacks the iron machinery, and when lying idle and dry, rust continues rapidly; while the woodwork, both underground and on the surface, when in operation is protected from rot through being kept damp; but timber work after being soaked with water and then allowed to dry rots rapidly.

With the passage of the McFadden Bill, the mines referred to, together with a host of others in the same condition, may be saved from ruin. When the McFadden Bill is passed, they will resume operations and produce hundreds of thousands of ounces of gold that will otherwise be a total loss.

It should be remembered that the mines in existence at the present time should be kept alive by all means within the power of this nation, because it is not easy to find a mine with payable ore in sufficient quantities to be classed as a payable concern; and it would appear to be a pity to allow the known gold producers of this country to cease to exist with millions of ounces of gold contained in their ore reserves, that cannot be extracted at a profit under present conditions but can be made to meet expenses under the relief that will be afforded them by the McFadden Bill.

If the known mines are allowed to permanently close down and become abandoned, it will be necessary to search for new mines, because the old mines have entirely perished. It will be greater economy to maintain the existence of the old mines that are known to contain large tonnages of payable ore under normal conditions than to attempt to find new mines.

Subsidy Paid by Gold Producers

BY H. N. LAWRIE

HAD the price of gold ascended to the average wholesale price of all other commodities during the five-year period (1915-1919) the gold producers would have received for the amount of gold they actually produced $218,280,000 more than the amount which they did receive of $404,509,000. Of the $218,280,000, the amount which would have been paid by the industrial consumers of gold would have been $133,686,000 for the gold actually consumed, while the Government would have paid $84,594,000 upon the monetary gold surplus. Inasmuch as the price of gold has been fixed, these respective amounts may be construed as subsidies paid by the gold producers to the industrial consumers of gold and also to the Government, which received the monetary surplus. Since there was no monetary surplus in 1919, the industrial consumers of gold benefited by the entire subsidy of $65,500,000. It is reasonable to assume that if the premium had been in effect during the entire period (1915-19), which would have insured a normal (1914) purchasing power of the ounce, the gold production of 1915 $100,000,000, would have been maintained throughout the period, in which event the gold producers would have received $500,000,000, the monetary price, plus $250,000,000, the premium, a total of $750,000,000, or $345,491,000 more than has been actually received.

IMPORTANT GOLD FACTS

Total U. S. gold stock May 1, 1919	$3,092,430,916
Total U. S. gold stock May 1, 1920	2,646,615,750
Decline in U. S. gold stock May 1, 1919, to May 1, 1920, 14.4	445,815,166
Exports of gold from the U. S., calendar year 1919	368,144,500
U. S. gold imports, calendar year 1919	76,534,000
Loss of gold by excess exportation, calendar year 1919	291,610,500
Exports of gold from the United States, Jan. 1 to Sept. 30, 1920	259,331,925
U. S. gold imports, Jan. 1 to Sept. 30, 1920	198,888,957
Loss of gold by excess exportation, Jan. 1 to Sept. 30, 1920	60,442,968
Total Federal Reserve net deposits Oct. 15, 1920	1,694,130,000
Federal Reserve notes in circulation Oct. 15, 1920	3,351,271,000
Total reserves Federal Reserve Banks Oct. 15, 1920	2,154,911,000
Ratio of reserves to F. R. net deposit and note liabilities Oct. 15, 1920, 42.7 per cent, 4.3 per cent above the legal requirements	
Gold cover of the Federal Reserve dollar note in circulation Oct. 15, 1920	46.6c.
World's gold production 1915, $469,000,000; 1920 (estimated)	$325,000,000
World's gold production decline 1915-1920	$144,000,000 or 30 per cent
U. S. gold production 1915, $101,000,000; 1920 (estimated)	$50,000,000
U. S. gold production decline 1915-1920	$51,000,000 or 50.5 per cent
Gold sold by U. S. Mint for consumption in manufactures and the arts, 1919	$76,837,600
Usual estimated gold coin destruction	3,500,000
Total gold sold and coin destroyed for use in manufactures and the arts, 1919	80,337,600
1919 production fails to equal gold consumed in manufactures and the arts by	21,848,000
Old gold received by New York Assay Office and returned to manufacturers, 1919	20,359,613
Gold sold by U. S. Assay Office, New York, for consumption in the manufactures and the arts Jan. 1 to March 31, 1920	20,037,317

	1918	Per Cent	1919	Per Cent	1918-19 Per Cent
U. S. siliceous ore gold output	$42,284,130	63.7	$38,209,508	66.8	Decline 9.6
Placer gold output	15,673,424	23.6	14,918,468	25.8	Decline 4.7
Base ore by product output	8,454,282	12.7	5,847,359	9.9	Decline 30.8
U. S. gold production, 1920 (estimated)			$40,000,000	to	50,000,000
Estimated failure of gold production to meet 1920 requirements of manufactures and the arts			$30,000,000	to	40,000,000
Estimated income from excise of 50c. per pennyweight based on 1919 domestic consumption of gold in manufactures and the arts (excludes imported jewelry, a new additional source of revenue)					43,000,000
Estimated premium cost based on 1919 gold production					29,000,000
Balance in favor of U. S. Treasury					14,000,000

In imposing the excise of 50c. a pennyweight, which is equivalent to $10 an ounce, for the gold contained in manufactured articles, the McFadden Bill enables the industrial consumer to pay more nearly the anticipated cost of production during the forthcoming five-year period, an amount which when paid to the producer of new gold will re-establish the purchase power of the ounce of its status of 1914, and will therefore insure the normal production of gold in the United States.

The gold production of the United States for 1920 will be between $40,000,000 and $50,000,000, less than 50 per cent of the 1915 production; and unless some

*In part abstracted and in part condensed from original manuscripts

remedy, as is provided for in the McFadden Bill, is expedited, the production for the ensuing years will rapidly approach the vanishing point, as the gold mines of the country continue to shut down. By reason of the monetary necessity for maintaining the normal gold production of the United States, especially during this period of credit and currency contraction, of protecting the monetary gold reserve from further industrial depletion and of safeguarding the gold standard itself, Congress should provide a remedy without delay in the interest of national security.

Gold-Mining Industry in California

By Fletcher Hamilton

DURING the last six weeks I made an automobile trip through various counties in California, traveling about 4,000 miles. In that time I did not cover one-half of the state, but only reached the points where I thought some good could be done, and some education started along the lines which would bring the business people, the bankers as well as the miners of California, to the point where they would realize that the gold situation not only of California but of the United States was at a critical point. We know the conditions confronting the gold-mining industry, the high cost under which mines are operating. The industry is confronted by a condition unlike that of any other industry, and that is a fixed price for its product.

In making my trip, I wanted to familiarize myself with the conditions, and I can say to you, coming from a gold-producing state—the primary gold state of the nation—that it is a shame to see the mining camps and the mines themselves forced to close down because of the unnatural conditions which prevail at this time. In Trinity County there were three stamps operating, where in the past there had been a hundred stamps in operation. In Amador County, where there were from 500 to 600 stamps in operation, today the number is equivalent to sixty stamps. In Calaveras County, in 1914, there were 494 active stamps, and today fifty. In Tuolumne County, where there were 300 active stamps, today there is not a stamp in operation in the county. In Kern County, the Yellow Aster, which had 100 stamps, is not operating. So it goes throughout the state, and it does not mean only that stamps are not dropping, but it means that the population of the mining counties of California is dropping off. For example, in Calaveras County the decrease shown by the census of 1920 is 40 per cent. I take it that this condition pertains as well to the other gold-producing states.

The relief that we are working for is provided by the McFadden Bill. It seems to me that every business organization in this country should take action on a measure which so vitally affects the business of the country. There has been some opposition to the McFadden Bill by the jewelers, who based their opposition on the grounds that paying the gold producer a premium of $10 per ounce would be granting a subsidy to that industry at the expense of the jewelry trade. The gold consumer is being subsidized by the United States because of the very fact that he is supplied with his raw product at a fixed price. There is no economic formula which will vitalize an industry in a period of rising costs if it must sell its product at a fixed price.

There has also been opposition by bankers stating that there is too much gold in the country. In the same breath they say that the gold problem is an international question, but they do not say in the same breath that there is too much gold in the world. It is merely that there is too much in the United States. So the problem is the distribution of the gold, and not the fact that no new gold is necessary.

We have had opposition from people who say that the principle of the McFadden Bill is wrong. I state to you that the government of France has had for many years a sumptuary tax upon the use of gold as a commodity, or the use of gold in the arts and trades. In June of this year the French passed an additional sumptuary tax, or an excise tax upon the use of gold as a commodity. You did not find at the time that there was any change in the monetary value or the exchange rate on the franc, and it was proved that such a tax did not affect in any way the monetary value of the gold.

In answer to the statement that other governments are not giving relief to the gold miner, I quote the following from a report by Sir Evelyn A. Wallace, president of the Transvaal Chamber of Mines:

> Since the 24th day of July, 1919, we have been able, under the new agreement with the Bank of England, to market our gold not indeed to the best advantage, since the government of India is reserving the best for its own operations, but to considerably increase advantage. The result of this has been that during the last five months of 1919 we obtained about three million pounds more than we should have obtained had we been restricted to the standard price Beginning at approximately 16 per cent, the premium has varied up to 44 per cent, the average up to the latest date of which we have advice being 26¼ per cent, and the last cable states that the premium is approximately 33⅓ per cent.

I should like to see the American Mining Congress make a stronger effort to bring about relief to the industry. I believe that the gold-mining industry, as well as the nation itself, should give to H. N. Lawrie, who has sacrificed his personal affairs to study this question, the support which would carry this legislation through to a successful conclusion. It is right and it is just, and I believe it is necessary for the maintenance of our financial position.

The Gold Producer in Colorado

By George E. Collins

IN THE five years from 1915 to 1919, the production from the gold mines of Colorado steadily declined, from $22,500,000 to $9,750,000 in round numbers. In 1920 the production, assuming that November and December will continue at the same rate as the rest of the year, will be less than $7,250,000. The first year's drop was 15 per cent, the second nearly 17, the third 20, the fourth over 23, and this year nearly 26 per cent. The decrease has been steady and continuous. If present conditions continue, the production in 1921 will decline to $5,000,000.

What does this involve? In the first place it involves the depopulation of thriving communities: homes broken up, the savings of a lifetime sacrificed; families parted. Typical gold-mining towns such as Cripple Creek and Central City are almost deserted. Houses are being torn down, and the lumber shipped away. Mining railroads, such as the Cripple Creek Short Line,

the Boulder & Northwestern, and the Gilpin Tramway, have gone out of business, and in some cases have already been scrapped. Mines are being abandoned, and their workings are caving or filling with water. Most of the men who used to work in the mines have left and gone into other employment.

Why has Colorado, as a gold-producing state, suffered so much more than California? The reason is, I think, largely because California produces gold principally in the form of bullion, whereas our production consisted to a greater extent of gold contained in ores and concentrates which were shipped to the custom smelters and treatment plants. The figures supplied to me by individual producers show that the falling off in the case of the mines and districts which produce gold as bullion was not as serious as in those which shipped to smelters. This is confirmed by the fact that from 1915 to 1919 the gold from Colorado mines deposited in the Denver Mint fell from $14,304,980 to $7,648,044, or 46½ per cent, whereas the gold from Colorado purchased by the smelting plants dropped from approximately $6,846,320 to $2,175,745, or over 68 per cent.

When a mine reduces its own gold the treatment costs are under its control. To some degree employees, and especially the skilled and permanent employees, of treatment plants, are influenced in their demands, and in the character of the work which they produce in return for a given wage, by what they know to be the surplus available from which to pay them. Such men, usually more intelligent than the mine employees, and often possessing comfortable homes, are disinclined to destroy the enterprise by which they live. Actual figures show that in two of the largest and most representative treatment plants in the state, both producing gold almost entirely as bullion by the cyanide process, in districts widely separated and physically very different, the treatment costs from 1915 to 1919 increased respectively 8 per cent and 60 per cent. In the same mines, during the same period, the mining costs increased respectively 98.8 per cent and 160 per cent. According to my experience this tendency is universal. Costs of mining have advanced more than costs of treatment at the mine.

In the case of mines which ship ores and concentrates to the smelters, this is not true. I cannot give you the figures from all mines, but I feel confident that the costs of smelting have advanced at a greater ratio than the costs of milling or cyaniding; and I am still more sure that the smelting charges, including deductions, show a still greater increase. In the case of one mine, which was once among the principal gold producers of the state, and where the nature of the ore renders it entirely dependent on the smelters, the freight increase has been 57 per cent, and the smelting costs have doubled. Freight and smelting are a first charge on the value of the ore shipped. The miner does not share the proceeds of the ore with the railroads and the smelting plant. He receives the balance after their charges have been deducted. They have not the same incentive to temper the wind to the shorn lamb which may be supposed to influence the men employed in a mine treatment plant. To the worker in the smelter, his employer is a great and wealthy international corporation; he does not realize that his compensation really comes from mines which are struggling to make both ends meet, usually without success. The increased cost can be, and is, passed on to the miner.

Nor is this the entire story. If you increase the limit at which ore becomes workable from $5 to $10, you are certain to reduce the quantity of available ore by more than one-half. Without going further into detail, I may say that the minimum value of workable smelting ore, excepting certain districts, is now from $20 to $30. The minimum value of workable concentrating ore has similarly increased in about the same proportion. The result is that most of what was ore in Colorado in 1915 has ceased to be ore in 1920, and will continue worthless until all costs have come back to the 1915 level.

Meantime, the ores which were of higher grade, or cheaper to handle, have been mined out in the struggle for bare existence, and in almost every instance development work has been curtailed or suspended. It is clear that, while the proposed bonus of $10 per ounce on gold will prevent a further decline in the gold output, no increase in production will be possible unless, in addition to the bonus, a considerable reduction in working costs is effected.

Many mines have managed to stave off the evil day by the use of various expedients.

The acute danger of the situation is that mines are getting down to where they can no longer resort to such temporary expedients. A large proportion of the gold mines in the state which are still in operation are reduced to a situation where they must spend more on development and maintenance, must have new stocks of supplies, must purchase new plants of machinery, etc., or go out of business altogether.

Gold-Mining Conditions in Alaska

By Milnor Roberts

ALASKA is principally a mining country. The development of its settlements and routes of transportation took place under the pressure of mining needs. The upbuilding of nearly all its cities, except the fishery centers, accompanied the opening of its mines. Although some of the coast towns existed as fishing and trading ports prior to the finding of gold in the Klondike on Aug. 17, 1896, their real growth took place after that date, along with the opening of the territory as a whole. Juneau, the capital of the territory since 1906, attained early importance through the Treadwell mines, which were in regular operation in the early 80's. Seward, another part, was founded and developed as the coast terminus of a railway (now owned and being completed by the Government) to be built to reach near-by mining districts and the gold fields of the interior. Cordova also is a railway terminus and ore-shipping point. All the cities, towns, and camps of interior Alaska without exception grew up either as mining centers or as stopping places on routes to the mines. It seems clear that no cause has yet arisen in Alaska that would have served to develop the country in any degree as mining has done.

The current life and activities of the territory, as distinguished from the causes of its settlement, are likewise mainly dependent on mining. The exceptions to this statement are easily noted and can be segregated for the purpose of considering the condition of the mining industry. The only prominent exception consists of the fishery interests, and these are confined to the coast. The fur trade involves a comparatively small number of persons, and the same may be said of farming. Indeed, the farming industry depends

upon either the mines for disposal of its products, or upon other lines of industry which in turn serve mining. The basic industry of the territory as a whole is mining. The one metal that far outranks all others, except copper, which is mined along the coast and on the Copper River, is gold. Therefore, it may be said that whatever influences affect gold mining have a bearing also on most other industries in Alaska.

Gold mining has suffered a great decline in the North during the last few years, a period in which it has been dwindling elsewhere in the United States. In 1905, the gold production for Alaska reached a value of $15,630,000, and in the following year rose to its record figure of $22,036,794. These two totals served as limiting figures for the output during the next ten years. At the close of that period, in 1916, the production was $17,241,713. Since this latter figure corresponds closely to the average for the twelve-year period of which it marks the end, evidently no falling off in production had taken place up to 1916, but thereafter the gold output decreased rapidly. In 1919 it was about $9,000,000, while for the present year (1920) the estimated total is far less.

The first probable cause for existing conditions is the war. At the outbreak of the war in 1914, many British miners in Alaska, together with those from the adjacent Yukon Territory of Canada, hastened to their country's aid. As the need for men became more imperative, they were followed by others. America's entry into the war caused most of our young men to enlist, but even then there remained a good proportion of the older and more experienced miners. When the demand for men to carry on war industries in the States became pressing, another outpouring took place. On hearing from "the outside" of the ever-increasing wages in the copper mines and the fabulous earnings (so-called) being made in shipbuilding and other industries in the Pacific Northwest, the miners, being accustomed to adapt themselves to various kinds of work, were quick to take advantage of the opportunities open to them. Thus the war drew upon the man power of Alaska both directly and indirectly.

The statement is occasionally made that the mines of Alaska have run out and that the decreased production of gold is due to this cause alone. Such a theory would postulate the simultaneous failures of practically all mines distributed over an area one-fifth the size of the United States proper. To believe that under the varying conditions that exist in Alaska's gold-producing districts Nature's numerous stores of gold all came to an end at once, requires a great stretch of the imagination. The flooding of three of the four Treadwell mines in 1917 is also pointed out as a prominent factor in the lessening of production. Yet in place of the Treadwell there are two other low-grade properties in the Juneau gold belt, the Alaska Gastineau and the Alaska Juneau, which have been yielding gold steadily, although not profitably, and the Chichagoff, a remarkable mine of high-grade ore situated near Sitka.

Elimination of the factors that have had only a minor part in diminishing the output of gold from Alaska brings us to the most direct cause, namely, high wages and the high cost of materials and supplies used in mining. The increased wages in the States reached during the war not only drew men away from the North, as already stated, but since then have held them here, the high scale having in general remained in effect on the Pacific Coast. Why should men pay the high rates of fare to distant points in the North, only to receive less wages there than they can obtain here? In order to attract miners to Alaska, rates of pay higher than those prevailing in the coast states must be offered them. In the Puget Sound region today common labor receives $5 to $6 per day, the higher rate being paid for heavy work comparable to mining. Carpenters, machinists and blacksmiths are paid $7 and up. At the same time the Alaska Gastineau near Juneau is offering millmen, laborers and oilers $3.50, cranemen, carpenters and blacksmiths $4 to $5.50, mine laborers $3 to $3.75, and machinemen $4, although contract miners are enabled to earn $5 to $10 per day. This is the highest wage scale this gold mine can pay and still make both ends meet, regardless of a profit. Meanwhile the copper mines to the westward can offer shovelers $5.25 to $5.75, miners $5.75 to $6.25, or, including contractors, an average of $6.75, and millmen $5.60 to $7.10. Inasmuch as the cost of boarding men has fully doubled, and the wages are exactly double, it will be seen that the whole item of labor has doubled.

Materials and supplies have increased in cost even more than wages. Ordinary lists showing former and present prices of numerous commodities are not wholly applicable when considering the particular needs of the Alaska miner, who cannot afford to ship goods of doubtful quality to his distant camp. On this point there should be no confusion. Prices in the coast states for the good grades of materials needed for the mining trade in the North are far above those prevailing before the war—approximately double, in round numbers. To mention a few items, dynamite has advanced 70 per cent; caps and fuse 100 per cent; drill steel 110 per cent; tool steel 125 per cent over pre-war prices. California crude oil has greatly advanced and gasoline has doubled in price.

While the large operations in Alaska are carried on with the aid of engineers and office forces, many small mines are worked by the individual owners with small crews. Such operators do not need a complicated system of accounting to show them whether they are making money or losing it. A pocket notebook and a pencil have often sufficed for working out an estimate of cost for the proposed season's work and for summing up the results, while many a million in fat pokes has come out of the North unchaperoned by even that much bookkeeping. Yet the owners knew how they stood on the season's operations and the miners had their pay from bedrock. Today the consensus of opinion is that gold mining, except in rich ground, does not pay. In a recent letter the Alaska Bureau of Publicity at Juneau states that in pre-war days the average cost of mine operation was $6 per man-day, including wages, materials, supplies and overhead expenses, while the average today is $11.

Ordinarily, in the fall our Alaskan friends call at the Mines Building, University of Washington, to compare notes on the past season's doings and to discuss plans for the coming year. Some of them attend the winter session given for mining men at the College of Mines and make use of the laboratories for experimenting on their ores. Many such men are letting their gold claims lie idle while they turn their attention to other metals. The high cost of operation has not only lessened the actual mining, but has also discouraged prospecting for new ground and the development of finds already made. A grubstake nowadays represents a small fortune. Under present conditions prospecting is not justified.

South Dakota Gold Mining

By B. C. Yates

PERHAPS the best way to show what failure to obtain an increased price for newly produced gold means to South Dakota is to present the actual condition of the gold industry of the state, with the more apparent causes which have brought about this condition. Briefly stated, the gold industry of the Black Hills of South Dakota is in a state of disintegration, not because the mines are becoming exhausted, but because the gold taken from the mines does not have sufficient value to pay the cost of production.

The Black Hills do not comprise a very large area, about 100 square miles, and the gold-producing section is only a small part of the whole. In this limited area, four years ago, there were from ten to twelve regular producers, and there were other mines being developed, some of which were producing a considerable amount. Only two, the Trojan and the Homestake, have survived the war period. These properties have been operated during this period to keep their mines and treatment plants in working condition and their organization intact, with the hope that, in the near future, conditions will be such that some profit may be had from their operations. Prospecting is at a standstill, and only two or three mines in the development stage show any signs of activity.

The population of the two largest mining towns of the Hills, Lead and Deadwood, has decreased from 12,045 in 1910 to 7,416 in 1920, and Lawrence County, which is the principal mining section, has now 6,665 fewer people than ten years ago. Practically all of this decrease has occurred during the last three years. In every mining community of the Hills are to be found idle mills, empty houses, and deserted prospectors' cabins.

The joint reports of the U. S. Geological Survey and the Bureau of the Mint give the average yearly production of gold in the Black Hills, from 1912 to 1917 inclusive, as having a value of $7,436,000, in 1918 $6,699,400, in 1919 $5,289,700; and from the report of the State Mine Inspector for the first six months of 1920, it is estimated that the total for this year will not be much over $4,000,000. This is a reduction of approximately 45 per cent in three years. The annual reports of the State Mine Inspector give the average number of men employed in the gold mines of the district from 1912 to 1917 inclusive, as 3,063, for 1918 and 1919 as 1,933, and for the first six months of 1920 as 1,681, with very little if any increase to date. These figures do not indicate a very healthy condition of the gold-mining industry in this district. They do tell us, in language which cannot be misunderstood, that something must be done to improve the situation.

The prices of supplies and labor which have prevailed during the last few years, and which still prevail, make the cost of production almost prohibitive at the fixed price for which the gold miner is forced to sell his product. Wages have increased from 40 to 50 per cent, cyanide 52 per cent, dynamite 92 per cent, drill steel 138 per cent, and all other supplies used in mining operations show similar increases. No figures are available which will accurately give the increased cost of producing an ounce of gold in the Black Hills mines. The producing mines of the Hills are fortunate enough to have had a large amount of ore broken down and remaining in the mine, as well as ore which could be mined at a low cost, which has thus far tided them over the high-price period. It is needless to say that these favorable conditions will not last. Calculations based on normal operations show an increase of approximately 30 per cent in the cost of producing an ounce of gold, without taking into account interest on investment or depreciation of mine and plant due to deferred development and repairs. It is difficult to estimate how much should be added to operating costs to cover the last two items, but they will certainly be reflected in future balance sheets. Should cost of labor and supplies be reduced to pre-war normal in the near future, it will still be necessary to pay more for our gold, because of the depreciated physical condition of our mines, and this is true whether they have been kept running or were closed down.

You no doubt will consider this an extremely pessimistic report. It is, gentlemen. The gold industry is face to face with a grave crisis—a crisis brought about by a world war and the short-sighted policy, adopted by the Government, of bleeding without feeding an industry essential to the life of any civilized nation.

When our Government decided to take an active part in the great European conflict, the producers of metal, gold included, were urged to speed up production. Gold producers, trying to respond to this patriotic call, found themselves confronted with indifferent governmental executives, loss of labor, high prices of supplies, an ever-increasing difficulty in getting supplies at any price, and a fixed price for their product, based on pre-war conditions. For the gold mines to keep up production during this period of rising cost it was necessary to reduce expenses, and this could be done only by cutting off development, prospecting and plant repair, as the price of labor and supplies was continually rising. Increased costs for the future is only a natural consequence. As a concrete example, the Homestake mine, under normal conditions, excavates yearly 17,500 ft. of tunnels for the purpose of developing known orebodies and prospecting virgin ground. During 1918 and 1919 this was reduced to 8,600 ft. From this it may be readily seen that the company will have to spend many thousands of dollars, in the very near future, to bring the mine up to its normal working condition. What is true at the Homestake is undoubtedly true at other producing gold mines, and the situation is far worse in those mines that were forced to close down.

Gold-Mining Conditions in Oregon

By Henry M. Parks

FOR A FEW years prior to 1916, Oregon produced annually about $2,000,000 in gold. This annual production has continually decreased since 1916, and with increasing rapidity. The greatest decrease has taken place during the year 1920. This is due to the fact that some of our most important quartz properties, which have been holding on for the last year or two, hoping against hope, have at last exceeded the elastic limit of their holding-on power. Three of these important producers have recently closed down and pulled their pumps. As a result Oregon's 1921 gold production will probably be not more than one-fourth of the output in 1916.

The conditions which have brought this blight upon

the gold-mining industry of Oregon and of the United States are due naturally to the unavoidable expedient of enormous inflation or expansion of the currency of the country. Necessarily it required more and more of this diluted currency to satisfy. All the real money of the country (gold) vanished from circulation almost over night. The only gold in sight during the last four years has been that produced under great difficulties by the gold miner, and he had no alternative but to take diluted currency in exchange for his gold. Is there any wonder that the gold production of the country is rapidly diminishing?

The surprising thing to my mind is, not that these conditions, with their natural results, obtain, but that so little national concern is in evidence because of the existence of such unfortunate conditions. I am surprised that $50,000,000 can be lopped off from our country's annual gold production without commanding more interest and concern on the part of our statesmen and financiers.

A very logical plan is proposed in the McFadden Bill, which is intended only as a temporary relief measure to tide over this crisis and to save, if possible, the life of a fundamental industry. It seems incredible that there should be any opposition to the reasonable plan of throwing out a life line to the gold-mining industry. The opposition to the measure that has arisen in certain of the industrial arts and trades seems short-sighted. By such opposition there is grave danger of "killing the goose that lays the golden egg."

The commission of the Oregon Bureau of Mines and Geology, at its regular meeting in Portland on Oct. 22, 1920, discussed the McFadden Bill at considerable length. The measure was introduced in the House of Representatives on March 22, 1920, by Congressman Louis T. McFadden and is designed to stimulate the production of gold in the United States for use directly as money or indirectly as a base for the issuance of currency. The interesting fact was brought out in a prolonged discussion of the bill that during the year 1919 gold to the amount of $20,000,000 in excess of the entire gold production of the country for that year was purchased from the United States Mint for uses other than coinage.

The conclusion of the commission by unanimous vote was as follows: (1) That the bill is carefully drawn and can be successfully administered without difficulty. (2) That if enacted it will greatly stimulate the production of new gold, the annual output of which is now less than one-half that of 1915. (3) That the excise tax on manufactured gold will produce revenue sufficient to meet the requirements of the act. (4) That the benefit accruing to the gold producers is justly due them and is in no sense a bonus. (5) That the act, when in operation, will not in the slightest degree alter or affect the monetary system, except that the increased production of gold will, by adding to the supply of gold currency, permit a reduction of paper currency already issued in excessive amounts, thus tending away from unsound money in the direction of sound money. (6) That after a careful study of the bill and the need therefor the commission unqualifiedly indorses the same and is confident that no one, after seriously reading the provisions of the measure, will do otherwise than indorse it; and that such opposition as has arisen is due to failure to read and study the bill and not the result of mature judgment as to the effects of the proposed act. (7) That other agencies interested in sound currency and the maintenance of the gold production be advised of our action and urged to work to the end that the bill may become a law.

Gold Mining in Arizona

By W. B. Phelps

GOLD MINING in Arizona is almost entirely confined to the Oatman district. The gold produced in other parts of the state is won as a byproduct from copper ores. Gold mining in Arizona is languishing under the heavy burden of conditions over which it has no control, and which have grown worse instead of better, year after year. The producing mines are becoming depleted, and there is no incentive to find new gold mines. The prospector has forsaken the hills. The discovery of ore that could be mined at a fair profit a few years ago does not interest him today; nor can capital be interested to pursue the development of ore-bodies where there is no hope of any return on the investment. Unless some measures of relief are afforded the gold-mining industry, it is my belief that it will be only a question of time until gold mining will be a thing of the past.

Those who use gold for industrial purposes ever object to paying the cost of production. They buy their gold today for the same price as they did five years ago, $20.67 an ounce. Five years ago, before the dollar had diminished in purchasing power, gold could be produced at a profit, and normal gold production was maintained, but now the purchasing power of the gold ounce is less than half what it was then.

Gold mining is not an ordinary business. In fact, it is unlike any other business. As an example, the Tom Reed company has been in operation for over twelve years and represents an investment of over $3,000,000. It will not cost us much to close down—but what will it cost to stay closed down, and what will it cost to reopen? A shutdown for any length of time would mean destruction and ruin to the mine and its investment. It is not so much the visible as it is the invisible loss. Our mill and surface equipment can be repaired or replaced, but there are miles of underground work which would be flooded, caved in, and destroyed. Work that was done and carefully protected at enormous expense would be ruined. Would that mine ever be reopened and would its possible ore output warrant the tremendous cost, even if it was?

The case of the Oatman district, which I represent, is typical. Powder for which we paid $13.25 now costs us $24; fuse once $38.40 costs today $81; caps were $11.50 and are now $21; steel rails were $65 and now cost $115; timber that we paid $24 for is now $71; oil and coal have more than doubled in price. Boarding-house supplies are about 90 per cent higher, and the cost of labor has increased $2 per shift per man. The gold-mining industry alone has been called upon to bear this increased cost of production without any increase in the price of the metal produced.

It has been stated that we are now in a downward market and that prices are dropping. That may be the case in other parts of the country, but, gentlemen, I can assure you that we have not been confronted with any such "serious" predicament in Oatman. If certain small items have been reduced in price, the reduction means nothing in comparison with the recent increase in electric power and freight rates.

Practical Mining Course at Copper Queen

An Opportunity Afforded to Ambitious Workers To Increase Their Knowledge and Obtain Advancement by Systematic Study Under the Leadership of Men in Direct Charge of Operations—Weekly Classes Covering a Wide Range of Practical Subjects

By George J. Young
Written for *Engineering and Mining Journal*

Apart from the direct problems which present themselves to the management of a large mining property, there are others of a less direct nature, but important, in that their successful solution establishes a foundation upon which the industry makes substantial advance. A management broad in spirit will not fail to see the importance of these indirect factors. It is, of course, a debatable point as to how far a management can go, and there are practical reasons why a small mine cannot undertake what might be easily done by a large mine. Nevertheless, both the small mine and the large one can contribute their quota in advancing the practical knowledge of the individual miner.

Skilled miners, well versed in their craft, accustomed to handling mechanical equipment, and willing to cooperate with the superintendent and foremen, are, needless to say, an asset to the industry. With a given number of such workers, greater tonnage, fewer accidents, better timbering, cleaner mining, and lower unit costs can be obtained than with mixed crews. It is from this group that foremen, shift bosses, and bosses are drawn. These sergeants and corporals of industry are fully as important as skilled miners and of great practical importance under existing conditions.

BISBEE FROM SACRAMENTO HILL

Percentage of Well-Trained Workers Small

A cross-section taken of the rank and file of the operating crew of a mine will show, in most instances, only a relatively small proportion of well-trained workers and a large proportion of less-skillful and poorly informed workers. The direct result is that the number of workers may be largely in excess of that required, were they all to reach a proper standard. In a small mine, it is possible to make a drastic selection and to obtain a majority of skilled workers. In a larger mine, the process of selection is not so easy. It is highly probable that there is not a sufficient number of skilled workers to satisfy the needs of all of the metal mines in this respect. There thus remains, as an alternative, the task of raising the average grade of miner, shift boss, and foreman by systematic instruction.

Probably every mine does a certain amount of unsystematic instruction and training. The well-managed mine, where the overseeing is well done, contributes in no unimportant way its share in developing skilled miners. The large labor turnover operates to reduce in the aggregate the regular training which a miner would get were he to remain a longer time in a good mine. The cumulative experience that is gathered by the itinerant miner has a certain value, it is true, but not nearly as much as would be the case were he to grow up with a mine. There is no general organization that is actively directing its attention to the task of developing skilled miners. Evolution acts to some extent, but for the most part the mine superintendent takes what he can get and does with it the best he can.

Raising the Grade

Raising the grade of the average miner is a real problem confronting the mining industry. Efforts made along these lines are worth the study of mine managers. The most important example that has come to my attention recently is the practical mining course offered to its employees by the Copper Queen Branch of the Phelps Dodge Corporation at Bisbee, Ariz. By creating an atmosphere stimulating the individual to make an effort to better his knowledge and position, and by making the actual leaders of the men in their everyday tasks the leaders in the educational work, a unique and highly commendable organization has been built up.

An Educational Department, under S. C. Dickinson as director, conducts the practical mining course. The attendance for the first two years is given in Table I. As might be expected, the foremen and shift bosses were more assiduous in their attendance than miners and muckers. To a school superintendent the total attendance might be looked upon as relatively small when compared to the total number of underground employees, averaging approximately 1,000. Due regard must be given to the inertia shown by the average miner as well as to the fact that attendance is voluntary. The proportion of really ambitious men who are prepared to make some sacrifice to advance themselves is not large

Advantage of Man-to-Man Contact

The effect of the work, however, is not measured by attendance alone. The man-to-man instruction that receives its primary stimulus from those who attend the practical courses cannot be evaluated, but it is, in my opinion, an important element in raising labor standards and making the work as a whole effective with respect to a goodly proportion of all the workers. A small proportion of men actively working to advance themselves

will leaven a much larger number who come in contact with them.

Apart from these general considerations, there is much that is worth while examining in the practical course. Arthur Notman, superintendent of the Mine Department of the Copper Queen company, states the objectives in the following:

"The object of the company in establishing the Educational Department and providing this course is twofold: first, to determine who are the ambitious men among you; second, to provide ways and means for developing such men as are ambitious to such a point that they will be competent to fill positions of greater responsibility. Those of you who have succeeded in the past and those who will succeed in the future are the men who have the determination to take advantage of every opportunity. This is such an opportunity."

TABLE I. ATTENDANCE AT PRACTICAL MINING COURSE

	1919-20	1918-19
Per cent of foremen attending one or more lectures	100 00	...
Per cent of night foremen	100 00	.
Per cent of shift bosses	94 4	
Per cent of miners	44 7	
Per cent of muckers	39 2	
Per cent of others, underground	4 0	
Per cent of attendance total underground (using average attendance)	13.3	
Per cent attendance total underground (using total attendance at class)	30 6	
Average attendance for the year	136	166
Number attending this year who did not attend last year	352	
Number attending 22 or more lectures (half)	94	118
Number attending one lecture (total attendance)	659	821
Number attending each and every lecture	2	6
Average number of employees underground	1,021	1,003

Mr. Notman, speaking directly to ambitious men in his organization, says:

"Your chance to fit yourself for the place ahead, to place yourself on the salary list instead of the day wage list, to gain the necessary knowledge to improve your opportunities, is right here in this mining course. It is a part of the Copper Queen Branch just the same as the Mines, Safety Department, the Employes' Conference Committee, etc., are parts of the same branch. It is not connected with any other educational institution or association in the district. The course is designed solely to give men the opportunity to better themselves.

"Men who have attended thirty-five or more different lectures will be examined and rated by an Examining Board, and those passing, whenever possible, will be given preference in future appointments. Merely passing the course, however, does not signify that a man has all the necessary qualifications to be the broad and sympathetic type of boss that the company desires; the ability to handle men figures largely in the preferred list. Completing the course successfully does not necessarily mean immediate promotion, but rather promotion as vacancies occur."

The specific rules governing the course are as follows:

RULES GOVERNING THE COPPER QUEEN MINING COURSE

1. To be eligible to take the examination the applicant must have attended thirty-five different lectures. Credit for absences is to be allowed if accompanied by a doctor's certificate.

2. The Examining Board shall consist of the superintendent of the Mine Department, the assistant superintendent of the Mine Department, two mine superintendents, the master mechanic and three miners appointed by the Employees' Conference Committee.

3. "Skilled Miner" certificates are to be issued to men who satisfactorily pass the examination, provided that they have had at least two years' underground experience as a miner.

4. "Knowledge of Practical Mining Operations" certificates are to be issued to those who pass the examination satisfactorily but have not had the necessary experience. Such certificates are to be exchanged for a "Skilled Miner" certificate when the holder has had the necessary experience. Optional.

5. All oral questions are to be answered correctly either by the applicant or the board at the time of the examination.

6. Correct answers to the written questions are to be furnished by the department upon request.

7. Foremen are to be allowed to appoint emergency shift bosses who do not hold certificates, the understanding being that they will not be appointed regular shift bosses until they pass the examination.

8. Credits in the examination are to be as follows:

Oral examination	20
Written examination	20
Experience	25
Ability to handle men	25
Attendance	10
Total	100

Seventy per cent of the total required to pass.

9. Full credit is given in "experience" to a man who has had five years' experience as a miner.

10. The foreman and shift boss of each applicant for examination shall submit to the examining board a written report on his ability to handle men, such report to be used by the examining board in determining points to be credited under "Ability to Handle Men."

11. Experience is to be graded as shown in the following table:

1. In no case shall a man receive more than 25 points.

2. Outside experience to be accompanied by documentary evidence in proof of service.

Years		1	2	3	4	5
Occupation	District	Year	Years	Years	Years	Years
Timberman	1	4	9	14	20	27
	2	4 5	10	15	21	28
Repairman	3	5	11	16	22	29
Shaftman	1	3 5	8	13	19	26
	2	4	9	14	20	27
	3	4 5	10	15	21	28
Stopeminer	1	3	7	12	18	25
	2	3 5	8	13	19	26
Stopeman	3	4	9	14	20	27
Driftminer	1	3	7	12	18	25
	2	3 5	8	13	19	26
Raiseminer	3	4	9	14	20	27
Timber rustler	1	2	4 5	8.5	13 5	20
	2	2 5	5	9	14	21
Mucker	3	3	5 5	9 5	14.5	22
Group "A"	1	1 5	3 5	6.5	10.5	15
	2	2	4	7	11	16
	3	2 5	4 5	7 5	11 5	17
Group "B"	1	1	2 5	5	9	14
	2	1 5	3	5.5	9 5	15
	3	2	3 5	6	10	16
Foreman	1	7	16	27		
	2	8	17	28		
	3	9	18	29		
Shift boss	1	5	14	25		
	2	6	15	26		
	3	7	16	27		

(Subject to Revision)

Group "A"
Skipmen
Pipemen
Nippers
Trackmen
Powdermen
Cagers
Timber swamper

Group "B"
Motormen
Swampers
Loaders
Carmen
Drivers

12. After each examination the three miners on the Examining Board to be replaced by three others who hold certificates.

13. Compensation for miners on the Examining Board shall be the existing scale of wages.

14. Each candidate shall answer a set of questions as to training and experience, answers to be presented to the examiner when the candidate presents himself for written examination.

15. The examination proper shall consist of oral and written questions, conducted in the English language, and shall be of such a nature so as to determine the competency and qualifications of the applicant.

16. The oral examination shall be had separately, and candidates will be called alphabetically in so far as this can be done. There shall be from twelve to twenty questions.

17. All candidates, being assembled for the written examination, shall be assigned to separate desks, provided with writing material and a list of printed questions required to be answered. Also a printed card, numbered, on which to write his name and address. This card will be inclosed in a sealed envelope and passed to the person keeping the records of the examination, together with the answers to the printed questions. The candidate's examination paper will be marked by the number which appears on the card.

18. Questions for examination shall be uniform and shall be selected by the Examining Board.

19. All applicants who shall receive a grade of 70 per cent and shall be otherwise competent and adjudged competent shall be granted a certificate signed by the Examining Board and the manager of the Copper Queen Branch.

20. The board shall have the right at any time to add to or modify these rules in any way.

A man can start to take the course at any time. Meetings are held in Bisbee every Wednesday, an afternoon session at 1 o'clock and an evening session at 7 o'clock. The instruction consists of a series of articles or lectures prepared for the most part by members of the engineering staff, superintendents, foremen, and other employees. The lectures are given by the individual preparing them, and thus there is the important principle of contact between the leader and his men in the highly desirable relationship of instructor and student. The advantage is a double one, for the leader must definitely organize his subject and must look at it from the point of view of his men. He is thus under the necessity of reviewing and visualizing his own work.

The subjects presented the second year, together with the lectures, were as follows:

1. Mucking and Mine Tools, by J. T. Marshall, foreman, Lowell.
2. Breaking Ground, by F. D. Lane, efficiency engineer.
3. Shaft Sinking, by T. N. Jewell, foreman, Calumet and Cochise.
4. Breaking Ground in Drifts, by James McGarry, foreman, Dallas.
5. Timbering and Repair Work in Drifts, by Jack Radcliffe, foreman, Sacramento.
6. Raises, Breaking and Timbering, by J. S. Stewart, foreman, Holbrook.
7. Track and Road Maintenance, by Lou Moon, night foreman, Holbrook.
8. The Selection of a Mining Method, by Gerald Sherman, consulting engineer.
9. Horizontal and Inclined Top Slicing, by J. W. Scott, foreman, Czar.
10. Square-Setting, by J. W. Toland, underground superintendent.
11. Horizontal and Inclined Cut and Fill, by J. F. Sinclair, underground superintendent.
12. Caving Methods, by Gerald Sherman, consulting engineer.
13. Steam Shoveling, Open-Cut Mining, by George Mieyr, superintendent, Sacramento Hill, and A. Livingston, statistician.
14. Accident Prevention and Safety, by W. W. Gidley, safety inspector.
15. Explosives, by F. D. Lane, efficiency engineer.
16. Sampling, by Leon Fuchere, chief sampler.
17. The Importance of Metallurgical Considerations in Mining, by William B. Boggs, chief metallurgist, Copper Queen smelter.
18. Ventilation of Metal Mines, by C. A. Mitke, mining engineer.
19. Fire Prevention in Metal Mines, by C. A. Mitke, mining engineer.
20. Mathematics, by C. S. Heislar, construction engineer.
21. Drifting Machines, by Fred Doscher, drill-repair man.
22. Stopers and Pluggers, by Fred Doscher, drill-repair man.
23. Standards, by Al Cromer, foreman, Gardner.
24. Electricity, by Charles Bear, chief electrician.
25. Air Compression and Transmission, by Frank Duval, assistant master mechanic.
26. Hoisting and Haulage, by O. N. Alvin, master mechanic.
27. Pipes, Pipe Fittings, and Hose, by J. S. Maffeo, mechanical engineer.
28. Discipline, by G. H. Dowell, manager, Copper Queen Branch.
29. Drainage, by O. N. Alvin, master mechanic.
30. Map Making, Reading, and Interpretations, by H. Ziesemer, chief engineer.

BISBEE FROM THE TRAIL TO HIGGINS MINE

31. General Geology, by J. B. Tenney, consulting mining geologist.
32. Geology of the Warren District, by J. B. Tenney.
33. Chemistry and Ores of Copper, by C. H. Compton, chief chemist.
34. Mine Time-keeping and the Segregation of Mine Labor, by E. A. Crocker, cost department.
35. The Purchasing, Distribution, and Handling of Supplies, by F. S. Davenport, superintendent, supply department.
36. Methods of Compensation, by E. B. Rider, chief efficiency engineer.
37. Organization, by H. C. Henrie, chief clerk.
38. Efficiency Engineering, by Arthur Notman, superintendent, mine department.
39. Economics of the Mining Industry, by Gerald Sherman, consulting engineer.
40. The Employment of Men, by C. W. Moon, employment manager.
41. The Duties of a Shift Boss, by R. R. Boyd, assistant superintendent, mine department.
42. Company Policies, by G. H. Dowell, manager, Copper Queen Branch.

The lectures are printed in the form of pamphlets and are placed in the hands of the men. I have examined practically all of these pamphlets, and have found the subject matter interesting and practical. There has been conscientious care in their preparation, and as a whole they reflect great credit upon both the individuals preparing them and the management broad enough to initiate this work.

It is worthy of note that a similar school was started by the Cleveland-Cliffs Iron Co. in 1915. Its purposes

are much the same as the Copper Queen school, and, like it, it began in a small way. C. S. Stevenson described this school in a paper presented at the twentieth annual meeting of the Lake Superior Mining Institute in September, 1915. In the State of Nevada, a miners' instruction class was formed a number of years ago at Virginia City, and has continued up to the present. It was organized by certain mine superintendents and school men. With the assistance of the University of Nevada, it obtained a fair start. Since then other schools have been organized at Tonopah and Ely. Each of the schools is under the direction of a technically trained man, and though the attendance has been relatively small, good work has been done. The Nevada work is of special interest, in that it represents the welding together of the state educational system and local initiative. Unlike both of the examples quoted before, it is directly in charge of the University of Nevada.

The Nerve of Mr. Hoover!

By Mark R. Lamb

Written for *Engineering and Mining Journal*

LATELY Mr. Hoover has been discussing WORLD problems. These problems require executives. Mr. Hoover thinks that the engineer, speaking generally, would be best equipped for the task. He gives his reasons. Poor engineer!

"Hoover held that engineers were best qualified to undertake the great task he outlined, inasmuch as they had no special economic interests for themselves in a constructive solution of the problems, their only interest being in creating a working force for public service."

In other words, the engineer is not financially interested, and is therefore more or less in the position to be impartial and fair—like a preacher.

It is only natural that Mr. Hoover was mistaken, and at least let us be charitable and accuse him of nothing worse. Anyone knows that Mr. "X," with the big oil company, has shares and is a millionaire. That he is still a practicing engineer does not mean that he has "no economic interest" in the British control of all the oil in Mesopotamia. Mr. "Y," the famous copper man, after many years' faithful labor in building up a famous company with mines all over the world, is surely heavily interested in shares in mines in Chile, Russia, and Africa. Mr. "Z," the flotation expert, with many victories to his credit, is certainly a heavy holder of stock in his company, and interested financially in the free development of mines in all protected territories.

A list like this would include most of the membership of the Institute, and on behalf of the Institute I protest against the base insinuation that engineers have no "economic interest" in anything in the world. It sounds too much like "living with his wife's folks" (see "Lamb's Formula") and is sure to hurt the engineer's feelings.

Mr. Hoover should also remember that he and I are not the only ones who have escaped the drudgery of engineering by broadening activities into commerce and finance and becoming comparatively wealthy. Hardly an engineer in these days but knows intimately the intricacies of "common and preferred," the many types of bonds; how to borrow at the bank, and all about notes and acceptances, bills of exchange, and trust receipts; whereas, only a few years ago, an engineer was more or less proud of his ignorance of such things, and talked in a self-satisfied way of being "purely (and poorly) technical."

Not a few engineers lately have deliberately worked with bankers and financiers for a time with no other purpose than to broaden their experience and value and to improve their financial standing. Most of these have substantial "economic interests" in all parts of the world, and Mr. Hoover is unfair in putting them on the economic rating of an elevator starter.

If Mr. Hoover sends me on such an economic errand to Europe, I want it distinctly understood that I am just as much entitled to an "economic interest" in Rumanian oil fields as any other engineer-financier like Mr. McAdoo, Morgan, Sörensen, Van Law, Butters, Bosqui, Jackling, Hoover, and thousands of others.

Of course, if Mr. Hoover had in mind those merely civil engineers, I have nothing to say. They are a sad lot. Always talking about the railroad *they* built in Brazil or China, totally forgetting the financier in New York who *really* built the railroad. They are poor fish! If they built the railroad or the bridge or the port works or the office building, why does someone else own it? And why, immediately after completing the job, is it so vitally important for a C.E. to get another?

The electrical engineers are worse. They don't know a banker's acceptance from a wedding invitation: They labor over (someone's else) drawing board, improving (someone's else) machinery, building (for someone else) beautiful, efficient power plants.

Whoever heard of a C.E. or an E.E. doing anything big *for himself!* Whoever heard of one who had even an "economic interest" in the house he lives in, much less in world matters?

Now, as to things political, Hoover must grant that mining engineers are enthusiastic students of political economy and are constantly being elected as congressmen, senators, governors and mayors and are frequently given cabinet portfolios. Some of them actually vote occasionally. Who can say that a wealthy mining engineer with shares in mines, steamship lines, banks and commercial organizations has no "economic interest" in the economic development of Europe, the benighted?

Please make Mr. Hoover retract.

Silica Brick Production Decreased In 1919

The quantity of silica (refractory) brick produced in the United States in 1919, according to an estimate made by the U. S. Geological Survey, was the equivalent of 216,363,000 9-in. brick, and was valued at $11,798,000, a decrease of 120,199,000 brick and of $8,190,000 from 1918. The average price per thousand decreased from $59.39 in 1918 to $54.53, in 1919. The output in 1919, though much smaller than that in 1918, was much larger than that made in any year prior to 1916.

Mexican Onyx

When waters charged with carbonate of calcium derived from limestone are allowed to evaporate they deposit masses of the carbonate, some of which are of great beauty. This process can be observed at many warm and "petrifying" springs and also in limestone caverns where stalactites and stalagmites are being formed, according to the U. S. Geological Survey. Mexican "onyx" is formed in this way. Its variations in color and texture, which make it attractive and valuable as an ornament, are commonly produced by oxide of iron, or even by mud and clay.

Picturesque Mining Experiences—VI

A Slight Unpleasantness

By W. H. SHOCKLEY
Written for *Engineering and Mining Journal*

ON JULY 26, 1899, my pack train started from Yao-tzu-po at 4 a.m. Riding with my interpreter, Wang, my official companion (wei yuan) Yeh, and a few servants, we soon left the pack train behind. At the walled village of Ku Cheng we found the central square jammed by a holiday crowd watching a temporary stage whereon brilliantly clad performers were enacting a battle between imperial and rebellious forces. The Emperor's troops, led by his slender daughter, were winning, but suddenly her shrill cries rose to a shriek of agony, and she fell on the stage in convulsions. Her suffering was pitiful to see, but my Chinese friends seemed to find the scene amusing, and smilingly explained that the lady general was in the throes of approaching maternity. As a result of her incapacity, the rebels won the battle.

Seeing that the attention of the crowd was directed as much to us as to the play, we rode on to Ho-chin-hsien, the residence of a district magistrate, an official who personally attends to those duties that are divided among our county officers. The people call him "the father-mother official." We arrived at Ho-chin at 2 p.m., and expected the mules within a couple of hours, but late in the afternoon a muleteer brought word that four of our servants had been beaten and the mules impounded by the villagers. This was startling news, for all our goods, except the thin clothes we wore, were

THE AUTHOR IN CHINA, ACCOMPANIED BY INTERPRETER AND GUIDE

with the pack train. We told Yeh that he must at once ask the officials to help us, but he said that he could not call on the magistrate because he had no cards and no proper clothes. His objections being speedily overruled, he visited the magistrate and came back in half an hour, telling us that ten cavalrymen had been sent to the village. Late that night we received word that the pack train would arrive in the morning. Worrying about the safety of our servants and our goods, and suffering from the heat, I passed a wretched night trying to sleep on some boards in the upper story of a temple.

Accompanying the pack train in the morning came our servants—dirty, haggard, and blood-stained. I had prepared hot water for them, and was much surprised when they unanimously declined a bath. They wanted to look as miserable as possible until after the visit of the coroner (wu tsoa), an official whose business it is to examine into assaults and murders. He proved to be a keen little man of sixty-odd. He looked over the servants, who were stretched out on improvised couches, and almost too weak to talk. The cook's case was the worst; he gave no sign of life when questioned. But when the coroner told the bystanders that the four

TEMPLES ON THE YELLOW RIVER AT YU MEN K'OU

The Yellow River leaves the mountains at Yu men K'ou and is the boundary between Shansi on the right and Shensi on the left. This break in the mountains was, so the priest told me, made by the Great Yu, when he was controlling the floods of China, about B. C. 2278. The Shansi temple was lately (1895?) redecorated, and one of the principal pictures represents nine states paying their respects to Yu. Among the crowd are representatives of various nations—a big, hirsute, fur-clad Russian, a Frenchman leading a bear by a string, a Salvation army lass in short skirts, a middle-aged Englishwoman with projecting front teeth, a man bearing a banner on which is written B. Furth, Vienna. These foreigners are probably taken from some comic paper or advertisement; I think, Austrian. Mixed up with these nations are various monsters: the man with the head in the middle of his adbomen; the man with a hole through his body; the egg with six legs and four wings; a bird with a Frenchman's head, hair nicely parted. The whole excellently well done

bloody wounds on the cook's head were knife-cuts, the cook spoke up quite vigorously: "No, they were made by a stone." At this answer the coroner smiled in a relieved manner, for he had found out that the cook was shamming. After the coroner left the servants consented to wash themselves, and in a few minutes made a marvelous recovery. Meanwhile, I had gone over the baggage and found everything intact. Our 3,000 ounces of silver, which must have been a temptation, was untouched.

From our servants we learned that they had stopped in the village after tiffin and watched the play. While there, one of the villagers stepped on the foot of my number one boy, and to his remonstrance replied: "If your foot had been where you ought to be, and that's at home, there would have been no trouble." On this a row started, and my men were driven away. Going back to their inn, they seized staves and, returning, drove everyone out of the square. On this the villagers shut the gates, rang the alarm bell, came in force, captured

the servants, beat them, tied their hands behind them around the columns of the temple and their cues tight above their heads. In this position they remained for several hours, insulted, jeered at, and tortured by swarms of flies.

With the pack train had come as prisoners several elders and the head man of the village. After abjectly apologizing they were led away. I appealed to the magistrate to let them off lightly because of their honesty, but I heard that they were given 650 blows—a very severe punishment.

Mining Activities in the Potosi District, In Bolivia

Several Important Tin Operations Being Carried On Which Are Revivals of Ancient Mines—Both Old and Modern Methods Used

THE Potosi district of Bolivia, according to Trade Commissioner Schurz, is essentially a mining region. The mining industry centers about the famous Cerro de Potosi, although there are less important mines at other points outside the immediate radius of the city of Potosi. Silver and tin are the principal products of the Potosi mines, though copper, lead, antimony, and other minerals are also produced. Exports from the district during 1918 amounted to the following totals:

Mineral:	Kilos
Tin:	
Barilla (concentrate)	4,639,530
Bars	582,050
Wolfram	1,990
Silver	22,840
Copper	31,000
Bismuth	18,360

The Cerro de Potosi is a cone-shaped mountain about 2,000 ft. high, situated on the outskirts of the city of that name. The Spaniards began to work its rich deposits of silver ore in about 1545, and during the colonial régime the enormous quantities of silver taken out of the Cerro, variously estimated at from $1,000,000,000 to $2,000,000,000, formed the principal basis of the mineral industry of the old viceroyalty of Peru. However, the Spaniards not only ignored the tin and other metals existing in the Cerro, but the inadequate methods used in mining and smelting prevented them from securing the full benefit of their labors, so that the dumps left from their workings still contain a very appreciable quantity of metal. During the past few decades there has been a marked revival of mining in the Cerro, the present operators being comparative newcomers.

Important Mining Interests in the Region

The most important interests in the Cerro are those belonging to Luis Soux, of French birth, who operates several mines in the Cerro and owns a smelter, the only one in Bolivia, which was built about twenty-five years ago, and in which he makes bars containing about 95 per cent tin. He also sends out large quantities of tin concentrate (barilla) and silver ore. About 1,000 people are employed in all his workings. The second most important interest in the district belongs to the Bebin brothers, also of French origin. These men have recently installed a new concentration plant, where the tin ores from their mines in the Cerro are prepared for shipment in the form of concentrate. The equipment of this plant, which is the most modern of its kind in Bolivia, is of American manufacture. About five tons of barilla which runs from 55 to 60 per cent tin are turned out a day. Probably 400 employees are on the payrolls of the Bebins. Third in importance are the interests of the Anglo-Bolivian Mining Syndicate, Ltd., which is controlled by the Aramayo Francke Mines, Ltd., with important tin, silver, and bismuth mines in southern Bolivia near Atocha. This company works, among other mines, the old "Real Socavon," which dates from early colonial times. Of secondary importance are the mining interests of Benavides, Cabrimonte, and Medinaceli.

Antiquated Methods Employed

Numerous small operators work one or two galleries with the aid of a few Indians and sell their ore to the larger miners or to the regular buyers of ores. In 1919 there were 742 bocaminas, or mine entrances, in the Cerro. The mountain is, in fact, honeycombed with galleries, which are connected throughout its interior. Conflicting claims have given rise to a great mass of litigation, not only because of disputes over original ground claims, but also because of the survival of a peculiar old Spanish law, now only applicable to the Cerro, whereby any miner must cease working on encountering the gallery of another miner, or must divert his own gallery in another direction in the hope of striking another vein of ore. Mining methods are still generally antiquated, being for the most part in the pick-and-shovel stage, with little use of power drills or mechanical equipment of any kind. The laborers are Indians or "cholos," few of whom can be called expert miners. The ore is carried down the mountain to the concentrating plants on the backs of burrows, though an "andarivel," or cable way, is used also in one instance.

Among mines outside the radius of the city of Potosi are those of Porco, which are situated along the railway between Potosi and Rio Mulato. It is believed that these deposits of tin are now nearing exhaustion. Another mining company controlled by British interests, which was formed for the purpose of working the alluvial tin deposits in the bed of a river for a few miles from the city of Potosi, installed two powerful dredges, one at Aroifilla and the other at Chaca. The material taken out of the river bed contained about 20 per cent tin. The Aroifilla dredge produced for a time upward of 110 tons of barilla per month, running from 60 to 63 per cent tin, and the Chaca dredge produced 30 to 38 tons of barilla per month. However, the burning of both of these dredges, which represented an investment of about £100,000, paralyzed the work of this company.

Importance of Burmese Gems

Burma is said to be the world's chief source of supply of rubies and of one kind of jade. The quantity of jade exported during the year 1918-19 was 2,763 hundredweight, as against 3,108 hundredweight in 1917-18. Most of this trade is with Hongkong. In addition to this export by sea, 571 hundredweight went across the frontier to China during 1918-19, as against 500 hundredweight during the preceding year. No record is kept of the exports of rubies, sapphires, and spinels, as most of these articles go out as personal effects. The value of the trade, however, must be several hundred thousand dollars a year.

Metallurgists of Note

Galen H. Clevenger

GALEN H. CLEVENGER'S career as a metallurgist is the result of hard luck. Otherwise he would have been a miner. Thus, by this same hard luck the mining fraternity lost an excellent human prospect. When Mr. Clevenger was sixteen years old an old miner in the Black Hills of Dakota considered him such a good man that he contracted with him to drive a tunnel on a prospect, for which work he was to receive a one-half interest in the expected mine. Clevenger drove the tunnel single-handed. Ore, however, was absent, so that although he received the physical one-half interest as promised, his mental interest in mining quickly declined to a much smaller fraction than this, and caused him to take up metallurgy, which offered a greater opportunity for experimentation and research. At this time he was a student in the South Dakota School of Mines. This was the natural school for him to attend, for he had lived in that state since 1882, when, at the age of three, he helped his parents move from their old home in New York State. From the age of fifteen, he was obliged to earn his own living. While a student at the mining school Clevenger began experiments upon the cyanidation of an accumulation of chlorination tailings. For the purpose he built a 200-lb. demonstration plant out of what were known in those days as whiskey barrels, these being plentiful at that time and place. The operation of this small plant convinced him that the tailings could be treated profitably; he not only assayed his feed and tailings but actually recovered the gold and silver in the form of bullion. However, to others there were all sorts of reasons why chlorination tailings could not be cyanided, the chief being the familiar one that if it were economically possible it would have been done before, it being assumed that young Clevenger did not know more than all the prominent metallurgists that had preceded him. Finally a woman loaned him a few hundred dollars, and this, together with credit extended by a foundry whose owner was not particular as to whom he extended credit, enabled him to proceed with the construction of a thirty-ton plant. This was a success from the start, and Clevenger was able to pay all his obligations by running the plant well into a Dakota winter, which was not particularly pleasant for an outdoor plant. Following this practical demonstration by a youngster, many thousands of tons of chlorination tailings were treated profitably by Western mining companies. After being graduated from the South Dakota School of Mines, Mr. Clevenger accepted the position of assayer and chemist to the Dakota Mining & Milling Co., of Deadwood, which had the first wet-crushing cyanide plant of any importance in the United States. Later he traveled through the West, from Mexico to Alaska, and prospected unsuccessfully for a season in the district around Skagway. On the way back he decided that the best way to advance in the art of metallurgy was to take a post-graduate course at Columbia University. His chief trouble that fall, he says, was to find a bank which would take care of his money for him, a $200 balance being about the minimum accepted by New York banks, and to persuade some of the professors that he had been properly prepared to take their courses. After securing his Columbia degree, Mr. Clevenger returned to the scene of his endeavors and was engaged as research metallurgist with the National Smelting Co., when he rediscovered the Pearce process of recovering gold from matte, which was a secret known only to the Argo smelter at Denver. Since then, Mr. Clevenger has had wide practical experience, and for a time taught at Stanford University. With Charles Butters he did a great deal in developing the silver metallurgy of the Cobalt district by devising a process for the local treatment of the ores. With the co-operation of H. W. Gepp he solved some of the problems connected with the recovery of zinc from Broken Hill concentrates by the electrolytic process, discovering the deleterious effect of traces of cobalt in this connection.

GALEN H. CLEVENGER

Mr. Clevenger is now consulting metallurgist both to the U. S. Smelting, Refining & Mining Co. and to the U. S. Bureau of Mines, as well as holding responsible positions in the National Research Council and the A. I. M. E. His home is in Boston.

HANDY KNOWLEDGE

How To Cut Belts Square

BY F. D. RICH

Cutting the ends of a belt as a preliminary to fastening them seems such a simple operation that often the belt man does not give it the consideration necessary to insure the best results, and much of the difficulty with otherwise good belts is due to their not being cut and joined accurately. It is as easy to make a belt joint which will run the same as an endless belt as it is to make a poor one by careless rule-of-the-thumb methods.

When a belt runs "wobbly," or races back and forth across the pulleys, it is not giving its best service, nor can it have its longest life. A belt that is repeatedly jumping off the pulleys is costing about twice as much as it should, because its life is being shortened and power is lost. Provided that its ends are cut square, and it is joined with care, a belt can be made to run as straight as an arrow if the pulleys are lined up true.

If a square is not used, one or both of the ends will be cut unevenly or irregularly, which prevents smooth running. Even the use of a straightedge does not assure the perfect results obtained by using a square, for the slip of a fraction of an inch will bring the belt ends together at an angle, as shown in Fig. 1. This results in the belt "shimmying" on the pulleys, which impairs its service, for, as it moves from side to side, the line of direct pull, "*A-B*," moves from one side of the belt to the other, imposing shifting and irregular strains, which no belt can be expected to stand indefinitely.

For belts up to 15 or 18 in. wide the ordinary square is used. It is pressed firmly against the edge of the belt and the knife held vertically when cutting. See Fig. 2. A sharp knife is essential. The point of the knife should be wet. When a number of belts have to be cut, a good arrangement is to drive two nails in a large block of wood, and against these set the edge of the belt and the edge of the square, as shown in Fig. 3. This prevents either the belt or the square slipping. A slip of leather or a piece of old belt is often tacked on the end of the block to protect the point of the knife as it comes through the belt.

Wide belts are more difficult to square accurately, and the difficulty is often increased by slight variations in width, which throws the square out. To avoid this and assure perfect results, the following method has proved to be the best: At any point near where the belt is to be cut, measure across and find the center as at "*A-A*," Fig. 4. At any distance back of this, two or three feet, find the center again as at "*B-B*." Between these two center points draw a clean, sharp line. This marks the center axis of the belt. As shown in Fig. 5, the square is placed against the center line, and the end of the belt trimmed off. Two small nails driven in on the center line will prevent the square from slipping.

In cutting the other end of the belt, the center line is found in a similar manner as that just described. At any point on this line other than where the belt clamp will come, a point "*C*" is taken—Fig. 5. By using the square, a line "*D-C-E*" is drawn at right angles to the axis, and all the way across from edge to edge. It is sometimes easier to draw this line by marking the points "*D*" and "*E*" and then placing a straightedge through the points "*D-C-E*" to draw the line. See Fig. 6. The straightedge should be straight. The line "*D-C-E*" is

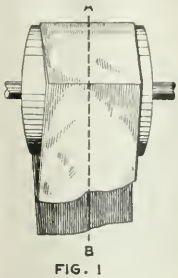


FIG. 1

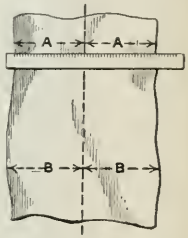


FIG. 4

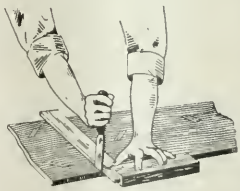


FIG. 2

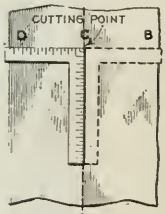


FIG. 5

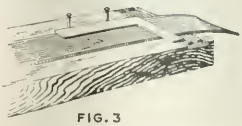


FIG. 3

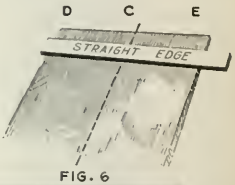


FIG. 6

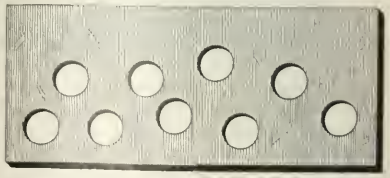


FIG. 7
DETAILS OF BELT CUTTING

used as a "base line" to measure from after the belt is in the clamps.

Where the ends are to be cut is determined after clamps have been put on and the belt brought into position. By measuring from the line "*D-E*" an equal distance on each side of the belt, a new cutting line can be established. Calipers are convenient for making this

measurement over the belt clamp. As a matter of convenience, one end of the belt is always cut square and ready for making the joint before putting the belt into the clamp.

It is no uncommon thing to see, in journeys through plants, laced belts in which from 40 to frequently more than 70 per cent of the cross-section of the belt is removed in punched holes. See Fig. 7. Many types of metal fasteners are in common use, which from an engineering standpoint are but slightly if any more satisfactory than lacing methods, for several reasons: First, because many of them sever the lengthwise, power-carrying fibers. Second, because others place all the strain in a straight line comparatively close to the end of the belt. Third, because some make a joint which is so stiff and hard that they pound on the pulleys and cause the belt to break back of the joint. Fourth, because many put metal in contact with the pulleys, which causes noise and wears and weakens the metal, so that such joints must be constantly watched, both to prevent danger to workmen and to detect failure of the joint.

The ideal belt joint is one which would run the same as an endless belt, without the drawbacks or difficulty in making and later shortening to take up stretch. Belting manufacturers themselves estimate that only a very small percentage of belts need to be made actually endless. Their estimates range from one-half of 1 to 2 per cent as the proportion of belts which it is necessary to make endless. The qualifications of a belt joint, by which any engineer can check up the comparative efficiency of his own methods, are as follows: The joint must maintain the maximum strength of the belt and it must avoid destruction or weakening of the lengthwise, power-carrying belt fibers. The joint should prevent breaking the belt back of the joint. It must not hammer on the pulleys, and it must not be subject to wear or to weakening through shock. The joint should insure continuous, uninterrupted operation without supervision; should hug the pulleys tightly, and insure full transmission of power. It should run silently, the same as endless. Joints should be so made that they can be easily taken apart for removing or shortening the belt; they should be safe against accidents or breakdowns, must be easily and quickly made without special equipment, and should last for the life of the belt.

Repair of Leaching Vats

By C. Flury

The bottom of a 5½ x 22 ft. circular cyanide leaching vat constructed of iron was pierced with numerous holes. Some parts were so badly worn that a needle could have been pushed through without effort. Previously, the leakage was stopped by means of plugs made from coal-tar-soaked cotton waste. Ths method, however, proved to be inefficient. A two-inch cement bottom was laid on the inside of the vat; but pressure variations during charging and discharging broke the cement layer in a short time. This result led those responsible for operations to devise a more flexible bottom, which was built in the following way: Over the whole defective iron bottom was laid an asphalt layer, one-quarter inch thick. This was covered with a layer of canvas (old filter leaves removed from a Butter's vacuum filter). Care was taken that the canvas was placed while the asphalt was still hot. The canvas was then covered with an asphalt layer one-quarter inch in thickness. After twenty-four hours the tank was put under water pressure for seventy-two hours. The water was then discharged and the tank filled again. It was left for seventy-two hours. During the experiment the vat was closely observed, but not the smallest leak could be found. The repair cost amounted to approximately $92, whereas a new tank was quoted at $750. To put in a new bottom was impossible, as the bottom ends of the mantel pieces would not stand new riveting.

Protection of Eyes in Using Arc-Welding Apparatus*

By Dr. C. R. Kindall

Recently thirty men were viewing the demonstration of a new portable electric arc-welding outfit. A few hours later seventeen of the thirty men reported to the doctor for treatment. They were suffering from traumatic conjunctivitis. In two cases the pain was severe. Only two men of the thirty were not affected in some way from this exposure. These two men wore thick-lensed orange-colored glasses. Several of the men wore orange-colored glasses with thin lenses, but the latter were not heavy enough to afford protection against an exposure as long as that which took place. The distance of the eye from the arc also influences the possibility of injury. Conjunctivitis is an inflammation of the conjunctiva. The conjunctiva is the mucous membrane covering the inside of the eyelids and part of the eyeball. Traumatic conjuctivitis is caused by foreign bodies in the eye, exposure of the eyes to high winds, dust, smoke, intense light from electric arc lamps, and from electric welding apparatus. In the instance mentioned, the inflammation was due to the ultra-violet rays. The ultra-violet rays lie beyond the violet rays in the spectrum and are visible to the eye. In some cases the effect is so severe that, in addition to conjunctivitis, an inflammation of the skin is produced.

The symptons of conjunctivitis caused by intense light or by the ultra-violet rays are abnormal intolerance to light, excessive secretion of tears, intense smarting of the lid, contraction of the pupil, sometimes swelling of the lid, and small ulcers developing on the eyeball or cornea. Unless properly treated by a physician immediately, chronic inflammation of the conjunctiva, cornea, iris, or retina, and possibly blindness, may result.

Under proper treatment most cases get well in a few days. All treatment should be under the direction of a physician. That usually advised is to place ice packs on the patient's eyes three or four times daily. The pack should be left on from fifteen minutes to an hour. The eyes should be irrigated with normal salt solution (a teaspoonful to a quart of sterile water) or a saturated solution of boric acid several times daily. If there is a discharge of pus, a few drops of a 25 per cent solution of argyrol or a 5 per cent solution of protargol should be placed in the eyes three to six times daily. The patient should be confined to a darkened room until his condition improves, in order to avoid complications. These treatments will reduce the swelling, give the patient comfort, and prevent the development of chronic conjunctivitis.

*From *Reports of Investigations*, U. S. Bureau of Mines, October, 1920

BY THE WAY

A Fruitless Reformation

"Tha trouble these 'ere pro'ibitin' h'enforcement h'officers do be 'avin in makin' h'all o' we min' their laws," said Cap'n Dick, "remin's me o' tha night that Dicky Truscott an' Jan Richards tried for to cure Tom Trezise o' tha drinkin' 'abit. Tom did dearly love a drop o' beer or a noggin o' whiskey. Scoores 'pon scoores o' times I've 'eard 'im say, 'I've 'ad lots o' beer in my time an' I've never yet 'ad no *poor* beer.' Tha night o' w'ich I do be speakin' h'all three boys wuz drinkin' daown to 'Arry James 'Drain Tunnel' saloon. Wuzn't long afor' Tom, 'oo couldn't 'old much drink, any'ow, wuz maudlin' drunk, so h'out 'e gaws to tha back room an' fell asleep in a cheer. Dicky an' Jan then an' there decided that they should try for to cure Tom o' tha drinkin' 'abit. So they took Tom, poor h'ol chap, an' lifted un h'into a cart an' 'auled 'im h'out to tha graveyard. There they puts un daown by a new-dug grave—an' Tom a-sleepin' all the w'ile. Then they 'id theyselves be'ind a bush an' waited. 'Baout a' 'our Tom wakes h'up an' looks aroun'—wil' h'eyed like. 'Is 'and slips h'over tha hedge o' tha grave, an' 'e sez, 'W'ot bloody shaf' is this?' Then 'e sees tha 'eadstone an' 'e h'asks, 'W'ere am I to?' So Dicky h'up an' speaks, 'Thee's in 'ell, m'son, an' close to one o' its pits.' "Ow long 'as I been 'ere?' sez Tom. 'Thee's been 'ere a week,' h'answered Dicky. "Ow long you been ere', h'asks Tom. 'I been 'ere two weeks,' sez Dicky. 'Well,' sez Tom, 'thee's naw tha bloody place better'n I do. 'Ere's a shillin' for to gos' h'out an' get a quart o' beer for we.' An', m'son, never h'again did they try for to cure Tom o' tha drinkin' 'abit."

The Latest in Ideas

We take the following from the New York *World*:

Laborer Gets $150,000

Anaconda, Mont., Nov. 28.—From a laborer's task at the Washoe smelter to the possession of $150,000 was the realization here recently of Claude Sheumaker, who received a telegram from an eastern broker advising him that he had realized this fortune on the sale of oil stock. Sheumaker immediately drew his earnings, purchased a railroad ticket and started east. Sheumaker conceived the idea of buying oil stock while in the army. While serving overseas with the Twenty-third Division he was wounded. His original investment was $300 of back army pay. He intends purchasing a ranch in Oregon, he said.

As an Idea Conceiver we cannot rate Claude better than one-half of 1 per cent, but for plain bull-headed luck we should grant him at least a plus.

Volcanism in Pennsylvania

"The Fayette mine of the Lowber Gas & Coal Co., three miles from Fayette City, Pa.," said the New York *Times* recently, "is on fire and burning fiercely. Investigation so far made lends color to the belief that the fire was caused by volcanic eruptions of mild intensity, which, according to engineers, have been responsible for the breaking out of flames in two other mines in this region in the last four weeks."

Murderer's Bar

Murderer's Bar in the Middle Fork of American River is described in Hittel's "History of California" as it was in July, 1851, at which time it was perhaps at its best for activity and yield. According to Hittel, an eye-witness said: "A turn in the road presented a scene of mining life as perfect in all its details as it was novel in its features. Immediately beneath us the swift river glided tranquilly, though foaming still from the great battle which a few yards higher up it had fought with a mass of black obstructing rocks. On the banks was a village of canvas that the winter rains had bleached to perfection and round it the miners were at work at every point. Many were waist-deep in the water, toiling in bands to construct a race and dam to turn the river's course; others were intrenched in holes like grave diggers, working down to the bedrock. Some were on the brink of the stream washing out 'prospects' from tin pans or wooden 'bateas'; and others worked in company with the long tom by means of water sluices artfully conveyed from the river. Many were 'coyote-ing' in subterranean holes, from which from time to time their heads popped out, like those of squirrels, to take a look at the world; and a few with drills, dissatisfied with nature's work, were preparing to remove large rocks with gunpowder. All was life, merriment, vigor, and determination, as this part of the earth was being turned inside out to see what it was made of."

A Scientific Geologist

The common or garden geologist has produced some thrilling literature; but now comes the upper crust, the "scientific geologist"; and his work is certainly far finer and more full of pep. We publish a sample of it, taken from a prospectus designed to sell stock in the Frio County, Tex., oil fields. We may pause to warn the intending investor (who, according to the prospectus, will be everyone who is "not a piker") that Frio means cold, and, in the slang of our youth, it may be a very cold day for him if he yields to the seduction.

Geological Survey

Gentlemen:

The State of Texas contains a volume of unwritten history, wrapped in the confines of geologic ages. With this there is an unwritten law, for the genius of man to unfold, and understand.

Well equipped, he can open this book of nature, and read, even to its lowest foundation, seeking the blessings therein concealed, which are so necessary to the comfort and pleasure of the human family.

In our present age oil is the most anxiously sought for, among the world's greatest commodities. You are greatly favored in the selection of the property, west of the town of Moore, on the I. & G. N. R.R., about forty miles southwest of San Antonio. This tract of land—3,327 acres, on the Brown holdings—is indeed a veritable treasure house of oil, of the best grade known to commerce.

It is located on one of the largest rivers of the Carboniferous Age; one of the western rivers of the great Mississippi Valley. These rivers of the Carboniferous Age are the oil depositories of the world.

The deposit under your lease is a very large pool on an anti-clinal dome. This dome was formed by an internal uplift, which constructed a true oil-structure.

There are many interesting features connected with this valuable property, which I can assure you is one of the very best in the district.

134-acre Miller lease, northwest of the Kimball well, is situated on the same great oil-channel.

In about the 300-ft. level you will strike sufficient gas to run all of your machinery, and about the 600-ft. level you will strike lubricating oil in paying quantities. In about the 2,000-ft. level you will strike gusher oil.

Sincerely yours,

J. V. KIMBALL, M. E. and
Scientific Geologist.

Oct. 13, 1920.
San Antonio, Tex.

CONSULTATION

Spanish Pyrites

"I am seeking some information regarding the consumption of Spanish pyrites in this country. In how large a quantity is this material ordinarily imported? I would also like to know if the domestic pyrites deposits can compete successfully with the Spanish product. The statement has been made that the Spanish pyrites deposits supply about two-thirds of the world's production, so that their importance is apparent to anyone; but I would like to know the especial importance of Spanish pyrites in supplying United States demands. Any further information you may supply, such as market prices and grades, will be greatly appreciated."

The extensive pyrites deposits of Spain and Portugal are the most important source of pyrites in the world, and account for over two-thirds of the world's production. Although practically a unit, Spain supplies 90 per cent of the output of the district and Portugal the remainder. About two-thirds of the output contains copper in recoverable quantities. The higher-grade copper ore (containing over 5 per cent copper) is smelted locally. A lower grade of copper ore containing 1½ to 5 per cent copper is shipped to European countries for the recovery of its copper, sulphur, and iron content. Ores containing about 1½ per cent copper are customarily treated locally for their copper content, and the residue, or "washed ore," containing pyrites, is exported to the United States. The lowest grade of ore, as judged by copper content, is shipped solely for its sulphur content.

The treatment of the 1½ per cent copper ore is a leaching process utilizing water and atmospheric oxidation that extends over a period of three years.

According to A. E. Wells, two of the companies selling Spanish pyrites in this country dispose of part of their copper-bearing unwashed ores under a contract by which the sulphur content alone is paid for, the pyrites cinder reverting to the dealer. These companies have plants for treating the cinder for the recovery of copper by a chlorination and lixiviation process, after which the residue is sintered and shipped to the iron furnace.

The sulphur content of the Spanish pyrites imported to the United States varies between 45 and 50 per cent, the lump varieties usually running higher than the fines. A little arsenic may be contained in the ore. Most of the imported ore enters the country by way of New York, Philadelphia, and Baltimore, although the southern ports of Charleston, S. C., Savannah, Ga., New Orleans, La., Norfolk, Va., Jacksonville, Fla., and Wilmington, N. C., are also important domestic points of entry.

The Spanish ore comes in two principal grades, recognized by the trade as furnace size and fines size. Most of the ore of furnace size finds its way to the South, where furnaces for treating this sort of material almost exclusively are situated. The fines are consumed by the acid plants in the north. The price of the two grades ordinarily shows a differential of about 2c. per unit in favor of the furnace grade. This is due, as may be surmised, to the objectionable character of the extremely fine ore which the "fines" grade may contain. The fine dust tends to clog the flues and towers and interfere with the process to a harmful degree.

Incidentally, one of the objections to the use of domestic pyrites is the fact that the ore when mined frequently produces more fines than lumps. An average proportion as stated by Wells is about two-thirds fines to one-third lump. As the greater portion of the Southern acid plants are equipped to handle furnace ore, this interposes some difficulty in manipulation. Sulphuric-acid manufacturing equipment in the north consists principally of fines burners. Concentration is frequently necessary, to make the ore sufficiently high grade to treat. The average eastern domestic pyrites, lump, fines, and concentrates, runs about 40 per cent sulphur, which is lower than the imported Spanish grades, and is usually very low in phosphorus and arsenic. A small percentage of copper is frequently present. Domestic fines and concentrates have the advantage of usually being easier to roast than the Spanish fines.

As given in the market report, Spanish fines are quoted at 12c. per unit, c.i.f. Atlantic ports; domestic fines, 12@14c., f.o.b. Georgia mines. The prices of domestic and foreign material do not vary widely. Other quotations are referred to in the market report. As the Spanish product is a convenient ballast, it has an important transportation advantage.

Ever since 1891 the total yearly imports of pyrites from all countries has been greater than the domestic production. During the greater part of this period imports have been more than twice the domestic output, indicating clearly the important part played by importers in the pyrites industry. It has only been in the last few years, in 1918 and 1919, that imports have taken a decided downward slump, so that domestic production and imports nearly balance. The decrease in imports was largely due to the difficulty of obtaining ships for the transportation of the pyrites from Spain. Unless a tariff or governmental restriction is imposed upon the importation of Spanish pyrites, imports will likely increase; but the ready availability of crude sulphur for acid manufacture tends to compete and restrict the rate of former importation.

A comparison of domestic production and total imports of pyrites from figures given by the U. S. Geological Survey follows:

	Domestic Production (Long Tons)	Value	Total Imports (Long Tons	Value
1910	241,612	$977,978	803,551	$2,748,647
1911	301,458	1,164,871	1,006,310	3,788,803
1912	350,928	1,334,259	970,785	3,841,653
1913	341,338	1,286,084	850,592	3,011,137
1914	336,662	1,283,346	1,026,617	4,797,326
1915	394,124	1,674,933	964,634	4,817,977
1916	439,132	2,038,002	1,244,662	6,726,318
1917	482,662	2,593,035	967,340	5,581,457
1918	464,494	2,644,515	496,792	2,741,676
1919	380,000	2,500,000	388,973	2,176,565

(a) Containing more than 25 per cent sulphur

The largest domestic pyrites production occurred in 1917. Since then, output has dropped to a little above the pre-war rate.

THE PETROLEUM INDUSTRY

Oil Shale and the Engineer

The Mining, Retorting, Refining, and Marketing of Shale and Its Products Can Best Be Developed by Those Familiar With Similar Operations in Established Fields—Problems To Be Solved Before the Industry Can Be Made Commercially Successful

By David Eliot Day
Written for *Engineering and Mining Journal*

THE subject of oil shale and shale oil has received considerable publicity in the last two years; perhaps too much for its own good. It is a new and exceedingly interesting topic, about which little is definitely known, and it has inspired numerous contributions to both the technical and the popular press.

One of the effects of this publicity has been to stimulate the sale of stock in numerous oil-shale companies. That any of this stock will ever achieve a value in excess of that of the property which it represents is exceedingly doubtful. In all probability the work of commercially developing oil shale will be done by companies already established and successful, notably oil or mining corporations, and these companies will have no stock for sale. This may seem undesirable, but it is certainly logical.

To be successful in a new enterprise of this sort, the operating company must be financially sound. It must have sufficient capital to carry on a long, expensive campaign of research, experiment, and construction. It must have an experienced staff of high-grade engineers. The established mining or petroleum corporation possesses these qualifications. Furthermore, each of these institutions has had long and valuable experience in some of the operations which will be included in the oil-shale industry. Thus the mining company, although unfamiliar with the detailed technology of petroleum, is experienced in developing and mining ore, and in roasting ore after mining, a process which, as closely as any other, approaches the operation necessary for the retorting of oil shale. The oil company, on the other hand, although not as familiar with the preceding operations, has had long experience in refining, transporting, and marketing petroleum products.

Essential Prerequisites to Successful Exploitation

It is not my intention to attempt to dissuade the earnest, capable operator from entering this field, but he must fully appreciate the problems which will be encountered. He must realize the futility of attempting to operate without sufficient capital, without the entire confidence and understanding of his stockholders, and without the benefit of capable technical advice. He should be determined to secure all possible data before he begins operations.

Such data may be grouped under three main heads: (1) Information concerning the property, (2) facts concerning the process to be adopted, and (3) data concerning the oil produced.

The exploration of an oil-shale property, to be of permanent value, should produce certain concrete facts. The most important of these are:

a. The tonnage of commercial shale on the property.

b. The amount of recoverable oil that this tonnage represents.

c. The number of units of shale which must be mined and treated to produce one unit of oil.

d. The attitude and thickness of the commercial beds, together with other data governing mining conditions.

e. The relation of the property to selection of a plant site, to economical mining, to dumping facilities, transportation, water conditions, and other operating and marketing conditions.

Advantages of Core Drilling

These facts may be readily obtained by an experienced mining engineer with the aid of a systematic method of sampling. Except in the preliminary examination of a property, before acquisition, in which careful hand sampling may be justified, the only trustworthy method of completely sampling a property is that of core drilling, the advantages of which are many. It is the only method by which acceptable samples may be recovered from beds which do not outcrop on the property. The core forms an accurate record of the beds encountered and furnishes a complete continuous sample which may be rapidly and accurately subdivided into samples of retorting size. The samples obtained are at depth, where the actual mining will be done; not at the surface, where samples may or may not represent what will be encountered below.

Cost of Prospect Investigations

Many data concerning water conditions, hardness of formations, and mining methods employable are obtained at no extra cost. Although core drilling is considerably more expensive than haphazard hand sampling, the tonnage proved by this method, together with the results obtained, will more than offset the initial cost. In Colorado and Utah, the rich shale layers lie nearly flat, and as the oil content of any one bed does not vary greatly in a horizontal distance of less than half a mile, a series of three drill holes should prove 160 acres each, or about 500 acres in all. Assuming that in going to an average depth of 500 ft. these holes encounter a total thickness of 100 ft. of commercial

shale, roughly 126 million tons will be proved by this method. At a cost of $5 per foot for drilling, or $7,500 for the three holes, this development work will cost about 0.005 of a cent per ton. By analyzing samples representing every five feet of the core, and arranging the results obtained on a chart, it is possible to express graphically the number of commercial shale beds, the thickness of these beds, their attitude with regard to overburden and other mining conditions, the total tonnage of rich shale, and the total recoverable oil which may be expected from this tonnage. With these data in his possession, if they be favorable, the conservative operator is justified in proceeding with his development work, building roads, preparing his plant site, and making ready for the installation of his process.

Exploratory Observations of Value to Subsequent Operations

If the analysis of the drill cores has been performed in a careful and intelligent manner, a considerable quantity of data will have been obtained concerning the reactions of this particular type of shale under retorting. For example, much should be known about the temperature most suited to economical retorting, the rate at which the retorting should progress, the advantages of employing steam or vacuum during the process, and other similar matters. This evidence will be of great service in choosing the type of retort which can be best adapted to the treatment of the particular shale under consideration.

To date, considerable time and money have been spent in the United States in experimenting with processes for oil-shale distillation, but no process has been put into true commercial operation, nor do many of those which have been so far devised show much promise of ever becoming commercially important. The reasons for this lack of success are various. In the first place, the majority of these processes lack sound technical fundamentals. Not only have they been designed without the services of competent engineers, but the experiments made with them have been so sporadic and so poorly correlated that the results have yielded little of either positive or negative value. In the second place, the inventors responsible for these processes have striven rather for a good patent than for a sound process. The attempt usually has been to produce something radically new, rather than to adapt or improve some furnace already proven and operating in an analogous field.

Neglected Sources of Information

The cement industry, the byproduct coke-oven industry, and the practical methods of gas production have been neglected by the inventor of shale processes. None of the apparatus used in the above industries could be applied without change to retorting oil shales, but a vast amount of pertinent information is obtainable from them. Furthermore, there are a number of companies in this country which have successfully built and operated drying and roasting furnaces for many years. Seemingly the engineering departments of these companies would be the best source of information for the shale operator, but comparatively few such firms have been approached. Finally, most of the effort spent in experimenting with shale processes has been directed along non-essential lines. The vital need is to produce a retort of large capacity, low operating cost, and sound, permanent construction, not the possibility of producing 1 per cent more oil per ton, nor oil worth a fraction of a cent more per barrel. Oil-shale retorting presents a problem which is no more difficult than many already solved in metallurgy. It will only be solved by the methods applied in metallurgy: intelligent research, mechanically sound design, and careful, correlated experimentation.

Shale-Oil Products Differ From Those of Petroleum

A vast amount of hocus-pocus has been written by so-called experts on shale oil. Some claim that the products from shale oil far excell those produced from ordinary petroleum. Others state that shale oil cannot be refined without tremendous refining losses, and for that reason is relatively worthless. As a matter of fact, the products from shale oil are different from but not greatly superior or inferior to, those from ordinary petroleum. Paraffin from shale oil is undoubtedly of a better grade than the petroleum variety. Shale-oil lubricants, although satisfactory for many purposes, cannot fill the place of certain high-grade petroleum products, notably steam cylinder oil. The quality of gasoline is a matter of refining and blending. Shale gasoline may be better or worse than the petroleum product, according to the method of distillation and treatment.

The high percentage of unsaturated hydrocarbons in gasoline has been the subject of much unfavorable discussion. These products are removed by ordinary acid and soda treatment and cause a large refining loss. In all probability, by the time that shale gasoline is on the market in large quantities, the shortage of gasoline of any sort, and its high price, will have largely removed the trade prejudice against an unsaturated product. Gasoline from "cracking" plants is high in unsaturated, but there is no slackening in the development of "cracking" plants for that reason. Furthermore, methods of treatment which will produce a marketable product without exorbitant loss are being perfected, and will undoubtedly be applied to shale gasoline in some stage of its production.

Refining problems deserve as thorough technical and economic treatment as do any others connected with oil shale. The form in which the product should be marketed to produce the highest net return, refining methods and economies, production and treatment of particularly valuable fractions—all of these matters will play a prominent part in determining the success of the enterprise, and should be given full and technical consideration.

Those closely in touch with the economies of petroleum have no doubts as to the ultimate development of oil-shale resources. Many conservative men believe that, as the process of putting the oil-shale industry on a commercial basis will involve a long period of research, experiment, and construction, the time has already arrived to begin acquiring essential data. The future therefore promises a great advance in the technology of the subject. The time for promotion schemes has passed. So many investors have already lost money in such schemes that shady promotion is becoming more and more difficult. In the expansion of industry which will accompany a return to normal financial conditions, oil-shale development should prosper. No field offers greater opportunities to the engineer, and the engineer is indeed essential to the successful development of this field.

NEWS FROM THE OIL FIELDS

Merger of Producers and Refiners Planned in Wyoming

From Our Special Correspondent

A merger of all the companies operating in the Warm Springs district, Wyoming, into a $10,000,000 corporation is planned. The merging companies would include the Singers Securities Co., Alliance Oil Co., Woods Petroleum Co., Wyoming Premier Co., and others, together with the new refining plant of the Alliance Oil Co. at Thermopolis, of 3,500 bbl. daily capacity. It is stated that there are fifty-three producing wells in the district, most of them producing from the shallow sand. Many of the wells are now being drilled to the deeper and more productive sand.

The Mountain Producers' Co. declared its initial dividend of 2 per cent payable Jan. 3 to stockholders of record on Dec. 15.

Deepest Texas Well Proves Dry

From Our Special Correspondent

The deepest drill hole in Texas was abandoned recently at 5,908 ft. The hole was dry, or a "duster," in oil-field parlance. It is on the Roy Henderson ranch, Crockett County, and was drilled by J. A. Pope for the Ryan Petroleum Corporation. The hole was started 22 in. in diameter and finished 5⅝ in. in diameter. From 3,590 ft. down the well was uncased.

Production in north Texas continues to decline. Stephens County is now making only 115,000 bbl. per day. Few new wells have been completed recently. The best are the No. 4 Ackers, of the Cosbrook Petroleum Co., northwest of the town of Breckenridge, making an initial production of 800 bbl.; and the No. 2 S. M. Moore well, of the Gulf Production Co., north of Necessity, making 2,000 bbl. after having been heavily shot. These wells are in proved territory, and add no new acreage to their respective fields. In Wichita County the Burkburnett and Iowa Park districts continue to decline in production also, and Electra, with several good producing wells completed recently, is probably holding its own. In the Kemp-Munger-Allen section of this county the test on the Munger No. 6 well, of the Kemp-Munger-Allen Oil Co., at 1,800 ft., is being watched with interest. It is making a small amount of oil by pumping.

An epidemic of fires has visited the north Texas fields recently. In and around Wichita Falls fires have caused a property loss of $125,000. At Breckenridge a fire was started in the heart of the business district by one of the wells, and a loss estimated at $200,000, resulted.

Johnson County, Ky., Promises Good Production

From Our Special Correspondent

In the Gullett Branch neighborhood in Johnson County, Ky., the Big Paint Creek Oil Co. has three good wells, the Eastern Imperial Oil Co. one, and there is an encouraging showing of oil on the properties drilled by the Kentucky Counties Oil Co. and the Pitts-Yeo Oil Co. The Kentucky Counties Oil Co. struck oil in the Big Injun sand, which flowed over the top. Later some salt water developed, but the well looks to be a substantial producer. The Wheeler-Watkins well on the O. T. Rule lease was struck in the shallow sand and is making 50 bbl. at a depth of 250 ft.

The Big Boone Oil Co. reports a gusher at 410 ft. on the Tarrants lease, Davenport pool, Warren County. This well came in flowing and is said to have produced over 400 bbl. the first twenty-four hours.

No. 3 well on the Mose Wall lease, Simpson County, which was drilled in recently, is one of the largest producers yet struck in either Logan or Simpson counties and is being estimated at 500 bbl. per day.

The Cumberland Pipe Line Co.'s runs for the week ended Nov. 27 totaled 69,769 bbl., which is an increase of 13,000 bbl. over the previous week. This company serves only the eastern part of the state.

Californians To Prospect Stanislaus County

Among land owners east of Modesto, Cal., who have signed leases to the Montgomery-Jennings-Keller oil syndicate of Los Angeles, co-operating with the latter to prospect the Stanislaus County field for oil, are: Douglass F. Mullin, T. H. Kewin, Mrs. Abe Johanson, H. W. Voight and W. H. Van Near. The plan is to lease 12,000 acres before beginning active operations and over half the amount required has already been subscribed. It is expected that $100,000 will be spent in development work. The bulk of the leases lie in and about Waterford, Heckman, La Grange and Denair.

First Well in South Dakota Brought In

From Our Special Correspondent

Edgemont—The first oil well in South Dakota was brought in last week, two miles southwest from Edgemont, when French and Rossiter, drilling on the Slocum lease, struck oil at a depth of 700 ft. in the Lakota sand. This new well is fifteen miles east from the Mule Creek field of Wyoming and is in South Dakota.

Another Well in Chinampa Field Shows Salt

From Our Special Correspondent

The Thompson well No. 3, on Lot 114, Chinampa, which came in on Nov. 21, went to salt water on the following Tuesday. In drilling this well the drillers decided that they would just pierce the "pay strata" and thus delay the appearance of the salt. On piercing the line the well flowed under heads at intervals of one-half hour. It was while they were trying to get the well to flow steady that it blew itself in, due to the high pressure. The salt water appeared at once.

The Nicklos well No. 1, on the same lot, was brought in on Nov. 29. The oil was encountered in this well at a depth of 1,953 ft., but the flow was only about 10,000 bbl. It was decided to drill deeper to increase the production. An oil saver was put on the well and five more feet were drilled, when the production was increased to about 30,000 bbl. per day. The oil has been contracted for by the Metropolitan Co. On the same day the Aguila Co. brought in its well No. 15, in the Naranjos field. This well affects the International Co.'s well at Lot 252, Amatlan. The oil was shot fifty feet over the top of the derrick, owing to the high pressure and large percentage of gas. The estimated flow of the well is about 50,000 bbl. daily.

The Zacamixtle country is building up rapidly, and each day sees a new derrick or two springing up. The wildcats spread over a wide breadth, and are fairly well spaced, and as they will all be deep enough to define the pool by the end of the year, great concentration can be expected by March of next year, and the pool will probably have a short life.

The first expedition of oil prospectors to the Mackenzie River district left Edmonton, Alberta, Can., on Nov. 25. The party comprised Dan Darough, A. H. Schwier, Tony Nels and J. A. M. Rankin, all experienced northerners. They were given a clearance by the mounted police. It will take them about forty-five days to make the trip to Fort Norman, a distance by the winter trail of nearly 1,200 miles.

A great rush has set in for oil leases in the country on the Pouce Coupe River near its confluence with the Peace River, Alta., where the first in the field was a geologist representing the interests of the Imperial Oil Co., who secured leases covering approximately 10,000 acres. Several thousand acres were filed at the land office at Grand Prairie by other claimants during two days. It is reported that drilling operations will start soon.

ECHOES FROM THE FRATERNITY

A. I. M. E. Organizes the Mining Engineers of the Lake Superior District

Bradley Stoughton, secretary of the American Institute of Mining and Metallurgical Engineers, recently returned from his campaign among the mining men of the copper and iron districts of the Lake Superior region. Mr. Stoughton's efforts to consolidate the engineering men of those districts were quite successful.

At Duluth, Minn., he was the guest of honor at a subscription dinner held by the local members of the A. I. M. E. At the dinner there was discussion of the scheme to form a whole unit of the Institute for the Minnesota ranges, to be composed of four sub-units, viz., the Mesabi Range, the Vermillion Range, the Cuyuna Range, and the Duluth district. Each of these four sub-units later met separately and elected two representatives, who held a joint organization meeting on Dec. 4. At this joint meeting bylaws were adopted for the northern Minnesota section, and a list of nominations for officers was prepared. The annual meeting of the section will be held in February and officers elected. A separate section for Minneapolis-St. Paul is now forming, the committee on organization being W. R. Appleby, chairman, C. E. Juhlin, and Lloyd D. Cooper.

In the Upper Peninsula of Michigan Mr. Stoughton met the Institute members at Ironwood, Iron River, Iron Mountain, Ishpeming, and Houghton, and after full discussions at each point it was decided that each locality should appoint representatives, who should meet and organize into one or two local sections for the Peninsula. Sub-units will be formed at the different points, just as has been arranged for the northern Minnesota district.

Mr. Stoughton spent Nov. 28, 29, and 30, in Houghton, Mich., where he addressed a meeting of mining engineers at the Houghton Club. At this meeting the advisability of forming a Houghton or Copper Country chapter was discussed and an informal organization was established at Houghton under Professor Sperr.

During his stay Mr. Stoughton addressed the students at the Michigan College of Mines, emphasizing the many advantages offered to the student and alumnus by membership in a national organization of mining engineers such as the A. I. M. E. He also expressed the opinion that a large proportion of the mining engineers of the future would have to find employment in foreign countries, such as South America, Siberia, and Africa, inasmuch as it is quite certain that the larger mining enterprises of the future would be situated not in the United States but in these countries.

Freight Rates Affect Utah's Industries

Walter Fitch Declares Mines Could Not Survive Proposed Increases

The question of transportation, especially as regards the effect of increased freight rates on Utah industries, was discussed at the regular weekly luncheon of the Salt Lake Commercial Club on Nov. 25. Mention was made also of certain improvements, such as the increase in the number of cars available, obtained through the efforts of the Salt Lake City traffic bureau. These betterments were outlined by H. W. Prickett, of the bureau, who pointed out that it had been possible, through efforts at Washington, to secure a division of the territory just east of the Rocky Mountains, so that the increase in rates east of that line was 35 per cent and that west which includes Salt Lake City—25 per cent.

Walter Fitch, of the Chief Consolidated, Eureka, was the first speaker representing the mining industry. Mr. Fitch said that though all were of the opinion that the advance of 25 per cent in freight rates is reasonable, there were some spots that could not stand it, and that the mining industry was one of them. He held that the Public Utilities Commission of Utah had performed a wonderful service to the state when it declined to allow the railroads to advance their rates. Mr. Fitch spoke, among other things, of William G. McAdoo having made a gift of $1,000,000,000 to the railroad men, for which benevolence all must pay. C. F. Solomon, traffic manager of the J. G. McDonald Chocolate Co., also spoke. H. N. Byrne presided. An unusually large number of engineers and mining men were present.

Engineers' Club of Northern Minnesota Holds Annual Meeting

The public library at Hibbing, Minn., was the scene of the annual meeting of the Engineers' Club of Northern Minnesota on Nov. 26. The slate of officers for the coming year was presented by the nominations committee, as usual, but excited some discussion. The members in attendance finally rejected the committee's designations and the following new slate was prepared: For president, W. R. Van Slyke, Eveleth, or P. F. Chamberlain, Virginia; for vice-president, H. J. McInnis, Virginia, or Bert St. Vincent, Hibbing; for secretary-treasurer, Robert H. Ely, Eveleth, or M. W. Coleman, Virginia; for directors, Ed Loye or Walter Pohl, Hibbing; Howard McAdams, Eveleth, W. B. Bushnell or A. H. Krogdall, Virginia; H. H. Angst or A. Tancig, Chisholm. The balloting will be by mail.

New York Section, A. I. M. E., Devotes Evening to Gold and Silver

The New York section of the American Institute of Mining and Metallurgical Engineers held its regular meeting at the Machinery Club on the evening of Dec. 8. E. P. Mathewson presided. The speaker of the evening, George E. Roberts, vice-president of the National City Bank, made an interesting address on the bankers' view of the McFadden Bill. Mr. Roberts qualified for the subject by stating that he had received his mining education at Nome, where he had invested in a company started by Charles D. Lane. The company, known as the Wild Goose Mining & Trading Co., took out $1,000,000. Subsequently, although $8,000,000 was taken out, the accumulated debts overbalanced this sum, and Mr. Roberts sold his interest at a loss.

Mr. Roberts next discussed the American Bankers' Association report on the McFadden Bill. He stated that he was not entirely in sympathy with the bankers' view and considered it based on theoretical arguments which ignored a very serious and oppressive condition. In his opinion, the gold standard was essential, but could not be maintained without a gold-mining industry. As to the McFadden Bill, Mr. Roberts did not like it, but he did not see anything fundamentally wrong about it. He was not, however, prepared to say that he favored the bill.

C. W. Handy, secretary of Handy & Harmon, was next introduced, and presented an analysis of the silver market in particular, showing the cumulative causes which produced peak prices in 1920 as well as the conditions which operated to bring silver down to present prices.

George F. Kunz presented the jewelers' argument against the McFadden Bill. Briefly, his points were that the jewelry business is already heavily taxed, that it has troubles of its own, that rich people were buying platinum jewelry, and consequently the tax would be paid by poor people. "Things are coming down," he said, and if the gold miners would only have patience there would be no occasion for the excise tax.

C. W. Wheelock gave an historical summary of the gold and silver market. Mr. Chang, of the China Commercial Co., spoke about precious-metal hoarding in China. H. Emerson made some interesting comments on how silver first depreciated in price relative to gold. E. P. Mathewson adjourned the meeting after calling the attention of the members to the program of the next meeting, at which Robert Linton would present moving pictures of the operations of the North Butte Mining Co.

MEN YOU SHOULD KNOW ABOUT

O. R. Whitaker has returned to Denver from a trip to Mexico.

W. S. Bayley has completed a study of North Carolina iron ores.

Philip N. Moore, of the War Minerals Relief Board, was in New York City Dec. 8.

Pentecost Mitchell, vice-president of the Oliver Iron Mining Co., will spend the winter in California.

W. A. Harrod, mining engineer, of Golden, Col., examined mining property in southern Arizona recently.

C. W. Botsford, mining geologist, of Phoenix, Ariz., is in Magdalena, N. M., examining S. S. Lang's holdings there.

M. E. Merrill, mining engineer, is chief engineer for the Cia. Minera "La Constancia," Sierra Mojada, Coahuila, Mexico.

W. P. Chinn, general manager, and W. A. Rose, chief mining engineer, of Pickands-Mather & Co., are in Cleveland, Ohio.

P. K. Lucke, mining engineer, of Mexico City, who left for Europe on Oct. 19, writes that he has returned to Mexico City.

J. Morrow Campbell, mining geologist, left England for Burma late in November. He is on the staff of Steel Bros., Rangoon.

Raymond B. Ladoo, of the Bureau of Mines, and **Benjamin LeR. Miller,** of Lehigh University, Bethlehem, Pa., were in New York City on Dec. 10.

President **Frank P. Knight** and Vice-President **J. Judson Dean** of Iron Cap Copper Co., are in Globe, Ariz., to inspect late progress on the company's property.

Charles F. Williams, mining engineer, of Socorro, N. M., is at Batopilas, Chihuahua, Mexico, making a survey and report on the properties of the Batopilas Mining Co.

J. M. Callow, of Salt Lake City, Utah, president of General Engineering Co., consulting engineers, has returned to Salt Lake City after a month's visit at the New York City office of the company.

W. W. Shelby, mining engineer, recently at Charcas, S. L. P., Mexico, has been appointed assistant superintendent of the Cia. Minera "La Constancia," at Sierra Mojada, Coahuila, Mexico.

W. C. Teagle, president of the Standard Oil Co. of New Jersey, and a number of the officials of that company were in Houston, Tex., recently. They were making a tour of inspection of the oil fields.

W. J. Olcott, president, **John H. McLean,** general manager, and **John Uno Sebenius,** chief mining engineer, of the Oliver Iron Mining Co., inspected the company's properties on the Mesabi Range recently.

Mining Men Recently in New York City included H. C. E. Spence, of Mount Royal, N. M.; J. P. McCulloch, of Newville, Pa.; E. A. Holbrook, of U. S. Bureau of Mines, and Stanly A. Easton and R. S. Handy, both of Kellogg, Idaho.

Max Söhnlein, mining and metallurgical engineer, of Santiago de Chile, Chile, is spending a month visiting the Western States. He expects to return to South America from New York City about the end of December.

HERBERT M. WILSON

A party of Phelps Dodge officials, including **Walter Douglas,** president, **Arthur James,** vice-president, and **P. G. Beckett,** general manager, is visiting the corporation's mining and reduction plants in Mexico, New Mexico and Arizona.

T. H. Jenks, mining engineer, who has been in Colorado on professional work all summer, is in Denver, Col., completing work in Gilpin County. Before returning to Los Angeles, Cal., he will examine properties in New Mexico and Arizona.

Justice F. Grugan, mining engineer, who has been with the Suffern company, New York City, is on his way to the Transvaal to reorganize the affairs of an outcrop mine on the Rand, owned by the Langlaagte Proprietary company (the late Jacques Lebaudy).

F. A. Malins, formerly superintendent of El Cedro mill, Cia. Minera "Las Dos Estrellas," El Oro, Mexico, has been appointed consulting metallurgist to the company. **W. B. Rhodes** succeeds him as superintendent of El Cedro mill. **T. Skewes Saunders** is general manager of the company.

T. F. Cole, of New York; **Thomas Hoatson,** of Calumet, Mich.; **Walter Congdon,** of Duluth, Minn.; **George A. Newett,** of Ishpeming, Mich.; **William B. Mershon,** of Saginaw, Mich.; and **John C. Oliver,** of Pittsburgh, Pa., directors of the Calumet & Arizona Mining and the New Cornelia Copper companies, are visiting the holdings of the two companies in Arizona and New Mexico. They are accompanied by **John C. Greenway,** general manager, and **Ira B. Joralemon,** assistant general manager.

OBITUARY

Capt. Richard Webb, who represented the fee interests of M. H. Alworth on the Mesabi Range, died recently at his home in Hibbing, Minn. He opened the Cary mine, on the Gogebic Range, and was one of the pioneer mining men of the Lake Superior district. The remains were taken to Ironwood, Mich., for burial.

Christopher P. Russell, mining engineer, of Salt Lake City, a graduate of the University of Utah, was struck and fatally injured by a street car in that city on Nov. 24. He died without regaining consciousness on Nov. 25. Mr. Russell served abroad with the 115th Engineers and later with the army of occupation. He was a native of Salt Lake City and was only thirty-seven years old.

Herbert M. Wilson, the first president, later secretary, and one of the earliest proponents of the American Mine-Safety Association, died at Hartford, Conn., on Nov. 25, after a brief attack of pneumonia. Mr. Wilson was selected by Director C. D. Walcott as the chief assistant to J. A. Holmes when in 1907 the latter was appointed the first chief of the newly created technologic branch of the Geological Survey, which has since grown to the Bureau of Mines. Mr. Wilson will be remembered as the first engineer in charge of the Pittsburgh station of the Bureau; but yet more gratefully, and by a wider circle, for his great services and active interest in the mine-accident investigations whose headquarters were placed at Pittsburgh in 1910 by authority of Congress.

Mr. Wilson was born of English parents in Glasgow, Scotland, on Aug. 23, 1860, but came to the United States when a few months old and grew up in Plainfield, N. J., living there until he was graduated from the Columbia School of Mines in 1881. For two years he was in railway engineering in Mexico, but from 1882 to 1909 he served on the corps of the Geological Survey as topographer, irrigation engineer, geographer, and chief engineer of the technologic branch. From 1910 to 1914 he was engineer in charge of the Pittsburgh station, Bureau of Mines, resigning Government work to become director of the department of inspection and safety of the Associated Insurance Companies, Hartford, Conn. He subsequently became general manager of the companies.

THE MINING NEWS

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LEADING EVENTS

Minerals Separation Fails on Appeal in Miami Case

Court Affirms Ruling Dismissing Applications for Supplemental Bills—No Injunction Issued

The decision of the Circuit Court of Appeals, in its opinion which was rendered in Philadelphia on Dec. 9, affirms the rulings of dismissal of certain applications for supplemental bills, which were made by Minerals Separation, Ltd. for the purpose of finding the Miami Copper Co. in contempt of court for the use of its present flotation processes, and also sought to enjoin that company from the continued use of its processes.

The opinion of the Circuit Court of Appeals goes to considerable length in order "to quiet the controversy" as to several of its phases, and in its determination as to whether the trial judge had "rendered his judgment upon a wholly wrong comprehension of the facts or the law of the case," and whether, accordingly, he had abused his discretion in this respect. The only respect in which an appellate court will disturb such an order states that "to this end we have read and carefully studied the entire record." More than once the opinion states that the Judge writing the Circuit Court of Appeals' opinion would himself have ruled exactly as Judge Morris had done in the case of the orders which had been brought up upon appeal, the opinion of the Circuit Court of Appeals concluding as follows:

"Stress has been laid on a reference made by the learned trial judge to embarrassment because of his lack of familiarity with the facts of the case due to his coming into the case after it had gone to an accounting. To allay any unrest that might arise from this situation and to avoid the appearance of affirming the court's decree upon the negative quality of a finding that we discern no error in its order, we go farther and say, that, having made the law of the case we are presumed to know what it is, and that, applying the law to the facts, which, on the defendant's motion to dismiss are regarded most favorable to the plaintiffs, we would have made the same disposition of the case had we been sitting in the District Court when the application for a supplementary injunction was made." (See *Engineering and Mining Journal*, Aug. 14, 1920, p. 328, where the full text of Judge Morris' opinion, handed down on July 29, is given.)

WEEKLY RÉSUMÉ

The time in which the 1920 assessment work on mining claims may be performed will be extended to July 1, 1920, it is reported, if the House accepts the bill passed by the Senate as is anticipated. A permanent interdepartmental committee to study Alaskan problems has been appointed by the President with G. A. Parks as chairman. Tariff hearings on metal imports are to be held next month before the House Ways and Means Committee. Marion E. Rhodes, of Missouri, is the new chairman of the House Committee on Mines and Mining. J. H. Means is talked of for the position of chief engineer of the War Minerals Commission.

Both the Montana Legislature and that of Arizona, it is said, will be asked at the coming sessions to take steps in the direction of licensing engineers. Minerals Separation has failed on its appeal in the Miami case, the higher court affirming the ruling dismissing the application made for supplemental bills and refusing to enjoin the copper company. At Butte, Anaconda has closed the Leonard mine, which act will bring its copper production to 50 per cent of normal. In the Coeur d'Alenes Marsh Mines Consolidated has decided to continue its action against Hecla in spite of the latter's agreement with the Federal company. In the Black Hills, labor is reported to be more plentiful. The decrees quashing indictments in the Bisbee deportation cases have been sustained by the U. S. Supreme Court

Possibility of Wage Decrease Considered at Cobalt

The drop in the price of silver, combined with the difficulties caused by power shortage, has created a situation at Cobalt, Ont., which renders it impossible for some of the smaller producers to continue operations profitably unless mining costs can be reduced. This can be done only by a reduction in the rate of wages, which are now on the basis fixed when silver was bringing $1.30 per oz. In view of the general decrease of wages in other lines of industry, including lumbering, which has been the strongest competitor of the mining operators in the labor market, the question is receiving much attention. It is thought that when the men realize that a reduced rate of pay is the only alternative to a closing down of many mines for the winter they will accept a lower wage scale.

Washington B. Vanderlip Arrives in New York

Sketches His Career for "Engineering and Mining Journal"—Claims To Have Important Concessions

Washington Baker Vanderlip, whose reported success in obtaining important concessions in northeastern Siberia from the Soviet government for

WASHINGTON B. VANDERLIP

American interests has caused so much discussion on both sides of the water returned to this country on the S. S. "Aquitania," arriving in New York on Dec. 11. According to Mr. Vanderlip, his concessions embrace coal and oil lands and fishing rights. In speaking to the representative of *Engineering and Mining Journal* of his efforts to interest capital in the development of this Siberian oil field, he said that in 1903 he was introduced to John D. Archbold by his cousin Frank A. Vanderlip and endeavored to get him to finance an expedition for oil. Mr. Archbold, however, finally concluded that "there was too much oil in the world," and informed Mr. Vanderlip that they had no market then for their gasoline. This was at a time when the automobile was comparatively new.

About ten years ago, continued Mr. Vanderlip, he succeeded in interesting Ralph Arnold in the same matter, and Mr. Arnold had endeavored to finance the proposal in London and New York,

but failed. Later, said Mr. Vanderlip, Seeley W. Mudd and Philip Wiseman had tried to do the same thing during the war, but, Russia being in the throes of revolution, they could not make any progress. Mr. Vanderlip then suggested to Franklin D. Roosevelt, Assistant Secretary of the Navy, that if he would land him and members of the U. S. Geological Survey on the Siberian coast, he (Vanderlip) would show them the oil field, and made the proposition that the U. S. Government should obtain possession in order to forestall Japan. Mr. Roosevelt replied courteously that he was interested, but said that this was a mercantile proposition which the U. S. Government could not consider. Mr. Vanderlip then made the same proposal to the British Admiralty through the British Consul at San Diego, and received the usual polite acknowledgment of his letter—but no more. A few months ago Mr. Doheny brought the news to Los Angeles that he had been sought by an ex-officer of the British Navy to assist in financing the development of a wonderful oil field in northern Siberia. "We knew then," said Mr. Vanderlip, "that our secret was no longer a secret and that it was time to get busy. The result was the concessions that I have obtained."

Mr. Vanderlip was requested to give a brief biographical sketch of himself for the *Engineering and Mining Journal*. First, he said, he was not a university graduate. He had received his academic education at the Orchard Lake Military Academy, in Michigan, under Major-General Strong, and was preparing for West Point, but changed his mind and went to Arizona, where for a time he followed the cattle business. At the age of nineteen, he said, he found the Bright Angel Trail to the bottom of the Grand Canyon while prospecting for minerals, which happened to be his very first experience along mining lines. He then purchased a three-year course in mining engineering at the International Correspondence School at Scranton, Pa. This he followed with a year of study under Professor Falkenau, of San Francisco, who instructed him in mining geology, chemistry and allied subjects.

Following this, he worked as miner and assayer in various camps in California. Later, he met Leigh Hunt and went to Korea. From there he was given charge of exploration work in northeastern Siberia for a Russian-English company. His experiences at this time, said Mr. Vanderlip, are set forth in his book entitled "In Search of a Siberian Klondyke," which was published by the Century Company in 1903, but is now out of print. In 1900 he went to the Philippines as a partner of Mr. Hunt. Here he explored the islands, at times with the assistance of American troops, in the course of which work he discovered the placer deposits on the Paracale River, which were afterward worked for several years by several dredges and yielded many millions. From the Philippines, continued Mr. Vanderlip, he was engaged by Sir Ralph Moore through Arthur Pierce, a mining engineer of London, to explore Nigeria. He found nothing, but had the misfortune, he said, to pass on the opposite side of the range to that on which the famous Nigerian tin deposits were later found. Sir Ralph Moore, it seems, had obtained a piece of gold quartz the size of his thumb which had come down the Niger River with a load of oil nuts, and it was for the purpose of finding where this piece of quartz came from that he was selected to explore the interior, said Mr. Vanderlip. The latter traced the piece of quartz from tribe to tribe, at times passing through stretches where he was the first white man the natives had ever seen, until he located the ledges, but found them too low in grade to be commercially valuable. For this work Mr. Vanderlip said King Leopold offered him the then unheard of salary, all things considered, of $25,000 a year, together with full charge of the exploration of the Tanganyika Concessions. This, said Mr. Vanderlip, was prior to the amalgamation of the Thomas Ryan and Beatty interests with those of Leopold. On being examined, however, by a commission of the King, to determine his fitness for the work, the physicians stated that he was worn out physically and that if he returned to Africa he would die. Mr. Vanderlip said he then returned to America and went to Honduras for the New York & Honduras Rosario Mining Co. He contracted a tropical complaint at San Juancito, and was forced to return to this country, being carried to the coast on a litter.

On returning to New York Mr. Vanderlip met D. M. Riordan, then in charge of the mining department of the General Electric Co., who had known him since boyhood, and who engaged him as his assistant in the work of examining mining properties for the company. He was with the company for three years, and during this period was instructed to find deposits of rutile in this country. Knowing nothing about this mineral, he said, except that it was a mineral, he went to Washington, where Frank Hess and others of the U. S. Geological Survey informed him that no known veins of rutile existed on the American continent, but that small pieces of the mineral had been found from Georgia to Nova Scotia. He went South, and, beginning at the Tiffany mine, instituted a systematic search for rutile. By a process of elimination and with the aid of Mr. Hess and Dr. Watson he settled on Nelson County, Va., as the most likely place for operation. He prospected Nelson County thoroughly, panning every stream, and finally found the only two veins of rutile known to exist in the United States.

When the General Electric Co. ceased its mining operations Mr. Vanderlip was engaged by F. Augustus Heinze to examine mining and oil properties in Alaska. After leaving Alaska he went to Oakland, Cal., from which place he made various trips from time to time through the West on examination work. He then went to Los Angeles, he stated, on account of his wife's health, and has remained there ever since, making reports from time to time through the West and in Mexico.

Mr. Vanderlip stated that he was at one time a member of the A. I. M. E. and was made a fellow of the Royal Geographical Society for his work in Siberia and elsewhere.

His recent trip to Siberia, from which he has just returned, was started on July 10 this year, and it is just about thirty days since he left that country to return to the United States. Long interviews with Mr. Vanderlip in regard to his concessions were published in all the New York Sunday papers of Dec. 12. In these Mr. Vanderlip said he had been more or less correctly quoted and could add nothing to what he had already said.

The list of the capitalists associated with him is given in one of these interviews as follows: Harry Chandler, proprietor of the *Los Angeles Times*; O. F. Brandt, vice-president Title Trust Co.; W. G. Stewart, president Union Oil Co., Los Angeles; E. L. Whittier, oil operator; J. F. Sartori, president Security and Savings Bank Co.; T. E. Gibbon, retired, capitalist and attorney; H. Jevne, president Jevne company, wholesale grocers; T. W. Braun, president Braun company, wholesale druggists; Mr. Helman, vice-president Helman Banks; Lee Phillips, vice-president Pacific Mutual Life Insurance Co.; and E Fishburn, president Merchants' National Bank.

Bisbee Cases Dismissed

Supreme Court Sustains Federal Court Decrees

The Supreme Court on Dec. 13 sustained Federal Court decrees quashing indictments brought against twenty-five defendants who were charged with participating in the deportation of 221 alleged undesirables from Bisbee, Ariz., into New Mexico in July, 1917. Chief Justice White rendered the opinion of the court. The lower court in dismissing the indictments held in effect that the proceedings interfered with the state police powers, and that although the indictments sufficiently charged conspiracy to deport forcibly and against their will citizens of Arizona the Federal statute did not apply.

Price of Mine Explosives Cut in Cœur d'Alenes

Effective Nov. 29, the Dupont Powder Co., which has practically a monopoly of the powder business in the Cœur d'Alene district, made a cut of 50c per 100 lb. in the price of 40 per cent gelatin and 17 per cent stumping powder, or $10 per ton. This makes the local price of 40 per cent powder $25.15 per 100 lb. in ton lots, and $25.65 per 100 lb. in less than ton lots. The cut does not apply to 60 per cent gelatin, the local price of which remains $28.65 per 100 lb. in ton lots, and $29.15 per 100 lb. in less than ton lots.

Mexico Would Avert Shut Down of Mines

Presidential Decree Reducing Freight Rates and Taxes and Removing Import Restrictions Expected

"With approximately one-third of the republic's 3,500 silver and copper mines closed down because of the low market price of those metals," says an Associated Press dispatch from Mexico City dated Dec. 12, "the Government this week will take emergency measures to prevent complete paralysis of the industry with the consequent throwing out of work of more than 500,000 laborers, according to a Treasury Department statement.

"The action is expected to take the form of a Presidential decree reducing freight rates and Federal taxes and annulling laws restricting the importation of materials such as steel, powder, acids and tools.

"During the past week, President Obregon has conferred with the Governors of Guanajuato, Zacatecas and Durango and has met delegations from the States of Hidalgo, Chihuahua and Coahuila, all of whom described the situation as grave, with the possibility that mine owners would be forced to close down all their properties.

Governor Madrazo of the State of Guanajuato declared here today that silver and copper mines in his state pay 700,000 pesos in taxes annually, and expend more than 4,000,000 pesos annually, and if forced to suspend operations the heads of 5,000 families would be without work.

"Representatives of large mining interests have asserted that the present market price of silver of 58 cents per troy ounce renders operation of the mines impossible except at a loss of approximately 22 cents on each ounce, although Federal aid in the form of reduction of freight rates and taxes would make possible at least partial operation until the market ascends.

"A delegation of miners from Pachuca, the most important mining city in Mexico, arrived in Mexico City last night bearing a manifesto which will be presented to President Obregon today, asking the Government to take over all the mines and operate them.

"Reflecting on the delicate situation is the refusal of Mexico City bankers yesterday to accept silver deposits of more than 20 pesos. The Government is known to be coining only small amounts of silver."

Indians' Revenue from Zinc Land Greater in 1920

Greatly increased revenue from lead and zinc mining in the Joplin-Miami district for Indian owners of land is indicated in the annual report of the board of Indian commissioners. Only forty-one Indians have received the great bulk of this revenue, the figures for which are given as follows: 1917, $84,772.03; 1918, $384,679.41; 1919, $496,523.75; and 1920 (5 months only), $379,473.53.

Marsh Mines To Continue Apex Litigation Against Hecla

Refuses $100,000 Offered by Federal Company for Surrender of Lease—Stockholders Assessed

The directors of Marsh Mines Consolidated, operating in the Cœur d'Alene district, Idaho, have formally announced through a letter to stockholders that preparation is being made to continue the litigation against the Hecla Mining Co. to establish the claim of the Marsh to the "east orebody" of the Hecla. Marsh has a lease on the Russell and Mono Fraction Claims secured from the Federal Mining & Smelting Co., and which contain the alleged apex of the "east vein." The Federal company instituted suit against Hecla, but before the case came to trial a settlement was made out of court through which Hecla purchased the Russell and Mono claims and secured release from all claim for trespass, details of which were published in *Engineering and Mining Journal* in the issue of Nov. 27.

The settlement was made subject to the Marsh lease, which runs until July, 1926, the Federal agreeing to endeavor to make a settlement with the Marsh. In pursuance of this agreement the Federal company offered Marsh $100,000 for the surrender of its lease. This offer was promptly declined, following which the directors say action was immediately taken to continue the litigation to a conclusion. The directors say that it will be necessary to continue the Russell winze, now down 375 ft., to a connection with the Hecla workings, an estimated distance of 680 ft. This, with the extension of the Russell tunnel, from which the winze is sunk, 700 ft. to the east end line, is stated to be the only development work of importance that will have to be done before proceeding to trial. The directors have levied an assessment of 1c. per share, which they estimate will bring $20,000 into the treasury, and this, with $4,500 on hand, is expected to be sufficient to meet all preliminary requirements of the litigation. In this connection the directors say that "plans are now being considered which may result in securing such substantial financial assistance as to make it possible to take the major part of the burden off the stockholders."

Watchman Charged With Burning Oklahoma Concentrator

G. W. Hill was arrested on Dec. in the Joplin-Miami district on a charge of arson and two other men were held on a charge of conspiracy by Deputy Fire Marshal Bert Foster, of Oklahoma City. The charges grew out of the burning of the Georgia Mining Co.'s concentrator on Nov. 15. It burned early in the morning after having been on fire twice the day before. Hill was the night watchman at the property. Preliminary hearing has been set for Dec. 21 at Miami, Okla.

Greene-Cananea produced 3,350,000 lb. copper in November.

Bill for Licensing Engineers in Arizona To Come Before Next Legislature

Before the approaching session of the Arizona Legislature is to be placed a bill, prepared by a committee of members of the southwestern district of the American Association of Engineers, calling for examination and investigation of all applicants who may apply for permission to practice in the state as mining or technical engineers or geologists, assayers, surveyors or architects. Creation of a board of engineering examiners, appointed by the Governor, to serve without pay, is suggested. This board's work is to be supported by an initial registration fee of $25 and by renewal fees of $5 annually. Fines are to be provided for failure to observe the provisions of the act.

Propose Licensing of Engineers in Montana

Mining engineers of Montana are taking steps to preserve mining engineer positions for mining engineers. The State Legislature, which convenes in January, will be asked to impose a license, it is said, upon such positions in order to lift them out of the category of the ordinary job, according to sentiment heard in Butte mine engineering circles.

Recent Production Reports

Calumet & Arizona produced 3,486,000 lb. coppr in November, of which 2,236,000 was available for the company.

United Verde Extension produced 2,642,812 lb. copper in November against 3,864,756 in October.

North Butte produced 1,312,029 lb. copper in November compared with 1,390,829 in October. The November silver output was 52,211 oz. and that of gold 76 oz.

Shipments of specified Alaskan products to the United States in November as reported by the Department of Commerce were as follows: Copper ore, matte, etc., 16,720 gross tons (copper contents 12,802,696 lb.); tin ore and concentrates, 26,052 lb.; platinum, 28 oz.; palladium, 103 oz.; gold ore and base bullion, $250,230; gold bullion, 42,737 oz.; silver ore and base bullion, $137,425.

New Cornelia produced 2,670,000 lb. of copper (cathodes) in November.

Inspiration produced 5,350,000 lb. copper in November.

United Verde Extension produced 2,642,812 lb. copper in November.

Utah Copper's output for November was 9,120,000 lb., as against 8,000,000 in October.

Chino Copper produced in November 4,000,000 lb. as compared with 3,933,435 in October.

Ray Consolidated's November output was 3,975,000 lb., compared with 3,990,800 in October.

Nevada Consolidated produced 3,950,000 lb. copper in November, compared with 3,850,000 in October.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Six Months Grace Probable for 1920 Assessment Work

Senate Committee Against Further Suspension But Favors Extension of Time

The opening of Congress saw the introduction of bills by a large number of Representatives and by several Senators, looking to the suspension of assessment work for the year 1920.

There is considerable opposition to these resolutions, on the ground that many have gone ahead and have done their 1920 assessment work and that the requirement of this assessment work would make for more activities in mining regions.

On the other hand, the main argument is that the Government should relieve the mining industry of this burden at a time when the industry is especially unable to bear it.

The time in which the 1920 assessment work on mining claims may be performed will be extended to July 1, 1921, if the House of Representatives accepts a bill so providing that has been passed by the Senate. It is expected that the House will accept the bill promptly. Failure to do so would result in no legislation and would require all assessment work to be completed by the end of this month. The text of the bill as passed by the Senate is as follows:

"That the period within which work may be performed or improvements made for the year 1920 upon mining claims as required under Section 2,324 of the Revised Statutes of the United States is hereby extended to and including the 1st day of July, 1921, so that work done or improvements made upon any mining claim in the United States or Alaska on or before July 1, 1921, shall have the same effect as if the same had been performed within the calendar year of 1920. Provided that this act shall not in any way change or modify the requirements of existing laws as to the work to be done or improvements made upon mining claims for the year 1921."

The Committee on Mines and Mining of the House reported favorably a bill which would relieve claim owners of the necessity of doing this assessment work for 1920, but the Senate Committee does not favor the suspension of the work for another year and decided on the extension of the time in which the work may be done, as stated above.

An amendment to the assessment work statute has been introduced by Senator Smoot, of Utah, which would change the assessment work year to the fiscal, rather than the calendar, year. This would include Alaska.

Only 97 War Mineral Claims Remain

Awards totaling $75,631.56 were recommended during the week ended Dec. 4, by the War Minerals Relief Commission. The awards were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): Kershaw Mining Co., pyrites, $57,011.07, 50 per cent; Sig. Salomon, chrome, $206.28, 15 per cent; F. J. Abbott, tungsten, $2,615.17, 20 per cent; Farmer & Walsh, chrome, $2,770.82, 53 per cent; L. M. Mining Association, pyrites, $9,606.98, 40 per cent; Colorado Manganese Mining Co., manganese, $2,989.95, 80 per cent.

In addition, revised action was taken in three claims. In the case of Charles M. Tucker the full amount of his claim, $770, was allowed. In the claim of F. R. & E. E. Smith an award of $1,944 was recommended. The claim previously had been disallowed. In the claim of Ott and Thompson an additional $400.48 was allowed. Previously the award had been for $280.

Only ninety-seven claims remain to be acted upon.

Tariff Hearings Scheduled for Next Month

Tariff revision on metal imports will be the subject of hearings before the Committee on Ways and Means of the House of Representatives on Jan. 12, 13 and 14. The hearings on chemicals will be had on Jan. 6, 7 and 8, and on earths on Jan. 10 and 11. The free list is to be taken up at hearings on Feb. 11, 12 and 14.

It is not the intention to attempt the general revision of the tariff at this session of Congress. Advantage is to be taken of this time, however, to complete the hearings, so that a bill can be framed and introduced at the extra session, which is expected to be called before April 1.

Heads of Experiment Stations To Meet at Berkeley

Superintendents of the five western experiment stations of the U. S. Bureau of Mines have been instructed by Dorsey A. Lyon, the supervisor of stations, to report at Berkeley, Cal., Jan. 24, for a two-day conference on matters pertaining to future work and its co-ordination. The conference will also be attended by the deans of the five schools which are co-operating in the conduct of the experiment stations of the Bureau.

George A. Parks Heads Permanent Alaska Committee

Chairman Is Representative of Interior Department—Body To Enter Upon Its Work Immediately

As a further step toward providing more intelligent government for Alaska, and in an effort to stimulate further its industries, the President has given special authority to make permanent the interdepartmental committee which will deal with Alaskan problems. The committee is to be headed by George A. Parks, a mining engineer who has resided for thirteen years in Alaska, and who has made a special study throughout that time of the questions which will confront the interdepartmental committee. The President, in his letter to the Secretary of the Interior, said:

"In view of the work of the different departments in dealing with Alaskan affairs and the wisdom of co-ordination, I approve the formation of an interdepartmental committee to consist of a representative of the War, the Post Office, the Navy, the Interior, Agriculture, and Commerce departments; the Shipping Board; and the Federal Power Commission; the Governor of Alaska to be ex-officio a member.

"Each of the departments, the Shipping Board, and the Power Commission, is to appoint one member. The function of the committee is to co-ordinate and bring together facts and suggestions touching matters affecting Alaska, and to make recommendations for definite action to the department charged with the particular function, to the end that duplication may be prevented and efficiency secured.

"While the work of the committee is advisory, it is believed that by bringing together all available information and providing for an exchange of views by representatives of the different departments, much of the difficulties now experienced in dealing with Alaskan affairs will be obviated, and speedy and intelligent co-operative action secured.

"It is important that the committee have permanency. It will be well, therefore, that the representative of the Interior Department be the chairman, and that office space for the committee be there provided."

The personnel of the committee, in addition to Chairman Parks, is as follows: War Department, Maj. Clarence O. Sherrill, Corps of Engineers; Post Office Department, James B. Corridon, superintendent of railway adjustments; Navy Department, Capt. W. C. Cole, U. S. N.; Department of Agriculture, E. A. Sherman, associate forester; Department of Commerce, Dr. Hugh M.

Smith, Commissioner of Fisheries; Shipping Board, H. Y. Saint, staff assistant, office of director of operations; Federal Power Commission, O. C. Merrill, executive secretary, Federal Power Commission; Governor of Alaska, Thomas Riggs, Jr., member ex officio.

The committee will take up its work immediately, and among other things will give consideration to the recommendations made by the Alaska Advisory Committee in its report of June 11, 1920, to Secretary Payne. This committee consisted of representatives of the Department of Agriculture, Post Office Department, U. S. Shipping Board, and the Interior Department. Its report dealt with many matters affecting the growth and development of industries in Alaska, including mining, fisheries, farming, stock raising, timber, reindeer, transportation, road building, water power, etc. The organization of the present interdepartmental committee is in accordance with one of the recommendations of this Advisory Committee.

NEWS BY MINING DISTRICTS

CANADA

Ontario

Dome Mill Capacity Reduced to 600 Tons—Power Shortage and Drop in Silver Cause Further Curtailment

Porcupine—The Hollinger has declared a dividend of 1 per cent, payable Dec. 31, to shareholders of record Dec. 15. This makes a total of $2,214,000 for the year and $13,360,000 to date. Large supplies of coal are being rushed to the property to permit of the auxiliary steam plant being used to offset the shortage in hydro-electric power. The year's production is expected to reach a total of $6,000,000.

On account of breakdowns to both the underground and mill crushers, the Dome mill capacity has been reduced to about 600 tons per day. It is understood, however, that the grade is very satisfactory, and the production for the year should be approximately $2,000,000. The power shortage is still acute, and may cause further curtailment in milling, but should not interfere with underground operations.

Cobalt—A considerable decline in the price of silver has caused further curtailment of operations in the Cobalt district.

The Mining Corporation has stopped treating tailings in the Buffalo mill, and operations in other departments will be still further curtailed. It is understood that the Dominion Reduction will close its mill altogether. The operation of the high-grade plant for the treatment of flotation concentrates will be continued until toward the end of January, by which time all the concentrates on hand at the end of the clean-up and those concentrates from outside customers will be put through.

The Kerr Lake, which sends all its ore to the Dominion Reduction Co. plant, will also close. Kerr Lake is going ahead with its Utah property, and is now treating 100 tons of silver-lead ore a day. According to an official statement made last April, 87,000 tons were blocked out, averaging 18 oz. in silver and 80c. gold per ton. By the time the purchase price is completed, the property will represent an investment of about $500,000.

La Rose has stopped work at its Violet property, and the underground operations at the Bailey mine have been suspended.

The Ontario Department of Mines has just issued a report showing the output of the mines and smelters for the first nine months of 1920. The report shows a total production of $35,920,418, which is an increase of $6,000,000, as compared with the corresponding period of 1919. Practically all of the different metals covered by the report showed substantial increases, but the shortage of power and the low price for silver, as well as the curtailment of operations in the nickel field, will show a loss for the final three months as compared with the last three months of 1919. The report states, however, that on account of the drop in the price of commodities and the surplus of labor which now exists, this should prove specially advantageous to the gold-mining industry.

British Columbia

Trail—Shipments received at the Consolidated M. & S. Co.'s smelter during the week ended Nov. 30 totaled 12,502 tons. Shippers were as follows:

Mine	Location	Net Tons
Bluebell	Riondel	203
Canada Copper	Allenby	80
Horn Silver	Chopaka	53
Josie	Rossland	281
Knob Hill	Republic	56
North Star	Kimberley	173
Silver Cup	Gerrard	14
Velvet	Velvet	28
Company Mines		11,614

CALIFORNIA

Allison Ranch Starting New Exploratory Crosscut—Strike at Finnegan Mine Reported

Grass Valley—A new crosscut has been started in the Allison Ranch mine. This starts from the 600 level and will extend southwest into the Crocsus and Keystone claims, where a system of ledges and pay-shoots is believed to exist. The crosscut from the 1,200 level into Hartery ground has so far failed to develop pay-streaks, although a strong ledge has been discovered. A 400-ft. raise has been driven, and drifting both ways on the ledge is now in progress.

The tunnel of the Placer Gold-Lead mine, near North Bloomfield, is now in approximately 170 ft., and it is expected that the gravel channel rim will be cut within 150 to 200 ft. more. Two shifts are employed, and 30 ft. advance is being made per week.

J. Wesley Gebb, state mine inspector, has been devoting considerable attention to the new and reopened drift gravel mines of the Grass Valley district. In some of these properties bad ground has been encountered and the greatest care is necessary to avert accidents.

Angels Camp—There is a gravel mining boom developing and considering the number of undeveloped channels and gravel mines it has a chance of rivaling that of quartz. Since the reopening of the Victor, the Slab Ranch and the Sanguinetti gravel mines and the prospecting in the Rough Diamond gravel mine, much interest is being taken in working the old channels.

The discovery of a rich body of ore in the Finnegan mine at Carson Hill, south of Angels Camp, is considered encouraging. Several of the officials came from San Francisco in response to a telegram notifying them of the strike.

Knights Ferry—The Yankee Hill gold dredge, which started Nov. 19, is now running at capacity. At present it is situated about the middle of the Dan Mann and Sol Morris mining claims along the river. It will work two miles up stream from the starting point and two miles down stream, in accordance with present plans. Fifteen men are employed.

NEVADA

Reduced Railroad Rates Benefit Ely and Pioche

Ely—On Dec. 3 a new rate of $3 per ton became effective on all ore of a value not exceeding $15 per ton and consigned to Utah Smelting plants, adjacent to Salt Lake City from East Ely. This rate is a reduction of approximately $1.25 per ton on the tariff recently instituted. The new rate will encourage a number of the low grade shippers. According to S. B. Elbert, who is in charge of the mining operations at Ward, 50 tons of ore will be shipped daily to the Utah smelters. The Jennie A mine in the Hamilton section near Ely is shipping ore which is being hauled to Kimberley at a total cost of $19 per ton.

The Nevada Consolidated operating at about one-half normal capacity during the quarter ending Sept. 30, 1920, milled 671,063 dry tons as against 691,095 dry tons concentrated in the preceding quarter. The average copper assay of the ore milled was 1.5 per cent as compared with an average of 1.47 per cent during the preceding quarter. Cost of production was 16.04c. per lb. of copper.

Pioche—Ore shipments for the week ended Dec. 2 showed a large increase over the recent average, being 3,495 tons. Shippers were as follows: Prince Con., 1,865 tons; Virginia Louise, 950; Combined Metals, 305; Bristol Silver mines, 240; Black Metals, 50; Hamburg mines, 45, and Fairview Lease, 40.

Divide—The management of the Tonopah Divide has reported that its southeast drift on the 800 level is in $35 ore for the last 80 ft. and that the face is in ore of the same grade with only one wall exposed. The ore is harder and more siliceous than on the upper levels and shows sulphides.

NEW MEXICO

Great Eagle Fluorspar Co. Incorporated

Lordsburg—The total shipments of crude ore from this district for November amounted to 91 carloads, 4,445 tons, of an approximate value of $66,675.

The Great Eagle Fluorspar Co. has been incorporated with a capital of $100,000 by Merton W. Wentworth and Cyrus G. Goodrich, of Battle Creek, Mich., and Alford Roos and R. S. Spann, of Lordsburg, N. M. A large warehouse with ore platform, bins and track scale will be built at once.

Steins Pass—McGee Bros. have been carrying on development work quietly for the last three years upon their zinc property three miles south of town. They now have enough ore blocked out to justify a 100-ton mill, which will be built at an early date. A steam power plant of 300 hp. will also be put in. Water will be developed in the Animas Valley and pumped to the mill, a distance of 2½ miles, with a head of 400 ft. The orebodies opened up are large, and about 20,000 tons of lead-silver-zinc ore is in sight. The main shaft is down 300 feet and core drilling has been done to a depth of 600 ft., showing heavy lead sulphides.

COLORADO

Portland No. 2 Shaft Now Deepest in District

Cripple Creek—Shaft No. 2 of the Portland Gold Mining Co. has reached a depth of 2,450 ft., and is now the deepest shaft in the district. The collar of the shaft is at an altitude of 10,244 ft., and the new shaft station is being cut at an elevation of 7,794 ft. As soon as this is completed, development will be started on this level to determine the downward continuation of the big oreshoot opened on the 21st and 23d levels. The hoist from the Granite mine, which was recently purchased by the Portland company, will be installed at Shaft No. 2. A new screening plant is being installed to reduce the amount of hand labor on the surface.

MONTANA

Anaconda Closes Leonard Mine—Barnes-King Operating Shannon Only

Butte—The closing of the Leonard mine of the Anaconda Copper Mining Co. last week, rendering 400 men idle serves further to emphasize the depression into which the copper market has fallen. With the Leonard down, Anaconda's production is reduced to about 40 per cent of normal. Officials of the Anaconda declined to discuss the probability of a further reduction in output or whether or not wages would be cut, but from the pessimism prevailing in producing circles the belief obtains there will be a wage reduction from $5.75 to $4.75. Development work in such properties as are being operated is being conducted practically on a normal basis. Fireproofing has been halted until market conditions improve and no more money is being expended other than that which is necessary.

With the surplus of labor rapidly increasing in the Butte district, applications for silver leases are increasing, the price of the metal under the Pittman Act offering to the miner about the only hope at the moment. Efficiency of the miners still at work is showing a marked increase and for the first time in years there is a total absence of any radical talk, with no mention whatever of the I. W. W. being heard.

The directors of the Barnes-King have decided to make no effort to reopen the Piegan-Gloster property until improvement in the gold situation is in evidence. But one mine is now being operated by the company, the Shannon in the Marysville district. The North Moccasin is being worked by lessees.

WASHINGTON

Mineral Creek Copper Co. Shuts Down—American Refractories Co. Increasing Magnesite Shipments

Seattle—Unless the present sagging copper market takes a turn for the better several copper properties now operating in Washington will be forced to shut down, it is stated. It costs the small producers of Washington an average of about 15c. a pound to produce copper and several of them are now losing money. It is expected that the Sunset Copper Co. operating near Index will suspend operations in a short time. Their mine and mill are in excellent physical shape.

Cle Elum—The Mineral Creek Copper Co., operating a property at the head of Little Lake Kachess, has closed down for the winter season but expects to resume operations early in the summer if market conditions are then favorable. During the past summer they erected a small mill with a Forrester rod mill, Wilfley tables and Ziegler flotation cells. The property is developed with 2,000 ft. of tunnels and a large mineralized zone of chalcopyrite replacing granite along shatter planes has been developed.

Valley—The American Refractories Co. of Pittsburgh, which are operating the Double Eagle magnesite deposit, are increasing their shipments of calcined magnesite. The 14-mile truck road between the quarries and Valley is being repaired and the number of auto trucks increased to a three-shift basis.

SOUTH DAKOTA

Labor Becoming More Plentiful in Black Hills District—Golden Crest Property Sold

Deadwood—James Hardin, of Deadwood, and associates in New York City have purchased the Golden Crest property in the Two Bit district, and work has already started to place the mine in shape for operation. The property is equipped with a complete treatment plant as well as all machinery for mine development. This will be added to and overhauled and it is expected that active work will be started early next year. The new management states that all work will be pushed, that arrangements for placing the treatment plant in commission will also be completed early and that production of bullion will be made in 1921. The property has been idle for a number of years, but during the years of operation a good grade of milling ore was developed and a large amount of underground work completed. This mine work together with the equipment has cost to date over $300,000. James Hardin, of Deadwood, will have charge of the work and it is expected that an active producer will be added to the list of Black Hills mines.

Deadwood—New pumps and equipment have arrived at the property of the Cutting company, and are being installed to handle the large amount of water that necessitated the suspension of work in October. The company is making the necessary installations and active work will again be started soon after the first of the year.

Lead—The Monroe mill of the Homestake company at Terraville has been placed in commission and a total of 920 stamps are now dropping. There remain 100 stamps that are as yet idle, but these will be used early in 1921. Labor is becoming more plentiful and it is expected that a normal production will be reached early in the next year. Good progress is being made with improvements, and the Ellison hoist, which is being changed from steam to electric power, will be ready for use during the coming summer. The cages in this shaft will be replaced by skips. Most of the equipment required for the change has been received.

JOPLIN-MIAMI DISTRICT

Oklahoma-Kansas-Missouri

McCullough and Associates Sue for Loss Through Trespass on Fish Land Lease

Miami, Okla.—Suit was filed here Dec. 8 by W. P. McCullough, B. E. Beth, and Thomas F. Phillips for recovery of damages in the amount of $155,000, which they claim from Wesley M. Smith, the Quebec Mining Co., C. H. Plumb, E. R. McClelland, J. S. Mabon, the Tri-state Mining Co., and others. The plaintiffs allege that the McCullough lease to certain portions of the Fish estate in the Picher mining field is the legal lease and that the lease of Wesley M. Smith is not legal, and on this ground they ask the return to them of $125,000 paid in royalties by the Quebec Mining Co., and $30,000 paid as a bonus. They also ask $100,000 damages for loss through similar trespass on other sections of the Fish land lease, which they assert rightfully belongs to McCullough. The suit is ancillary to another tried in the Federal Court for the eastern district of Oklahoma in which McCullough's claims were upheld.

Joplin—It is rumored here that the Metals Extraction Corporation of America, which has been operating a zinc-oxide plant, employing a new process at Galena, Kan., is about to be absorbed by large eastern interests.

MINNESOTA

Mesabi Range

McKinney's Stevenson Mine Down—Rogers Brown Ore Co. To Have Fire-Proof Shaft

Virginia—The new shaft being sunk by Coates & Tweed Co. at the Julia mine is rapidly nearing completion. The company expects to be able to stock ore from it this winter.

Hibbing—Seven state owned properties report for the week ended Nov. 27 a total shipment of 72,485 tons.

The Stevenson mine of the McKinney Steel Co. has closed down and indications are that it may not operate next shipping season. The company has offered to send its several hundred employees to its coal mines in Kentucky.

The Rogers Brown Ore Co. has decided to put in steel sets instead of wood or concrete for its new shaft timbers. The shaft will be approximately 335 ft. deep and the only wood used will be the skip guides, which will make the shaft practically fire-proof. There will be five compartments with inside dimensions of 17 ft. 2 in. by 10 ft. The compartments will be as follows: Cage, 5 ft. 8 in. by 10 ft.; two skip compartments each 5 ft. by 6 ft.; and a ladder and pipe compartment 5 ft. by 3 ft. 7 in. respectively. The wall and end plates will be of 18-inch I-beams and the dividers will be 9-in. I-beams. The studdles will be 3½ by 3½ by ⅜-in. angle irons. There will be three sets of bearers besides the surface ones, spaced approximately 85 ft. apart and made of 12-in. I-beams 20 ft. long. The surface bearers will be of 18-in. I-beams 27 ft. long. The shaft lining will consist of reinforced concrete slabs for which the American Bridge Co. has designed special forms to conform with their design.

Vermillion Range

Ely—The Chandler Mining Co., operating the North Chandler and South Chandler mines, shipped a total of 133,000 tons of ore this season. The South Chandler reports 58,000 tons and the North Chandler 75,000 tons. It is reported that the mines will curtail their operations this winter and only work at one-half normal.

ALABAMA

Republic Company's Spalding Mines Shut Down—Production of Pig Held Back

Birmingham—Brown ore development in the next twelve months in Alabama promises to be on a big scale. Investigations are being made by representatives of financial interests of the Middle West and elsewhere that hold out great promise. Brown ore fields in the vicinity of Russellville, around Goethite and on the Alabama-Tennessee state line are receiving attention. The Republic Iron & Steel Co. is preparing to build a washery in its brown ore field around Goethite, Bibb County.

The Republic company has shut down its Spalding red ore mines, and will make no effort for further output there until the pig iron market is better and a large accumulation of ore has been consumed. The Republic company has only one out of three of the blast furnaces in this district in operation and the needs of ore are being supplied from the Raimund red ore mines and the brown ore mines. Dave McDaniels, who has been superintendent at the Spalding mines, has been transferred to the Raimund mines and W. H. Jobe, superintendent there, who came to Alabama from the Wisconsin-Michigan fields a few years ago, will take a position with another company.

The site has been purchased and the Federal Government will shortly begin construction of a coal-storage plant at Mobile, to handle coal being shipped from the Birmingham district down the Warrior River for export and to coal ships touching at the port of Mobile. The plant will have a compartment that will permit the handling of ore, regular shipments of manganese ores from Brazil and other countries for use in the Birmingham district being promised. The river transportation facilities of the Government are now handling a shipment of 6,500 tons of manganese ore from Brazil and one furnace of the Tennessee Coal, Iron & RR. Co. is on ferromanganese iron altogether. It is expected that the storage plant will be completed by May 1 next and then the imported ore can be brought with greater frequency and, awaiting barges to handle it on the Warrior River, can be stored at Mobile.

Chronology of Mining November, 1920

Nov. 1.—Interstate Commerce Commission opened hearings in Salt Lake City, Utah, concerning increases in intrastate freight rates on coal and ore. —Copper Queen at Bisbee, Ariz., laid off 350 steam-shovel men on Sacramento Hill.—Temiskaming Mine Managers' Association restored flat-rate wage scale.—United Verde Copper Co. reduced its force by 30 per cent.

Nov. 2.—Walker Copper Co., Quincy, Cal., laid off most of its miners.

Nov. 3.—Officials of British coal miners declare off the the general British coal strike.

Nov. 4.—New Idria Quicksilver mine, Cal., closed its larger plant.—Judge S. L. Pattee, Bisbee, Ariz., dismissed the 206 deportation cases pending due for trial Nov. 8.

Nov. 6.—Fire found burning in magazine on 300-ft. level of Fairview Fluorspar & Lead Co.'s mine.

Nov. 8.—Tom Read Gold vs. United Eastern apex suit came to trial before Mohave County, Ariz., superior court.

Nov. 10.—U. S. Court of Claims dismissed claim by American Smelting & Refining Co. against United States for additional payment of $512,515 on 33,069 tons copper taken at 23½c. per lb. during war.—Quincy Mining Co., Hancock, Mich., started up new 6,000, hp. Nordberg hoist.

Nov. 11.—American Engineering Standards Committee met in New York City.

Nov. 12.—Apex suit between Federal Mining & Smelting Co. and the Hecla Mining Co. officially announced to have been settled.

Nov. 13.—A circuit of mines in Grass Valley, Cal., district was served by airplane carrying supplies.

Nov. 15.—American Mining Congress' 23d annual session opened at Denver, Col., closing on Nov. 19.

Nov. 16.—Calumet & Hecla reduced all wages and salaries 15 per cent, closed down Osceola branch, and reduced forces at other mines; 1,500 men affected.

Nov. 17.—Nenzel Crown Point Mining Co.'s holdings sold at public auction.

Nov. 18.—American Metal Co.'s coal mines in Monclova district, Coahuila, Mexico, seized by striking Mexican coal miners; Americans warned out of the district.

Nov. 19.—American Engineering Council of Federated American Engineering Societies organized at Washington, D. C.; Herbert Hoover elected president of F. A. E. S.

Nov. 26.—Suit against J. F. Robinson and Commerce Mining & Royalty Co. for $200,000 damages and recession of land abruptly thrown out of court by Judge E. F. Laster, Miami, Okla.

Nov. 30.—Last ore carrier cleared from the Missabe docks at Duluth and Superior.

THE MARKET REPORT

Daily Prices of Metals

Dec	Copper N Y net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N Y	Lead St L	Zinc St. L
9	13.50@13.75	32.50	35.75@36.00	4.90@5.00	4.75@5.00	6.10@6 25
10	13.50@13.75	31.50	34.50@35.00	4.85@5.00	4.75@5.00	6.10@6 20
11	13.50@13.75	31.50	34.25@34.50	4.80	4.75@5.00	6.00@6.10
13	13.50@13.75	31.00	33.00@33.50	4.60@4.75	4 75	5.90
14	13.25@13.50	30.50	33.00@33.50	4.50@4.75	4.75	5 85
15	13 25	31.50	34.00@34.50	4 50	4 60@4 75	5 70

*These prices correspond to the following quotations for copper, "delivered": 13.75@14, 13.75@14, 13.75@14, 13.75@14, 13.50@13.75, and 13.50.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Dec.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
9	79¾	79⅜	90	228	232	26	26⅜	31½	33¼
10	77¾	77½	89½	223	226	25¾	26½	30¼	31¾
11	...	....	...	....	....	....	...	...	...
13	76¾	76½	87½	215	218	24⅜	25	28½	30
14	75¾	75½	87½	212½	216	23	24⅛	28	29¾
15	75½	75½	87	217¼	228	22½	23¾	25¾	27½

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver New York Domestic Origin	Silver New York, Foreign Origin	Silver London	Dec	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
9	344	99½	60⅜	39¾	13	344½	99½	62⅜	40⅞
10	344	99½	59¼	38⅞	14	344	99½	62¼	40⅝
11	344	99½	61¾	40½	15	346½	99½	66	42⅝

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Dec. 15, 1920

Several times this year firmness in the local metal market has been killed by declines in London, which have not only a sentimental effect here but also have threatened the importation of European metal into this country. That has been the case the last week. As we mentioned on Dec. 8, the feeling here was much better and prices were tending to advance slightly. Beginning with Thursday, Dec. 9, however, the declines in the London market have been regular and violent, with no promise of their being at an end, deflation in general there not having progressed as far as in this country. Local interests have been quick to accord with the movement, and sharp price cutting has been in evidence. Some producers refuse to do any business whatever at the current figures. The price of metals in London will, without doubt, dominate the local markets for the next few weeks.

Copper

Some of the larger producers continue to hold for 14c. delivered, and on Thursday and Friday did a satisfactory business at that figure. On Tuesday, however, the price declined, and this week, with copper being freely offered at 13½c. delivered, it is probable that holders at the 14c. price are doing little or no business. Sales have been scattering and not of large individual volume. Consumers in general are willing to buy only small lots. If a large order should come into the market, there is no doubt that some very attractive prices, considerably under the current low levels, would be quoted.

Although metal for December or January can be obtained at the prices we quote, a premium of about ⅛c. for each succeeding month is being asked. Almost no metal is being booked for these forward deliveries.

Reports from the League of Nations conference at Geneva indicate that some plan for financing the sale of copper until it can be fabricated may be decided on. Just what effect this will have on the market remains to be seen. If a workable plan can be agreed upon a great deal of good may come from this movement.

Lead

Lead prices held up manfully to the 5c. level on Thursday and Friday, and quite a few small orders were taken at that price, though on somewhat larger business the price was shaded 10 or 15 points. Many of the sales were made to jobbers. On Monday, however, the London influence could no longer be withstood, and the 5c. price became purely a nominal one. Today metal for any delivery and in any quantity could be obtained at 4.50c., New York. Even at this price it will be profitable to fill orders with lead imported from Germany or Spain. There has been no rush on the part of consumers, and it seems that they do not care for the metal at any price.

In St. Louis, the lead business is exceedingly dull. There are practically only two sellers, and they are not now reported as offering anything at as low figures as now prevail in New York. With the New York price being influenced by the cost of importation, the tendency will again be for the Western price to be higher than at the seaboard.

Zinc

The pronounced upward movement recorded last week was of short duration. With the violent declines abroad, the price has again dropped below 6c. and is still heading downward. Today zinc can be bought in Europe and delivered here at a profit at any price over 5c., so the possibility of improved prices, even with a further curtailment of domestic production, is not alluring. Zinc can now probably be obtained at the same price in New York as we quote for St. Louis, and possibly less. With business at practically a standstill, prices are largely nominal. On orders of any size there is little doubt that today's figure of 5.70c. could be shaded, particularly for New York delivery.

Tin

As would be expected, with the unsettlement abroad, this metal has been weak and irregular. Straits has sold as low as 31c. for spot metal, that be-

ing the settlement price of a 25-ton lot sold at auction on the New York Metal Exchange yesterday. This auction, however, was a fluke, as such sales are likely to be these days, with no demand. One sale of electrolytic tin of fairly satisfactory size was made on Thursday at approximately the price for spot Straits.

Straits tin for future delivery: Dec. 9th, 36.75@37c.; 10th, 36@36.25c.; 11th, 35@35.50c.; 13th, 34.25@35c.; 14th, 35@35.50c.; 15th, 35.50@36.50c. Demand fairly good.

Arrivals of tin in long tons: Dec. 11th, London, 80; 13th, Straits, 375.

Silver

Since our last week's report there has been some improvement in the market price of silver. This advance was a natural reaction from the sharp declines which have occurred over a considerable period. It is only reasonable to expect that at some point there would be a reaction, and as the impression prevailed that any further material decline would result in the closing up of foreign mines, operators have taken advantage of the situation to cover short sales, and there has been buying for speculative account and China operations. The market is very sensitive, and it is difficult to predict the immediate future.

Mexican Dollars—Dec. 9th, 46⅜; 10th, 45½; 11th, 46⅜; 13th, 47⅜; 14th, 47⅜; 15th, 50⅜.

Gold

Gold in London: Dec. 9th, 119s.; 10th, 118s. 2d.; 13th, 118s. 9d.; 14th, 118s. 7d.; 15th, 117s. 10d. Five million dollars in Australian gold is being taken by a local bank. The Australian government allows only current mine output to be exported.

Foreign Exchange

With foreign business exceedingly dull and with scarcely any speculation in foreign exchange, the market has been dull and narrow. On Tuesday, Dec. 14, francs were 5.85c.; lire, 3.44c.; and marks, 1.34c. New York funds in Montreal advanced to a premium of 16¼ per cent.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c. Outside sales reported at as low as 22c.

Antimony — Chinese and Japanese brands, 5½@5⅝c.; market very quiet; W.C.C. brand, 6¼@6½c. per lb. Cookson's "C" grade, 11@12½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony[1] (200 mesh), 7¼c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 7c.

Bismuth—$2.40 per lb., 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100-lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal** in rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$85 per oz.

Platinum—Firm at $85 per oz. Nominal.

Quicksilver—Nominally $50 per 75-lb. flask, with second-hands selling as low as $47 per 75-lb. flask. San Francisco wires $50@$55. Market dull.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

[1]**Manganese Ore**—45@50c. per unit, seaport; chemical ore (MnO_2) $60@$65 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

[1]**Tungsten Ore**—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.50, f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.25, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guarantced minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80@$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 11—Zinc blende, per ton, high, $36.75; basis 6 per cent zinc, premium, $33.50; Prime Western, $32.50; fines and slimes, $30 @ $27.50; calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $34.99; calamine, $30; all zinc ores, $34.90.

Lead, high, $67.85; basis 80 per cent lead, $65 @ $47.50; average settling price, all grades of lead, $60 per ton.

Shipments for the week: Blende, 6,515; calamine, 135, lead, 1,432 tons. Value, all ores the week, $318,050.

Fifty mills, or 45 per cent of the total number in operation in midsummer, are now idle, representing about 55 per cent suspension of output. An additional 10 per cent restriction is occasioned by curtailment in working forces at mines in operation. This cuts off around 3,750 tons per week from the midsummer producing capacity, and will reduce December production about 18,750 tons, 48,750 tons by the fifth of March.

Platteville, Wis., Dec. 11—No market here again this week. Mines continue to close. Shipments for the week: blende, 604; calamine, 17 tons. Shipments for the year: blende, 59,885; calamine, 2,551; lead, 452; sulphur ore, 1,242 tons. Shipped during week to separating plants, 1,538 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,500; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats, $8.50@$15, all per short ton, f.o.b Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton; ground (white) $24@$30 in bags, carload lots; (off-color) $22@$26 in bags, carload lots; all f.o.b. Kings Creek, S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $8@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b. mines, Georgia; crude, $8@$12; ground, $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia.

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton, f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$16 per ton, carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c. Lubricating grade commanding the best price is a fine flake, passing a 100@120 mesh, and running higher than 96 per cent carbon. Linotype machines use a flake passing 90 mesh and standing on a 120 screen, with 90 per cent carbon, retailing at 75c. to $1 per lb. and selling to jobbers at 11@40c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block; No. 6, 55c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25; all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150 @$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¾-in. disks, No. 1, $1.40 per lb.; No. 2, $1.25. The foregoing domestic prices obtain also in the Chicago district.

[1]**Monazite** — Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices being f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b. New York.

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1¼ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18; all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 12@12½c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $150, freight allowed; $145, f.o.b. seaboard bases; English, $135@ $140, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $60@$65, f.o.b. furnace.

[1]**Ferromolybdenum**—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $78@$80; 75 per cent, $160.

[1]**Ferrotungsten**—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

[1]**Ferrovanadium**—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 23½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9¾c. in quantity, mill lots.

Nickel Silver — Unchanged at 34¾c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets 21½c.; sheathing, 21½c.; rods, ⅝ to 3 in., 18½c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter; zinc plates, 10½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina. $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130.

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Dec. 14, 1920.

The rate of steel-ingot production in November may be estimated at 36,000,000 tons a year, against a 42,000,000-ton rate during the preceding ten months. The Steel Corporation's output is even greater now than formerly, but the independents seem to be well below 50 per cent, the divergence being due to the difference in price policy. The independents are now down to the Steel Corporation prices, except on pipe, but did not get down soon enough to accumulate orders, and there is now no buying.

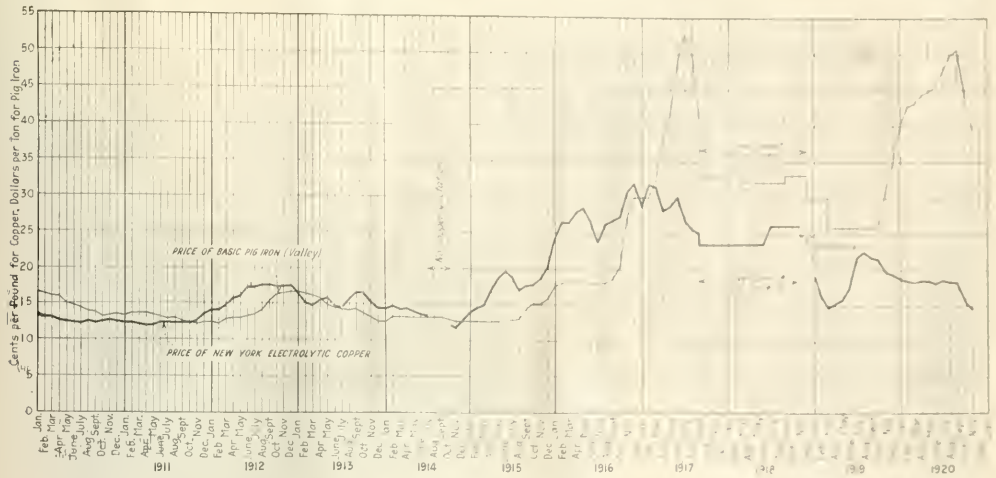
Pig Iron—Foundry iron is quotable at $35, Valley, or $2 decline, bessemer and basic remaining at $35 and $33 respectively. There is no demand, and additional furnaces are going out of blast.

Semi-finished Steel—A large independent having outstanding contracts to furnish sheet bars at $65, but lacking specifications, has revised the contracts to the Steel Corporation price of $47, which is now the market. Billets have not developed a market.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville — Furnace, $10@$12; foundry, $8@$10.



FLUCTUATIONS IN MONTHLY AVERAGE PRICE OF ELECTROLYTIC COPPER AND BASIC PIG IRON, 1910-1920

A Comparison Between Copper and Pig-Iron Prices

An Analysis of Price Curves Shows That Pig Iron Is Strikingly Less Sensitive Than Copper in Acknowledging a Major or Minor Market Trend

THE curves illustrated above show the fluctuations in the monthly average price of electrolytic copper at New York and the price of basic pig iron at Valley furnaces. Basic pig iron has been selected from the various pig-iron grades because it represents by far the greatest production of all classes of pig iron traded. The vertical scales of the curves have been so chosen that in pre-war years the curves of metal prices are placed closely together, admitting of easier comparison. It should be noted that a fluctuation of 1c. in the price of copper is relatively equivalent to a fluctuation of 100c. in the price of pig iron.

An inspection of the curve will show that there are both major and minor movements in the prices of each of these commodities. The major movement is shown by a definite upward or downward trend over a period usually several years long, whereas a minor movement records merely a temporary setback or recession in the general trend of a major movement.

For the period covered by the graph there are three well-defined "major" peaks in the copper and pig iron curves. The first occurred in the summer of 1912 for copper, and the winter of 1912 for pig iron; the second just prior to the assumption of governmental price control—in the winter of 1916-1917 for copper, and in the summer of 1917 for pig iron; the third, which is commonly called the peak of post war inflation, occurred in the summer of 1919 for copper, and the fall of 1920 for pig iron. In each case there was a decided lag on the part of pig iron to reach its peak price as compared with copper, the time of lag varying from four to thirteen months.

A glance at the behavior of these metals during major declines in the market will show a similar lag for pig iron. The first major decline for the period under discussion occurred during 1910 and the early part of 1911. Copper reached bottom in April and May of 1911; pig iron continued its decline until November of the same year. The next major drop began in the fall of 1912 and the winter of 1913, extending well into 1914, and being the immediate effect of the depression that resulted from the declaration of hostilities in Europe. Copper ended its decline in November, 1914, and started on an upward climb that was to take over two years; pig iron reached its major low point at practically the same time as copper in this major downward movement.

The third major decline in the ten-year period covered by the graph took place a few months before the institution of governmental price control of both metals, and, although the fluctuations in prices were arbitrarily controlled by governmental authority for an extended period thereafter, the price declined upon the removal of price restriction, both copper and pig iron reaching a major low point in March of 1919. The pig iron price fixed by the Industrial Commission of the Department of Commerce ruled the pig-iron market for several months immediately after the low of March, 1919, but copper quickly rose in price under the stimulus of post-war speculation and inflation.

The next major decline, or what will undoubtedly become such, began in August of 1919 for copper, and September of this year for pig iron—an interval of thirteen months. Copper, as can readily be seen from the curve, has receded a pre-war price level; pig iron has still to take a great fall before it reaches the pre war plane.

In the minor movements of these two metals the same tardiness of pig iron to respond to market conditions is apparent. The curves speak for themselves, and detailed examination of instances where this condition has prevailed is needless.

The conclusion is warranted that for the past critical and important ten years pig iron has strikingly failed to "sense" the metal market as compared with copper, and that it has been and is consistently tardy in its acknowledgment of a change in the market. This property of pig iron may be ascribed to various causes, not the least of which is the greater concentration of the iron and steel industry in the hands of one large and overshadowing producer, whereas the copper-producing interests are more evenly distributed, with greater competition than in the iron and steel trade.

MINING STOCKS

Week Ended December 11, 1920

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Adventure	Boston..	....	....	*50	....	....
Ahmeek	Boston	48	45½	45½	Sept.'20, Q	.50
Alaska-B.C	N. Y. Curb.	⅞	¾	⅞	....	....
Allouez	Boston	19½	19	19	Mar.'19,	1 00
Anaconda	N. Y.	39½	38	38½	Nov. '20, Q	1 00
Ariz. Com'l	Boston.	7½	6	6½	Oct. '18,	.50
Big Ledge	N. Y. Curb.	⅞	⅞	⅞	....	....
Bingham Mines	Boston.	9½	9½	9½	Sept. '19, Q	.25
Calumet & Ariz	Boston.	46½	43	43	Sept.'20, Q	1.00
Calumet & Hecla	Boston.	230	203	203	June '20, Q	5.00
Canada Copper	N. Y. Curb.	....	....	*20	....	....
Centennial	Boston.	7	7	7	Dec. '18, SA	1.00
Cerro de Pasco	N. Y.	30	25½	25½	Dec. '20, Q	1 00
Chief Consol	Boston Curb	3	2½	2	Nov. '20, Q	.10
Chile Copper	N. Y.	9½	8½	8½	....	....
Chino	N. Y.	18½	18½	18½	Sept. '20, Q	37½
Columbus Rexall	Salt Lake.	*34	*31½	*31½	....	....
Con. Ariz	N. Y. Curb.	....	....	....	Dec. '18, Q	.05
Con. Copper M	N. Y. Curb.	1⅛	1⅛	1⅛	....	....
Copper Range	Boston.	27½	26½	26½	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*46	*40	*42	....	....
Davis-Daly	Boston.	6½	5⅜	5½	Mar. '20, Q	.25
East Butte	Boston.	8½	7½	7½	Dec. '19, A	.50
First Nat'l	Boston Curb	80	70	70	Feb. '19, SA	15
Franklin	Boston.	....	....	2½	....	....
Gadsden Copper	N. Y. Curb.	....	....	*70	....	....
Granby Consol	N. Y.	20	18	18	May '19, Q	1 25
Greene Cananea	N. Y.	20⅞	20	20½	Nov. '20, Q	.50
Hancock	Boston.	3	2	3	....	....
Houghton	Boston Curb	....	....	*45	....	....
Howe Sound	N. Y. Curb.	2½	2½	2½	Oct. '20, Q	.05
Inspiration Con	N. Y.	32⅞	30½	30½	Oct. '20, Q	1 00
Iron Cap	Boston Curb	6½	6	6	Sept. '20, K	.25
Isle Royale	Boston.	21	17½	17	Sept. '19, SA	.50
Kennecott	N. Y.	18½	17½	17	Sept. '20, Q	.50
Keweenaw	Boston.	....	....	1½	....	....
Lake Copper	Boston.	2½	2½	2½	....	....
La Salle	Bnston.	1½	1½	1	....	....
Magma Chief	N. Y. Curb.	....	....	*21	....	....
Magma Copper	N. Y. Curb.	1⅛	17	17	Jan. '19, Q	.50
Majestic	Boston Curb	*12	*8	*8	....	....
Mason Valley	Boston	1⅛	0 99	0 99	....	....
Mass Consol	Boston.	3	2½	3	Nov. '17, Q	1.00
Mayflower-O.C.	Boston.	4½	3½	4	....	....
Miami	N. Y.	16	15½	15½	Nov. '20, Q	.50
Michigan	Boston.	2½	2½	2½	....	....
Mohawk	Boston.	45	43½	45	Nov. '20, Q	1 00
Mother Lode (new)	N. Y. Curb.	5½	5½	5½	....	....
Nevada Con	N. Y.	9	8⅜	8⅜	Sept. '20, Q	.25
New Areadian	Boston.	....	....	2½	....	....
New Baltic	Boston Curb	....	....	3	....	....
New Cornelia	Boston.	15½	14½	14½	Aug. '20,	.25
Nixon Nev	N. Y. Curb.	....	....	*5	....	....
North Butte	Boston.	10½	9¼	9	Oct. '18, Q	.25
North Lake	Boston.	....	....	*25	....	....
Ohio Copper	N. Y. Curb.	....	....	⅞	....	....
Ojibway	Boston.	1⅜	1⅜	1⅜	....	....
Old Dominion	Boston.	18	15½	15½	Dec. '18, Q	1 00
Osceola	Boston.	23½	23	23	June '20, Q	.50
Phelps Dodge	Open Mar.	†175	†150	....	Oct. '20, Q	2 50
Quincy	Boston.	38	35	36	Sept. '20, Q	1 00
Ray Con	N. Y.	12⅛	11⅜	11⅜	June '20, Q	.25
Ray Hercules	Boston Curb	....	....	*61	....	....
St. Mary's M. L.	Boston	31	29½	29½	June '20, K	2 00
Seneca Copper	Boston	....	....	17½	....	....
Shannon	Boston.	0 85	0 75	0 85	Nov. '17, Q	.25
Shattuck Ariz.	N. Y.	5⅜	5⅜	5⅜	Jan. '20, Q	.25
South Lake	Boston.	....	....	2	....	....
South Utah	Boston.	*6	*6	*6	....	....
Superior Copper	Boston	3	3	3	Apr. '17,	1.00
Superior & Boston	Boston	1⅛	1⅛	1⅛	....	....
Tenn. C. & C.	N. Y.	8⅛	7⅞	7⅛	May '18, I	1.00
Tuolumne	Boston.	*35	*35	*35	May '13.	.10
United Verde Ex.	Boston Curb	24	23⅛	24⅛	Nov. '20, Q	.50
Utah Consol	Boston.	3⅞	3⅛	3⅛	Sept. '18,	.25
Utah Copper	N. Y.	52⅛	50⅛	50	Sept. '20, Q	1 50
Utah M. & T	Boston.	1⅛	0 78	0 90	Dec. '17,	.30
Victoria	Boston.	1⅛	1	1	....	....
Winona	Boston.	*50	*35	*35	....	....
Wolverine	Boston.	10⅛	10⅛	10⅛	Jan. '20, Q	.50
LEAD						
Hecla Mining	N. Y. Curb.	4⅛	4⅛	4⅛	Sept.'20,QX	.15
St. Joseph Lead	N. Y.	13⅛	12¼	12½	Sept. '20,QX	.50
Stewart	Boston Curb	....	....	*10	Dec. '15,	.05
Utah Apex	Boston.	3⅛	2⅞	3	Nov. '20, K	.25
ZINC						
Am. Z. L. & S	N. Y.	7⅛	6⅛	6⅛	May '17,	1.00
Am. Z. L. & S. pf	N. Y.	31	25⅛	27	Nov. '20, Q	1 50
Butte C. & Z	N. Y.	5⅛	4⅛	5	June '18, I	.50
Butte & Superior	N. Y.	10	9	9⅛	Sept. '17,	1 25
Con. Interst. Cal.	N. Y.	7⅛	6⅛	6⅛	June '20, Q	.50
New Jersey Z	N. Y. Curb.	144	144	144	Nov. '20, Q	4 00
Success	N. Y. Curb.	*2½	*1⅛	*2	July '16,	.03
Yellow Pine	Los Angeles.	*50	*50	*50	June '20, Q	.03

Stock	Exch	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	N. Y.	1½	1	1	....	....
Alaska Juneau	N. Y.	1⅛	1	1	....	....
Carson Hill	N. Y. Curb.	....	....	22½	....	....
Cresson Consol. G	N. Y. Curb.	1	1⅛	1⅛	June '20, Q	.10
Dome Ex	Toronto	*43½	*43½	*43½	....	....
Dome Mines	N. Y.	11⅛	10½	10½	Oct. '20, Q	.25
Golden Cycle	Colo. Sprgs.	‡....	....	*73	Dec. '20, Q	.02
Goldfield Con	N. Y. Curb.	*7	*5	*6	Dec. '19,	.05
Hedley	Boston.	....	....	4½	June '19,	.10
Hollinger Con	Toronto.	5.60	5 50	5.50	Dec. '20, BM	.05
Homestake	N Y	53	53	53	Sept. '19,	.50
Kirkland Lake	Toronto	*39½	*38	*39	....	....
Lake Shore	Toronto	1.00	1.00	1.00	Oct. '20, K	.02
McIntyre-Porcupine	Toronto.	1 88	1 81	1 81	Sept. '20, K	.05
Porcupine Crown	Toronto.	*19	*15	*15	July '17,	.03
Portland	Colo. Sprgs.	‡....	....	*60	Oct. '20, Q	.01½
Reorgan. Booth	N. Y. Curb.	*4	*3	*3½	May, '19,	.05
Silver Pick	N. Y. Curb.	*6	*5	*6	....	....
Teck Hughes	Toronto	*10	*5	*10	....	....
Tom Reed	Los Angeles.	1.39	1 25	1 28	Dec. '19,	.02
United Eastern	N. Y. Curb.	2½	2¼	2¼	Oct. '20, Q	.15
Vindicator Consol	Colo. Sprgs.	‡....	....	*18	Jan. '20, Q	.01
West Dome Consol	Toronto	....	....	*60	....	....
White Caps Min	N. Y. Curb.	*4	*3	*4½	....	....
Yukon Gold	Boston Curb	*8	*6½	*6½	....	....
		1½	1⅛	1⅛	June '18,	02½
SILVER						
Arizona Silver	Boston Curb	*19	*17	*18	Apr '20, M	.03
Beaver Con	Toronto	*28½	*26	*28	May '20, K	.03
Coniagas	Toronto	2 00	2 00	2 00	Nov. '20, Q	.12½
Crown Reserve	Toronto	*15	*15	*15	Jan. '17,	.05
Kerr Lake	Boston	....	....	2½	Oct. '20, K	.12½
La Rose	Toronto.	*23	*22	*22	Apr. '18,	.02
Mc'inley-Dar.	Toronto.	*24	*20	*22½	Oct. '20, Q	.03
Mining Corp.	Toronto	1 10	0 85	1 00	Sept. '20, Q	.12½
Nipissing	N. Y. Curb.	8⅛	7	7⅛	Oct. '20, QX	.50
Ontario Silver	N. Y	4½	4	4	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb.	⅞	¾	⅞	Jan. '12,	.10
Peterson Lake	Toronto	*9	*9	*9	Jan. '17,	.01½
Temiskaming	Toronto.	*26	*24	*26	Jan. '20, K	.04
Trethewey	Toronto	*17½	*13½	*14½	Jan. '19,	.05
GOLD AND SILVER						
Atlanta	N. Y. Curb.	*2	*1	*1⅛	....	....
Barnes-King	Butte	‡....	....	1.11	Aug. '20, Q	.05
Bost. & Mont	Boston	....	....	*65	....	....
Cashboy	N. Y. Curb.	*7	*5½	*7	....	....
El Salvador	N. Y. Curb.	....	⅜	⅜	....	....
Jim Butler	N. Y. Curb.	*18	*15	*16	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb.	*5½	*4½	*5	June '16,	.05
Louisiana Con	N. Y. Curb.	¼	¼	¼	....	....
MacNamara M	N. Y. Curb.	¼	⅛	¼	May '10,	.02½
Open Mar	N. Y. Curb.	†11⅛	†10½	....	Oct. '20, QX	.50
Tonopah-Belmont	N. Y. Curb.	1⅞	1⅞	1⅞	Oct. '20, Q	.05
Tonopah-Divide	N. Y. Curb.	1⅛	1⅛	1⅛	....	....
Tonopah Ex	N. Y. Curb.	1⅜	1⅛	1⅛	Oct. '20, Q	.05
Tooopah Mining	N. Y. Curb.	1⅜	1⅛	1⅜	Oct. '20, SA	.05
West End Con	N. Y. Curb.	1⅛	1⅛	1	Dec.'19, SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb.	*18	*16	*18	July '20, M	.01
Consol. M. & S	Montreal	18	16	17	Oct. '20, Q	.62½
Daly Mining	Salt Lake	....	....	2.00	July '20, Q	.10
Daly-West	Boston	4½	3½	3	Oct. '20, Q	.25
Eagle & Blue Bell	Boston Curb	2⅛	2⅛	2⅛	Apr. '20, Q	.10
Electric Point	Spokane	....	....	*12	May '20, SA	.03
Fed. M. & S	N. Y	6	6	6	Jan. '09	1 50
Fed. M. & S. pf	N. Y.	28	27	28	Sept. '20, Q	1 75
Florence silver	Spokane	*16	*15	*16	Apr. '19,	01½
Grand Central	Salt Lake	....	....	*37½	June '20, K	.03
Iron Blossom	N. Y. Curb.	⅛	⅛	⅛	Apr. '20, Q	.02½
Judge M. & S	Salt Lake	3 50	3 50	3.50	Sept. '20, Q	12½
Marsh Mines	N. Y. Curb.	*10	*7	*8	....	....
Prince Consol	N. Y. Curb.	⅜	¼	¼	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*8	*7	*8	Feb. '19,	.01
Rex Con	N. Y. Curb.	*5	*4	*5	....	....
South Heela	Salt Lake	*61	*60	*60	Sept. '19, K	.15
Stand. S. L	N. Y. Curb.	⅜	⅛	⅛	Oct. '17,	.05
Tamarack-Custer	Spokane	2 00	2 00	2.00	Dec. '19, K	.05
Tintic Standard	Salt Lake	3.75	3.57½	3.57½	June '20, Q	.10
Wilbert Mining	N. Y. Curb.	*2½	*1½	*2	Nov. '17,	.01
NICKEL-COPPER						
Internat'l Nickel	N. Y	14½	13	13½	Mar. '19,	.50
Internat'l Nickel, pf	N. Y.	82½	82½	82½	Nov. '20, Q	1 50
QUICKSILVER						
New Idria	Boston.	1½	½	½	Jan. '19,	.25
TUNGSTEN						
Mojave Tungsten	Boston Curb	....	....	*5	....	....
VANADIUM						
Vanadium Corp	N. Y.	45	39½	39½	Oct. '20, Q	1.50
ASBESTOS						
Asbestos Corp	Montreal	86½	80	86	Oct. '20, Q	1 50
Asbestos Corp pf	Montreal	95½	92½	95	Oct. '20, Q	1 75
MINING, SMELTING AND REFINING						
Am. S. & R	N. Y	46⅜	42¼	42⅜	Sept. '20, Q	1.00
Am. S. & R. pf	N. Y	87	84½	84½	Dec. '20, Q	1 75
Am. Sm. pf. A	N. Y	72½	71	71	Oct. '20, Q	1 50
U. S. Sm. R. & M	N. Y.	42½	29½	31	Oct. '20, Q	1.50
U. S. S.R. & M. pf	Boston.	42	40	40	Oct. '20, Q	87½

*Cents per share. †Bid or asked. ‡Quotations missing. Q. Quarterly. SA, Semi-annually. BM, bi-monthly. K, Irregular. I. Initial. X, includes extra

CURRENT PRICES OF MATERIALS AND SUPPLIES

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	$3 55-4 50	6 22½	7 13	8 65	$5 20-6 5	4 57
No. 12	3 60-4 55	6 27½	7 18	8 70	5 25-6 20	4 62
No. 14	3 65-4 60	6 32½	7 23	8 75	5 30-6 25	4 67
No. 16	3.75-4 70	6.42½	7 28	8 85	5 40-6 35	4 77
Black:						
*Nos. 18 and 20	4 20-5 35	8 00	7 90	10 60	6 50-8 00	5 30
*Nos. 22 and 24	4 25-5 40	8 05	7 95	10 65	6 55-8 05	5 35
*No. 26	4 30-5 45	8 10	8 00	10 70	6 60-8 10	5 40
*No. 28	4 35-5 50	8 20	8.10	10.80	6 70-8 20	5 50
Galvanized:						
No. 10	4 70-6 00	8 70	8 60		8 00-8 25	5 75
No. 12	4 80-6 10	8.80	8 70	11 35	8 10-8 25	5 85
No. 14	4 80-6.10	8 80	8 70	11 35	8 10-8 35	5 85
Nos. 18 and 20	5 10-6 40	9.10	9 00	11 65	8 35-8 65	6 15
Nos. 22 and 24	5 25-6 55	9 25	9 15	11 80	8 50-8 80	6 30
*No. 26	5 40-6 70	9 40	9.30	11.95	8 65-8 95	6 45
*No. 28	5 70-7.00	9 70	9 60	12 25	8 95-9 25	6 75

* For painted corrugated sheets, add 30c. per 1,000 lb. for 5 to 28 gages, 25c. for 19 to 24 gages; for galvanized corrugated sheets, add 15c., all gages.

TRACK SUPPLIES—The following prices are base per 100 lb. f.o.b. Pittsburgh for carload lots, together with the warehouse prices at the places named.

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, $\frac{9}{16}$ in. and Larger	$4 00-4 25	$3 35	$3.40@$4 00	$5 47½	$7 75
Track bolts	6 00-6 50	4 35	4 60@ 5 00		8 75
Standard section angle bars	3.00-4 00	3 00	2 75@ 3 40	..	5 45

STRUCTURAL MATERIAL—The following are the base prices f.o.b. mill Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York 1 Year Ago	St. Louis	Chicago
Beams, 3 to 15 in	$2 45@$3 00	$3 80	$3 47	$3 67½	$3 97
Channels, 3 to 15 in	2 45@ 3 00	3 80	3 47	3 67½	3 97
Angles, 3 to 6 in., ¼ in. thick	2 45@ 3 00	3 80	3 47	3 67½	3 97
Tees, 3 in. and larger	2 45@ 3 75	3 85	3 52	3 72½	4 02
Plates	2 65@ 4 00	4 00	3 67	3 87½	4 17

STEEL SHEET PILING—The following price is base per 100 lb. f.o.b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$4 00@ $4 50	$4 00@ $5.00	$2 55

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	Warehouse: New York Current	New York One Yr. Ago	Chicago	St. Louis	San Francisco
¾ in. and larger	$4 50	$5 73	$4.72	$5 00	$5 82½	$7 05
CONE HEAD BOILER						
¾ in. and larger	$4 60	$7 10	$4 82	$5 10	$5 92½	$7 15
⅝ and $\frac{11}{16}$	4 75	7 25	4 97	5 25	83	7 40
½ and $\frac{9}{16}$	5 00	7.00	5 32	5 60	6 92½	7 60

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Hercules red strand, all constructions	20%
Patent flattened strand special and cast steel	20%
Patent flattened strand iron rope	5%
Plow steel round strand rope	30%
Special steel round strand rope	30%
Cast steel round strand rope	22½%
Iron strand and iron tiller	5%
Galvanized iron rigging and guy rope	+12%

Chicago,+10% on galvanized, 22½—2½%, off on bright.
Western and California Territory
20%, plow steel; 22½%, galv. iron rigging and guy rope.
Montana, Idaho and Arizona
15, plow steel, 27½, galv. iron rigging and guy rope.

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Denver	Chicago	St. Louis	Birmingham
Straight	$5 75	$8 15	$7 00	$7 00	$7 00
Assorted	5 85	8 40	7 15	7 15	7 15

BAR IRON AND STEEL—Per 100 lb. to large buyers at mill, Pittsburgh:
Iron bars .... $3 63 Steel bars $2 35

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	12@ 14c.	13c.	20c	14
Hollow	17@ 20c.	..	..	21

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card:

BUTT WELD

Inches	Steel Black	Steel Galv.	Inches	Iron Black	Iron Galv.
¾ to 3	54 to 57½	41½ to 44	[illegible]	15 to 5	+ [illegible] to 11
			[illegible]	19 to 9	[illegible] to 11
			¾ to 1½	24 to 34½	8 to 18
LAP WELD					
2	47 to 50½	34½ to 38	2	20½ to 28½	6 to 14
2½ to 6	50 to 53½	37½ to 41	2½ to 6	22½ to 30½	9 to 17
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
2 to 3	53 to 56½	40½ to 44	¾ to 1½	24½ to 34½	9½ to 19
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	45 to 48½	33½ to 37	2	21 to 2[illegible]	8 to 16
2½ to 4	48 to 51	33½ to 40	2½ to 4	23 to 31	11 to 31
4½ to 6	47 to 50	35 to 39	4½ to 6	22 to 30	10 to 18
7 to 8	43 to 4[illegible]	29 to 33	7 to 8	14 to 22	2 to 10
9 to 12	[illegible] to 41	24½ to 28	9 to 12	9 to 17	5 to 2[illegible]

STEEL—From warehouses at the places named the following discounts hold for steel pipe.

	Black New York	Black Cleveland	Black Chicago
¾ to 3 in. butt welded	38	39	54 [illegible] 40%
3½ to 6 in. lap welded	33	41	50 [illegible] 40

	Galvanized New York	Galvanized Cleveland	Galvanized Chicago
¾ to 3 in. butt welded	22	30	40 [illegible] 30%
3½ to 6 in. lap welded	18	26	37 [illegible] 27

Malleable fittings, Class B and C, from New York stock sell at list plus 23%.
Cast iron, standard sizes, net.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$1 25	$1 50	List	$2 25	$1 15	$1 00
Hot pressed hexagon	1 25	1 50	List	2 25	1 15	0 85
Cold punched square	1 25	1 50	List	2 25	1 15	1 00
Cold punched hexagon	1 25	1 50	List	2 25	1 15	1 00

Semi-finished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	40%	50
Cleveland	50	60-10

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
¾ in. by 4 in. and smaller	+10	30	20%
Larger and longer up to 1 in. by 30 in.	Net list	[illegible]	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:
For Wrought-iron washers:
New York ...... List Cleveland ...... $2 50 Chicago $1 90
For cast-iron washers the base price per 100 lb. is as follows:
New York ...... $7 00 Cleveland ...... $4 50 Chicago $5.50

CONSTRUCTION MATERIALS

PREPARED ROOFING—Standard grade rubbered surface, complete with nails and cement, costs per square as follows at [illegible]:

	New York 1-Ply	New York 2-Ply	New York 3-Ply	Chicago 1-Ply	Chicago 2-Ply	Chicago 3-Ply
No. 1 grade	[illegible]	$2 40	$2 80	$1 95	$2 [illegible]	$2 75
No. 2 grade	[illegible]	2 15	2 50	1 75	[illegible]	2 40

[illegible] in rolls of 108 sq.ft. [illegible] $3 50 per roll [illegible] $3 75 [illegible]
[illegible] $8 00 per square [illegible] $8 25 [illegible]

ROOFING MATERIALS—[illegible] f.o.b. New York.

[illegible] per roll	$3 [illegible]
[illegible]	2 25
[illegible] barrel [illegible]	[illegible] 0
[illegible] per [illegible]	1[illegible] (a)
[illegible] per [illegible]	12 00

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
[illegible]	$0 121	$0 [illegible] 17	$0 33 [illegible]
[illegible]	13	[illegible]75	30
[illegible]	10	175	
C[illegible]	125	2	

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20-Ft. and Under				12 x 12-in 20-Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$65 00	$65 00	$52 00	$58 00	$82 00	$68 00
Kansas City	51 00	51 25	51 25	51 25	60 00	51 25
Seattle		32 00	.....	.....	.....	32 00
New Orleans	38 00	.....	.....	.....	42 00	.....
Baltimore	70 00	.....	.....	.....	80 00	.....
Cincinnati	37 50	.....	.....	.....	45 00	.....
Montreal	87 00	87 00	70 00	85 00	79 00*	110 00
Los Angeles	.....	57 00	.....	.....	.....	59 00
Detroit	57 00	.....	.....	.....	67 25	67 25
Denver	.....	42 75	.....	.....	.....	42 75

	1-In. Rough, 10-In. x 16-Ft.—and under			2-In. T. and G. Cr. 10-In. x 16 Ft.	
	P.	Fir	Hemlock	P.	Fir
Boston	$62 00	$74 00	$47 00	$63 00	$76 00
Kansas City	102 00	106 50	106 50	113 00	112 75
Seattle	.....	37 50	.....	.....	38 50
New Orleans	65 00	.....	.....	40 00	.....
Baltimore (box)	5066 57 50	.....	.....	54@ 64	.....
Cincinnati	34 00	.....	.....	35 00	50 00
Montreal	80 00	80 00	70 00	85 00	85 00
Los Angeles	.....	58 00	.....	.....	.....
Detroit	43 00	.....	43 00	.....	44 00
Denver	.....	37 75	.....	.....	35 25

*Montreal—Up to 22 ft; over which, $3.00 per M. increase up to 30 ft.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	Denver	Chicago	San Francisco
Wire	$3 25	$5 40	$4 45	$6 45
Cut	....	5.90	8@11	8.95

PORTLAND CEMENT—These prices are for barrels in carload lots, *without bags.*

	Current	One Month Ago	One Year Ago
New York (delivered)	$3 80	$4 10	$2 30
Jersey City (delivered)	3 20	3 55	2 27
Chicago	2 35	2 35	2 00
Pittsburgh	2 42	2 42	2 05
Cleveland	2 73	2 73	2 32
Denver	3 25	3 75	3 12
Los Angeles	3 10	3 10	2 78
San Francisco	3.09	3.09	2 43

NOTE—Charge for bags is generally 25c. each, $1 per bbl.

NOTE—There has been a sharp decrease in the Middle West, which we will show next month.

LIME—Warehouse prices:

	Hydrated per Ton— Finished	Common	Lump per 200-lb. Barrel— Finished	Common
New York	$21 00	$20 00	3 80* at plant	$3 60*
Kansas City	27 20	26 20	2.50	2 40
Chicago	.....	.....	.....	1 65
St. Louis	27 00	21 00	.....	2.50
San Francisco	25 40	22 00	.....	2.25
Minneapolis	29.50	23.00	2 00†	1 85†
Denver	32.00	.....	1 05 (bu.)	....

NOTE—Refund of 10c. per barrel, with 25c. per ton off on hydrated.
*300-lb. barrels. †180-lb. barrels.

LINSEED OIL—These prices are per gallon:

	New York— Current	Year Ago	Chicago— Current	Year Ago
Raw per barrel (5 bbl. lots)	$0 90	$2 15	$0 97	$2 37
5-gal. cans	1 05	2 30	1 22	2 57
1-gal. cans	1.15	.....	....	....

WHITE AND RED LEADS—500-lb. lots sell as follows in cents per pound:

	Red— Current		One Year Ago		White— Current	One Year Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb kegs	14 25	15 75	13 00	14 50	14 25	13 00
25- and 50-lb. kegs	14 50	16 00	13 25	14 75	14 50	13 25
12½-lb. kegs	14 75	16 25	13 50	15 00	14 75	13 50
5-lb. cans	17 25	18 75	15 00	16 50	17 25	15 00
1-lb. cans	19.25	20 75	16.00	17.50	19 25	16 00

MINING AND MILLING SUPPLIES

HOSE—

	FIRE	50-Ft. Lengths
Underwriters' 2½ in		$0 75 per ft
Common, 2½-in		40c

	AIR		
	First Grade	Second Grade	Third Grade
¾-in. per ft	$0.50	$0 30	$0 25

STEAM — DISCOUNTS FROM LIST

First grade.....30% Second grade.....40% Third grade..... 50%

LEATHER BELTING—Present discounts from fair quantities (½ doz. rolls):

Light Grade	Medium Grade	Heavy Grade
30–10%	30	25%

RAWHIDE LACING—For cut, best grade, 35c., 2d grade, 40c. For laces in sides, 63c. per sq.ft.; 2d, 62c. For semi-tanned cut: 25c.; sides, 65c. per sq ft.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to $0.07 extra while for quantities amounting to less than 600 ft. there is an extra charge of $0.01. The number of feet per pound for the various sizes is as follows: ¼-in. 8 ft., ⅜ in., 6; ½-in., 4; ⅝-in., 2½-in., 2 ft. 10 in.; ¾-in., 2 ft. 4 in. Following is price per pound for ¾ in. and larger, in 1200-ft. coils:

New York	$0 27	Kansas City	$0.30½
Cincinnati	0 37	Seattle	0 28
Chicago	0 27½	St. Louis	0 26½
Minneapolis	0 27½	Denver	0 30
San Francisco	0 25	Los Angeles	0 28

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$1 00
Asbestos for high-pressure steam	2 00
Duck and rubber for piston packing	1.20
Flax, regular	1 20
Flax, waterproofed	1 70
Compressed asbestos sheet	1 00
Wire insertion asbestos sheet	1 50
Rubber sheet	50
Rubber sheet, wire insertion	.70
Rubber sheet, duck insertion	60
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1 50
Asbestos wick, ¼- and 1-lb. balls	1 10

RAILWAY TIES—For fair size orders the following prices per tie hold:

Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago—Plain	$2 00	$2 25
Chicago—Creosoted	2 25	2 50
San Francisco—Douglas fir, green	1 35	.96
San Francisco—Douglas fir, creosoted	2.50	1.92

Prices per 0 at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0 80	No. 1	$0 60
No. 2	90	No. 2	70
No. 3	1 00	No. 3	80
No. 4	1 25		

FLOTATION OILS—Prices of oils for flotation, in cents per gal. in bbls.:

	New York	Chicago— In. Bbl.	Carloads
Pure steam-distilled pine oil, sp.gr. 0 93-0 94	$1.75	$1 90	$1 85
Pure destructively distilled pine oil	1.65	1.90	1 85
Pine tar oil, sp.gr. 1 025-1 035	.48	.34	.32
Crude turpentine, sp.gr. 0 900-0 970	.70	1.30	1 17
Hardwood creosote, sp.gr. 0 96-0 99*	.35	....	....

*f.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

	New York— Current	One Year Ago	Cleveland	Chicago
White	11 00–15 50	13 00	15 00	11 00–14 00
Colored mixed	7 00 10 50	9 00–12 00	11.00	9.50–12 00

WIPING CLOTH—Jobbers' price per 1000 is as follows:

	13¾x13¾	13¼x13¼
Cleveland	$55 00	$65 00
Chicago	41 00	43 50

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin— 40%	60%	80%	Black Powder
New York		$0 3325	$0.3625	.....	$2 80
Kansas City	$0 2475	27	.30	.34	2 40
Seattle	18	205	225	.29½	2 60
Chicago	2175	2525	2975	.34	2.45
Minneapolis	2272	2476	2731	.....	2 90
St. Louis	25	285	315	.3575	2 60
Denver	2250	26	29	.3325	2 80
Los Angeles	22	27	31	.....	2 95
Atlanta	2575	2925	3225	.3650	2 55
Cincinnati	2275	2525	2725	.....	2 30
Montreal	30	32	37	.38	4 10

CHEMICALS

SODIUM CYANIDE—New York price is 22@30c. per lb.; Chicago, 30c.; St. Louis, 34c.; Birmingham, 45c.; Denver, 5 c.

SODIUM SULPHIDE—New York price per pound is 6½c.@7c. for concentrated; Chicago, 5c. for concentrated, 3c. for crystals. Denver price is 6c. for crystals. St. Louis, concentrated, 10 c., crystals, 11c. Concentrated comes in 500-lb. drums crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 12@13c. per lb.; Chicago, 12½c.

ALUMINUM DUST—Chicago price is $1 10 per lb.; Birmingham, $1 52.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points:

	Union 100-Lb. Drums	Cameo 100-Lb. Drums	Union Single 25-Lb. Drums
East of the Mississippi and north of Chattanooga	$6.25	$6.00	$1.56

In the other zones the prices are proportionate to the increase in freights.

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Volume 110 New York, December 25, 1920 *Number* 26

Lenine and Washington B. Vanderlip

THE mystery surrounding Washington B. Vanderlip, the reputed mining engineer who stirred London, on his passage from Petrograd to New York, by his triumphant announcement of having negotiated immense mining concessions in Siberia, has been somewhat cleared up by the reports of interviews with him printed in the New York dailies, and by our own exclusive interview published in our news columns of last week. It now becomes fairly easy to valuate Mr. Vanderlip, his financial achievements, and his possible political significance.

First impressions from the cables sent from London were that Mr. Vanderlip might be a four-flusher and a drawer of the long bow; and that his stories of hobnobbing with Lenine and Trotzky, and their having figuratively turned the Soviet government inside out to please him, might turn out to be imaginary or a fabrication. But no such denial comes from Russia. Apparently all happened exactly as Mr. Vanderlip says it did. He was cordially treated, and in a most friendly and intimate way, by Lenine and Trotzky; they staged for him carefully selected glimpses of Russian conditions, and imparted to him the "true" orderly and prosperous condition of Russia, and the lamblike and ambitionless purposes of the Russian rulers, in order that he might take the boat for America and enlighten our ignorance in those matters.

It is a most dramatic episode. We all know Lenine and Trotzky, from the time they were "Reds," the former active in various cities of the Continent and the latter in New York, till the present. We know their madness, their fanaticism, their matchless cleverness, their immense ignorance and stupidity, their facility in governing by the lash the Russian ex-serfs, and their smooth facility in slipping from an impracticable communistic government to an old-fashioned military autocracy like that to which their countrymen were accustomed, without losing their own power. So we have been chiefly curious to know about the American actor in the drama. The recent revelations show him to be sober and serious, a correspondence-school "mining engineer," and a scout of experience for mineral properties. He has seen much of the world; yet his record and interviews indicate that he is neither clever nor brilliant, but, indeed, straightforward, ingenuous, and simple minded.

With all the makeshifts of changing forms of government in Russia, the colossal economic blunders of the upstart dictators have reduced that country to an industrial desert and to absolute want. The loss of all those advantages which mark civilization has been unbelievably rapid. Russia's railroads are all but gone; her cities half abandoned; her factories mainly closed; her industrial production is a mere shadow. Without assistance and new supplies produced under the "capitalistic" system of other countries Russia cannot expect to long withstand a complete collapse, and a relapse into a state of anarchy.

There are two ways for the Jolly Roger pirates to obtain the necessary plunder from abroad—by conquest or by trade. The former has been successfully prosecuted, and the spoils derived from Trotzky's many victorious campaigns have kept his vast army in those supplies which Russia can no longer produce. Had the Polish campaign finally resulted in the annihilation of Poland, as at one time seemed probable, we should have heard nothing from Petrograd concerning a resumption of trade or concessions to "capitalism." From Petrograd at that time came insolent proclamations of Russia's intention to conquer the world, including America. With Poland in Russia's hands, Germany would have revolted from the Allied terms, and Russia could have pushed forward on all her frontiers. As it is, she is resting very briefly on her arms for a new campaign against Poland in the spring, after having disposed of all her other armed enemies.

Meanwhile Russia needs further supplies, military and civil: someone must furnish her the sinews of existence and war which she has lost the power to provide for herself. With France she can do nothing. France knows clearly that Russia is a menace as dangerous as Germany was, and is frankly on the defensive. But with Russian secret agents and troops invading Asia throughout the Continent, expelling the British from Baku and threatening Mesopotamia and India, and with England's internal political and industrial troubles, Lenine sees an opportunity to force a resumption of trade with England, and so replenish his supplies. This looks expedient, even necessary, to Lloyd George, but he is bargaining hard to make the best terms he can for England. He is not going to come into close quarters with the "bear that walks like a man" without the proper safeguards.

Negotiations drag. At this time along comes the honest Mr. Washington B. Vanderlip, not a brilliant financier like the other Vanderlip, but a plain and ordinary American concession-hound. The astute (yet not sufficiently astute) Lenine, considers him attentively, as to whether he can use him. Possibly, he thinks, he can. The name suggests financial standing and influence. Lenine's political wisdom is Machiavellian; he exists, as Abdul Hamid did in Turkey, by studying the jealousies of other nations and preventing them from working together. Americans, he reflects, like the British, the French, the Germans, and the rest, are a greedy and stupid race: he does not know how much will buy them, but they can be bought. Anyhow, it will stampede Lloyd George if he thinks that the United States is going to beat England to the exploitation of Russia; so he puts one of his biggest worms on the hook. He courts the simple-minded Mr. Vanderlip, and gives him, not a

paltry concession of the ordinary variety, but a monopoly of coal, oil, and fisheries for an empire—Eastern Siberia and Kamchatka! Only, Mr. Vanderlip, you must reopen trade between Soviet Russia and the United States, which you can easily do with your Mr. Harding, now that Mr. Wilson's star has set. Explain to Americans how much money they can make by trading with Russia! And you, yourself, shall in addition have the handling of millions of dollars' worth of orders from Russia for American goods, and in these vast transactions you can let as much stick to your fingers as you think best!

Small wonder Mr. Washington B. Vanderlip's imagination was inflamed, and his hat band became uncomfortable for his temples. The spectacle (which Mr. Vanderlip reports) of Vanderlip in all seriousness reviewing in person a detachment of the Russian army is one worthy of being perpetuated in some masterpiece of painting.

So Vanderlip is sent, glorified and expansive, to America. He tarries just long enough in London to inform the world of what he has done, as Lenine had planned. Lloyd George, he states, telephoned him for an interview, but he could not bother, as he had to catch his boat. Now that he is in America, it will be an easy matter to make the necessary little arrangements with Mr. Harding, preparatory to entering in upon his commercial empire.

There is just one difficulty, or maybe there are two or three troubles, with Mr. Vanderlip's concession. It is big enough, to be sure, and rich enough. No fault to find with that. But it is not held at present by Soviet Russia nor even by the shadowy Siberian Republic, which is vaguely supposed to be independent of Soviet Russia: it is dominated by Japan. So the little detail comes in that Mr. Harding must take it away from Japan. Of course, any intimation to that effect would mean a bitter-end war between the United States and Japan (and we would not blame her), but that is a trifling detail.

Another detail is that many large and well-conducted British mining enterprises in Siberia have been confiscated by the Soviet government, and many of the officials held in prison, as hostages; and in this situation Lenine turns over the commercial empire, with all old concessions wiped out, to the United States. Of course, that means not only the necessity of the United States twisting the British lion's tail, but of cutting it off; but your friend Mr. Harding would not mind doing that to have the United States get $3,000,000,000 worth of orders! What would a war, or at least a bitter estrangement, between England and America signify, if you beat England to trading with our vast and rich country, Mr. Vanderlip? And remember, you get the concession.

We are vastly diverted by this really stupendous tragedy-farce; but we must give the verdict that Lenine is crafty but crude; and that Vanderlip is an unconscious pawn bedecked by Lenine in the tinsel and hardware of a potentate. We are relieved to know that Mr. Vanderlip is only a correspondence-school mining engineer, as he apparently is of the correspondence-school variety of world-politician; and we suggest to Mr. Lenine that he send for Mr. Hoover next time he wants to talk concession, if he wants to run up against a real mining engineer, whom we will recommend to him for an examination and a report.

Two Methods of Increasing Our Exports

THE copper and zinc industries in this country will not flourish until the European demand shows considerable improvement. This will not happen until either money is furnished by us, or Europe can ship goods to this country to pay for the metal which we export. The first solution of the problem has recently been suggested by Mr. Hoover, and he recommends that American capital be invested largely and permanently in European enterprises, especially in undeveloped fields. "If we are going to maintain the productivity of the United States," he told Mr. Harding, "there has got to be a readjustment, and we have got to put our excess capital into industries abroad. To enter this foreign field successfully there must be a defined Government policy for the protection of American individuals and interests abroad."

The alternative, of course, is, as mentioned above, the importation of European products, and this might mean the closing of American factories if sufficient imports arrived to balance entirely the export trade which we would like to have. Investment in foreign securities would seem to be the logical thing for capitalists in this country to do under the circumstances. Still, there is bound to be an effort in some business quarters to prevent the new administration from imposing any tariffs so high as to be prohibitive. Some of the firmly intrenched business interests, such as the automobile, cash register, and typewriter industries, have a world-wide market. They have little to fear from a low tariff, and much to gain, for the money which foreign interests obtain by exporting their products to this country makes those foreigners more able to buy the products which we export. If the tariff is low enough to allow large imports we would be pretty sure, normally, to have a big export business also.

We anticipate some interesting arguments when the new Congress comes to the tariff question. Big business will certainly not be unqualifiedly in favor of a stone-wall tariff, as has been the case to a large extent in the past. As Mr. Hoover has pointed out, we could have a good export business merely if we would invest enough money abroad, but we are not used to doing this, and it will take time to educate the investing public. Moreover, before we would be fully justified in doing this, we must have the safeguards which he proposes, and these can be provided only by the Government.

The Divining Rod From Germany

THE *Iron Age*, that highly respectable and reliable journal of the iron and steel industry, printed in its issue of Dec. 9 an article by Herman A. Holz, entitled "New Process for Locating Mineral Deposits," with the subheadings "The Divining Rod Made Efficient by a German Invention," "Remarkable Results," "Prospecting Revolutionized."

Mr. Holz is a maker of instruments of precision, such as metallurgical microscopes and the like, in New York. Therefore, we read with interest his announcement that "practical means have been developed to a high state of perfection for definitely locating mineral deposits—solid, liquid, and gaseous—in the earth, from above ground; for accurately determining the position, depth, width, thickness of each deposit, and for differentiating between the various materials forming the deposit."

Certainly there is nothing further to be wished in

these specifications! Mr. Holz further observes that "if the apparatus is adjusted for lead, it is actuated only by lead; if set for oil, it is acted upon only by oil. The apparatus can be adjusted for practically all useful materials found in the earth, such as all ores, salts (potash, etc.), coal, sulphur, asbestos, oil, natural gas, various clays, precious stones, (diamonds, etc.), mineral water, spring water, etc."

Again, there is nothing lacking in the specifications for a complete and reliable finder. Mr. Holz does not mention whiskey, hidden treasure, and buried evidence of crime, but there is no doubt whatever that this infallible little scout would nose them out, as capably as do the experts in those lines whose letters to us announcing their gifts we have from time to time published. In these purely American cases the gift was psychical: but the German invention is a tangible one, and we infer that anybody can use it who has the price to pay for it.

Mr. Holz states that some of the rays given off from mineral deposits are detectable "at a distance of fifty miles from the deposit, indicating its presence and general direction already from such a large distance." The writer himself has tested the instrument, and located in Germany a large lead-zinc-silver field "right near the American occupied territory."

Mr. Holz is not at all unconscious of the importance of his announcement of this discovery, which seems, according to him, to be well known in Europe, although the enlightenment of America as to what was going on abroad was delayed till Mr. Holz took the steamer to return to New York, bringing us the news from the centers of civilization.

"It is hardly necessary," he says, "to dwell upon the tremendous value of this invention; it is bound to revolutionize mining methods." Quite so; but go on, Mr. Holz. "It will reduce the speculative element in mining and drilling operations to a minimum; it will render great help to geologists in valuation reports, in laying out extensions to shafts(!), in relocating ore veins which have shifted in the earth, and in profitable exploration of mineral fields consisting of discontinuous orebodies. It will increase efficiency in mining all around. There is no more need of wildcat drilling for oil; the indications of the process are accurate to a depth of 7,000 ft." Yes, indeed: and it will do still more. It will revolutionize industry and the history of the world, incidentally putting out of business the mining geologist and the drill man.

Mr. Holz offered a similar manuscript to us, but we have hesitated to publish it. We come from Missouri, not Germany; and though we have great scientific credulity, we are skeptical of anything that comes from Germany at the present, whether it be marks or divining rods. We have learned to look at both sides of a German article, bite it, then decline to accept it. We understand that none of these machines have arrived in the country as yet: the way is evidently being paved for them, or possibly for the stock of the company that manufactures them. But if the inventor has one of these machines, he would be mad to sell it or divulge the secret, for his is the situation of the man who can turn base metal into gold. He has only to guard his secret, and go around gathering unto himself the vast mineral wealth of the globe. The offering for sale of a machine or "rod," or the offer of stock in the enterprise, will demonstrate the statements of Mr. Holz as at least exaggerated, and probably absolutely unfounded.

Mr. Holz has one chance in ten million, perhaps, of making good, but there is a sickening probability that he has joined the ever present army of dreamers that cannot produce.

Position of Domestic Silver Producers

THE present price situation in silver is a subject of serious concern to the domestic silver producer, even though he is temporarily in a protected position through the operation of the Pittman Act. Just what the policy of the domestic producer should be under present conditions could be determined with more or less accuracy were the trend of the world silver market known. Are present prices going to continue for several years or not? Is the present low price due to sympathetic reaction downward following the sagging in prices of copper, lead, and zinc? Undoubtedly to some extent, we would say with reference to the second question; but the first question is dependent upon conditions so far in the future as to defy anything more than speculation.

For the immediate future, C. W. Handy, at the last meeting of the New York section of the A. I. M. E., said that there was not any great strength to the silver market. Without much doubt silver prices will move in accordance with supply and demand. Before the war period and for a number of years silver prices were low. It should therefore be reasonable to expect that with an approximate return to normal economic conditions silver would be in much the same position as prevailed before the war. There would, however, be this difference: The several years of curtailed copper production will result in a definite decrease in the supply of silver produced from the treatment of certain copper ores. There will also be less silver produced from the reduction in the quantity of silver-lead ores. New producers of silver are not numerous. Mexico at present is curtailing the operation of silver mines, owing to the existing low price of silver. It would therefore appear certain that the supply of silver this year and next would be less than formerly. Future prices, other things being equal, should be higher than those prevailing before the war. We are inclined to be cheerful about the resumption of the world's industry after the prevailing deflation has run its course. We feel that industry will be accelerated and commodity prices will advance from the ebb prices which are undoubtedly upon us at this time and for probably some time in the future.

Viewing the position of the domestic silver producer more in detail, it appears to us that somewhat lower supply costs and increased efficiency of operations are in course and will become more pronounced as time goes on. The per-ounce cost of silver production should show a steady decline with a constancy in grade of ore and size of orebody. Looked at in another way, a greater tonnage of low-grade ore should become available for mining. It is a well-recognized principle in mining that the rate of production should be kept at a maximum in order to reduce unit costs to a minimum. Needless to say, a minimum unit cost would mean a maximum return on the basis of the fixed price now existing. It would therefore appear to us that domestic silver producers other than those who are producing silver as a by-product of some other metal should attain a production rate that would insure this minimum cost of production as speedily as possible. There should also be persistent effort to secure the maximum operating and administrative efficiency.

WHAT OTHERS THINK

The Causes of Gold-Mining Depression

In the Dec. 4 issue of *Engineering and Mining Journal*, referring to the Gold Conference, you write:

"Many of the speakers recited the decay of gold mining in various districts . . . without analyzing how far this decay was due to the exhaustion of ore reserves by mining."

This is correct, but is it to the point?

Excepting in special cases, it is not possible to ascertain how far lessened production is due to exhaustion of reserves. But such exhaustion of reserves, when it is uniformly apparent throughout an entire state which includes many districts in which conditions are radically dissimilar, is itself due, largely if not entirely, to depreciation in value of product. I have elsewhere shown conclusively that when mines are faced by increasing costs the management is compelled to try to keep expenses below receipts by lessened outlay in development, direct and indirect, which inevitably tends to exhaust the mine. It can stave off the evil day for a few years, but it is done at the expense of the ultimate yield. Moreover, the same conditions which eliminate the profit and reduce the life of an operating mine discourage prospecting and exploration in search of new orebodies, so that none are found to take the place of those which are exhausted.

It may be true, in a state whose production comes from relatively few mines, and where the output has fluctuated greatly, that reduced output is due to the exhaustion of ore reserves. But in the case of a state like Colorado, where the gold production for the ten years ending in 1916 was so nearly uniform, and where the number of mines and districts contributing to the total is so great, it is fair to assume that the falling off in production was not due to exhaustion of the reserves excepting in so far as such exhaustion was itself caused by the reduced value of the product.

Nor do I think you are justified in saying:

"That any call was ever made that influenced the policy of gold producers in the least is not true," or that reference to such an influence is necessarily "bunk" or "unconscious hypocrisy." Let me quote the actual words of the Secretary of the Treasury in 1918:

"At no time has this country so much required the largest possible production of gold as at present. Next to food and ammunition, gold is one of the most needed war essentials. . . . The man or the community that maintains or increases its production of gold in the face of difficulties and discouragement is performing a patriotic service which deserves recognition no less than the more obvious but not less useful services that are more in the public eye."

I think the *Journal* forgets. Perhaps gold producers did not take these words quite literally; and perhaps no man or organization deliberately faced ruin in producing gold solely for patriotic motives. No doubt other reasons, such as unwillingness to see their organizations scattered and their properties damaged by abandonment, influenced them to an equal or even to a greater degree. But to say that gold producers (equally with producers of chrome, manganese, or other "war minerals") were not influenced "in the least" by such authoritative appeals to their patriotism is to make a statement which itself, to my knowledge, is more than the truth, and is hardly worthy of the *Journal*.

GEORGE E. COLLINS.

Denver, Col.

In Opposition to the McFadden Bill

The McFadden Bill, as I understand it, is intended to impose a tax, or excise, on such gold as may be used in the arts; and, from the money so raised, a bonus of 50c. per pennyweight of gold produced is to be paid to the miners or producers of that metal. Of course, any sums so collected from the makers of jewelry and other commercial consumers of the metal would be paid back to such makers by the purchasers of such manufactures of gold. It is my firm belief that a bill of that sort would be a form of class legislation, and, therefore, it would be harmful.

Both gold and silver are commodities, as well as are copper, iron, wheat, wool, cotton, and other commercial products. And if a bonus is paid to the producers of either of them, the producers of all the other commodities may rightfully demand similar bonuses for their products; all of which means taxation beyond the ability of the public to pay. This, in itself, should be sufficient to justify the condemnation of any such legislation as is proposed in the McFadden Bill.

Again, a special committee, consisting of Messrs. Albert Strauss, Edwin F. Gay, Raymond T. Baker (Director of the Mint), Emmet D. Boyle (Governor of Nevada, and, at first, an ardent supporter of the bonus proposition), and Pope Yeatman, was appointed by ex-Secretary McAdoo on Nov. 2, 1918, "to investigate the present conditions in the gold-mining industry and study the problem carefully and thoroughly with the view of definitely ascertaining all the difficulties confronting gold production and submitting suggestions of sane and sound methods of relief." Surely the committee's instructions were sufficiently comprehensive.

This committee's report is dated Feb. 11, 1919, and it seems unnecessary to quote from it any more than the two sentences following:

(a.) "Under these circumstances there is, in our opinion, no special need for artificial stimulation of gold production; and

(b.) "It is therefore the judgment of this committee that no steps should be taken by the Government to stimulate or promote the production of gold."

As is noted above, Governor Boyle at first was an ardent advocate of bonus legislation in some form; consequently, he must have had the error of his ways pointed out to him very convincingly before he signed the report of the special committee.

And now comes the recent meeting of the American Mining Congress, at Denver. One of those present at the National Gold Conference of the American Mining Congress is reported to have proposed the following (threatening?) resolution:

"Resolved, That the directors of the American Mining Congress immediately take such measures as may be necessary, in the event of the failure of passage through the forthcoming short session of Congress of the McFadden Bill, to organize the gold producers of the United States and* Alaska for the following purposes:

"A. To deposit the gold produced by them in the mint and to demand coined gold in exchange therefor."

It doesn't seem necessary to quote any more of the proposed resolution because his first "purpose," "A," seems to indicate that he was ignorant of the fact that what he proposed is simply free coinage of gold, and free coinage of gold is in existence now in these United States and has been for many years!

However, it is greatly to be regretted that persons like the foregoing "proposer" do not take the trouble to study the subject sufficiently to inform themselves correctly regarding present conditions, before advocating measures for relief.

There are some persons now living who recall the great controversies regarding free silver and bimetallism of nearly a generation ago. As measured in gold, the commercial value of silver had fallen considerably, and the producers of the latter metal sent up a howl so loud and far-reaching that, compared with it, the present cry of the gold producers is but as a plaintive bleat! Many kinds of artificial stimulation were proposed, and two or three of them, which seemed sound and feasible to the free-silverites, were tried by the Government, but without success. The reason they failed in their object was because such acts of Congress were not in conformity with Nature's laws.

Let me quote from one who wrote about free silver and bimetallism in those days, December, 1891:

"Silver, in 1874, fell to $1.27 an ounce. In 1875, to $1.24 an ounce. In 1876, to $1.15. *Then, and not until then,* began to be heard the cry of the "Conspiracy of 1873.'" [It might be said in explanation that the free-silverites and the bimetallists claimed that silver had been demonetized secretly by a Congressional clique; and they termed the act "The Crime of '73."] "Silver has been struck down, but not by the bill of 1873, nor by any bill concocted by man. The hand which struck down silver is the hand which will strike all of us down in time, the hand which nothing can withstand, the irresistible hand of Nature. Silver has been struck down by one of the natural forces, by the great law of demand and supply."

And yet the writer of the lines just quoted professed to be a bimetallist! But he could have been a bimetallist only because he failed to understand, to realize, how absolutely impossible it is, because of the natural forces to which he referred, to so regulate the world's output of both gold and silver that they will always be produced in exactly the same relative quantities, and, at the same time, to maintain the demand for them in precisely the same relative proportions.

It seems almost unnecessary to add that the late war prevented so very much production and caused such an immense quantity of destruction that the world's business is still greatly demoralized. Gradually, however, it is reshaping itself, and, when it becomes more nearly normal and deflation will have been brought about, gold will come into its own.

To find ample proof of the fact that the exchange value or purchasing power of gold is enhancing, one has only to note in the daily press the fall in prices of commodities and sundry investment securities, as well as the opposition by labor organizations to wage reductions.

But the law of supply and demand is reasserting itself, and unless another great calamity again brings about unnatural conditions, causing the world once more to resort to artificial methods for carrying on its trade, gold will sooner or later resume its normal functioning with reference to general exchange.

New York City. W. DEL. BENEDICT.

*Why does he segregate Alaska from the United States?

When Is a Lode Not a Lode?

In your editorial comment on the Bingham decision, in the Nov. 13 issue, you ridicule the contention of the Utah Consolidated Mining Co. that either or both of the limestone beds carrying the ores in dispute are broad lodes. I doubt very much if your correspondent furnished you a copy of Judge Johnson's decision, or you would have noted that at least one of the beds, the Highland Boy-Jordan limestone, has been, to a certain extent, judicially designated a lode. In the Lawson case, the Supreme Court of the United States declared the entire thickness of the Jordan limestone to be a lode. Judge Johnson, in the Leadville case, finds that the Jordan and Highland Boy limestones are "part of the same bed," meaning along the strike, "probably mineralized from the same source," and that, up to a certain dike, the Highland Boy limestone constitutes a lode.

The real issue in the Leadville case became whether or not the lode extended as far west as the Leadville country, in which area the ore occurs in the same limestone bed. Mr. H. V. Winchell, in his testimony for the Utah Consolidated, based his definition of a lode, to which you take exception, upon the long-established precedent that any area is to be legally judged to be mineral in character if the miner will expend his time and energy in prospecting it in the expectation of finding ore therein. And you will note that Mr. Winchell has limited this in his definition, to an "experienced miner, or prospector of judgment."

If the Highland Boy-Jordan limestone, 250 ft. thick, is a lode from "underlying quartzite to overlying quartzite," the thickness of the Yampa limestone, 280 ft., would not, of itself, bar the limestone from coming under the same classification. A. E. ROBINSON.

Tooele, Utah.

Should Claim Assessments Be Postponed?

If there is anything you can do to prevent the passage of the bill to suspend the annual assessment work on mining claims I wish you would do it. I was employed by a copper company until the first of the month. Yesterday I met an acquaintance on the street, and I said, "Have you done your assessment work yet?" Said he, "No, I cannot get men to do it; miners are so scarce." So I said, "I will go to work for you, and I will get you all the men you need." "Well," said he, "I will wait. I think they will pass a bill so we won't have to do the annual work, and then I can go to California on that money and spend the winter there."

Now, this is just what has killed mining and prospecting. The claim hogs hold the country and won't develop and won't let any one else have the ground. The country is full of unemployed miners. Kindly do the best you can to save the mining and prospecting game.

WESTERN MINER.

Moving Pictures in the Mining Industry

The article, "Moving Pictures in the Mining Industry," which appeared in *Engineering and Mining Journal* of Dec. 4, is very timely. It could be broadened to include what the infernal Germans did in promoting sales of mining and electrical machinery before the war. I have seen beautiful films of the Krupps plant, with plentiful pictures of "modern mining machinery" which would not compare with the products of any Colorado foundry for strength and practicability. The films were supplied gratis to the moving-picture man. If it is remembered that in Santiago, Chile, practically every man of financial importance is a shareholder and director in a tin mine, the possibilities of this film propaganda will be appreciated. No films were available from the Colorado Iron Works, Chalmers & Williams, Hardinge or Allis-Chalmers, and the latter alone made twenty times as much mining machinery as Krupp, and it was four times as good. Even Humbolt, in Germany, sent out films.

Of course Siemens-Shuckert had frequent new films; and the General Electric and Westinghouse, both of which make *reasonably* good and *fairly* large quantities of electrical machinery, were noticeable by their absence.

Recently I have sent out a number of moving-picture machines to mines situated away from towns. The equipment with spares costs about $600. It seems like a stiff price to pay for entertaining such rough-necks as miners and mining engineers, but let us examine the matter in a little detail.

One of the mines is a day's journey from the railroad. It employs 2,000 men, mainly Bolivians, with a sprinkling of Chileans and a score or more Europeans. As there are no theatres, churches, or ball games, the majority pass evenings and holidays in the usual pastimes of mining camps—wine, women, and noise. Of course they *should* all be taking correspondence courses in order to become mining engineers, but they do not. Even booze and women get monotonous (especially the same women), and this accounts for much of the exasperating labor turnover.

In such a camp, a moving-picture machine is a big asset for the company. An admission is charged, which more than pays expenses of operative and film rent, and the hall is packed every night. The show closes early, so the men will get plenty of sleep and be on the job in the morning, and this is far better than allowing them to fall into the hands of designing saloon keepers, gamblers, and beautiful (?) women. It has proved possible, as a result of providing amusement for odd moments during the day and evening, to persuade the laborers to save part of their wages and even to invest it in shares of the company.

I know of one company which has such a machine. The company is planning a large new mill for tin concentration which will cost about £100,000. If I were a manufacturer of concentration tables, I certainly would send that company a film of my wonderful tables in operation. The miners might not get much from the film, but the manager, the mill foremen, and the shift men would immediately feel acquainted with my table.

The enterprising salesman of the enterprising manager of the enterprising company making a certain shovel once had the nerve to bring two shovels to my office and test them before my eyes on my own nice Wilton rugs. I must not tell you the name of the shovel, because advertisements are not allowed in these columns, but you all know the color of the edge of the shovels.

Well, the test consisted of using two different makes of shovels alternately as axes, chopping each other on the edges. The result was a revelation of steel quality. Whenever I see two shovels near each other now, I want to chop them together. Once, in France, this salesman's detachment was digging a trench in frantic haste when it occurred to him to investigate the quality of the shovels in his neighborhood. The development of the idea made a fine story, which the captain tells to this day. If this test and the two other tests invented by this same manager were filmed and loaned to the mining companies, the market not only for their shovels but for all shovels would be greatly increased.

Not long ago, a film was made showing underground and surface coal-handling equipment for the special education of French engineers, in the hope that their increased knowledge would assist them in choosing the best mining equipment. They got the education, but the resulting business barely paid for the picture. This was not the fault of the pictures, the idea, or the Frenchmen, but the blame lies with the Germans, who have deceived the poor French nation into thinking that they (the Germans) will repair all the damage done in the coal fields, at German expense with French machinery.

No machine films better than a pneumatic drill. A few feet of film cut out here and there, but judiciously, turns an ordinary drill into a wonder and gains for it a rapturous round of applause from the miners.

Smoke precipitations would make a spectacular film and would be of interest to smelters everywhere, but the smoke people are so very very scientific and so very very uncommercial that the suggestion simply wastes paper.

Hoisting, track, and standing rope is hard to sell because so many rope makers make good rope. A film showing a modern rope walk would surely gain friends and business and would differentiate one manufacturer from all the others.

The Holt company is going to have a fine opportunity this winter to film about fifty of its tractors which the City of New York has purchased to push snow.

All such films should make the circuit of all the mining towns of the world. A little patient investigation on the part of the *Engineering and Mining Journal* would provide a list of every mining-town picture machine. The *Journal's* subscribers would be glad to send the addresses, and these could be supplied to your advertisers as a Christmas present without annoying your advertising department. MARK R. LAMB.

New York City.

About 120 Grams of Radium Produced

Since Mme. Curie discovered radium, in 1898, the total amount of radium that has been produced is about 120 grams, and supplies are steadily increasing, according to the *Journal of the Röntgen Society*. The total output of the Standard Chemical Co. (Pittsburgh Pa.) up to 1920 is reported to be 50 grams of radium element, and although its present output is only 18 grams per year, the company is said to be preparing to produce 50 grams of radium element yearly, should the demand justify it. Since 1913 three new radium factories have been started in America and several in France, where an average of 18 grams of radium per annum was produced during the war.

THE COPPER QUEEN SMELTER OF THE PHELPS DODGE CORPORATION, DOUGLAS, ARIZ.

The Power of Copper

By Graham John Mitchell
Written for *Engineering and Mining Journal*

A FEW YEARS AGO the average citizen was likely to derive his conception of the value of copper mainly from the stock-market reports, the metal itself as a commodity meaning little to him. Then, with the coming of the war, he learned to think of copper in its use as a great destructive mineral, through lack of which Germany was greatly handicapped in her military campaign, whereas the United States had enormous supplies and large producing mines which could continually replenish her supply. But now, in the days of reconstruction, he must readjust his point of view and think of copper not in the light of its destructive uses but in its decidedly constructive significance. Practically all of the communities where it is mined have been established by the copper industry. Few of them would be in existence were it not for the mines around which they have been built.

Take, for example, the copper centers of Arizona, the state which leads in the production of this mineral. In 1919, Arizona produced 536,515,368 lb. of copper, which was 40.9 per cent of the total output in the entire United States for that year. If one were to attempt to picture the present mining centers of Arizona before the mines were discovered, the result would resemble the many familiar paintings of "The Arid Southwest" which adorn nearly all art museums. There would be a rattler devouring a jack rabbit, with a gila monster looking enviously on, and cacti and sage brush with stretches of desert waste would complete the picture. How different is the present-day panorama, with its modern cities and thriving communities built because of the copper mines!

No better single illustration of the effect of the copper industry in developing a district can be found than the city of Ajo, in southern Arizona. Eight years ago what is now a model town was a sand and sage brush covered flat, dotted here and there with occasional miners' cabins. Copper was mined at Ajo as early as 1854 by the Arizona Mining & Trading Co., which, however, could work merely the high-grade ore, as only such ore could stand the cost of transportation to the nearest point for shipment. After all the high-grade had been extracted, the mines were closed down, and as short a time ago as 1912 the old site of Ajo was practically deserted. To reach it one was forced to drive over a long, hot fifty-mile stretch of desert, the town of Gila being the nearest rail station.

An almost unbelievable transformation has been wrought during the last few years. Today a branch railroad runs directly to the town, and the visitor alights at a beautiful modern station. Ajo is a "company town" in the broadest sense of the word. It is laid out not merely to exploit the mines but on the theory that ideal working conditions and attractive surroundings do much to draw the highest type of workmen and to promote a spirit of harmony and satisfaction among them.

The general type of architecture of the company buildings is Spanish mission. There is a central park or plaza, with the stores and public buildings grouped around it. Farther back are the homes of the employees, and beyond are the "hills of copper," where steam shovels load the ore into cars which transport it to the extraction plant. Modern mining and metallurgical methods, backed by executive and engineering ability, have developed a system whereby the low-grade ore could be worked profitably, and, as a result, Ajo, one of the most unique copper-producing plants in the world, was built and a new and thriving community added to Arizona. The town and the New Cornelia Copper Co.'s mines stand as a tribute to the foresight and ability of Col. John C. Greenway, who was largely re-

sponsible for adding this new unit to the copper industry of the state.

A traveler over the El Paso & Southwestern R.R. from Chicago to California could pass through the diminutive station of Osburn, and, unless informed, would never suspect that eight miles north, nestled in the bottom of Mule Canyon, is the picturesque city of Bisbee, known throughout mining circles as one of the famous camps in the country. With it will always be associated the name of the late Dr. James Douglas, through whose efforts the Copper Queen Consolidated Mining Co. was developed. In later years this company became a part of the larger Phelps Dodge Corporation, which has taken a prominent part in Arizona's progress, under the leadership of Walter Douglas.

Millions of dollars are invested in Bisbee by Phelps Dodge and its sister producers, the Calumet & Arizona Mining Co. and the Denn-Shattuck Mining Co. These organizations have made possible a modern city in the heart of an otherwise desolate region. The El Paso & Southwestern R.R., from El Paso to Tucson, would never have been built were it not for the need of an outlet for the products of these mines. This road, which is surpassed by none from a standpoint of railroad construction, forms the present westernmost link in what will some day be a through rail system between Chicago and southern California.

A short distance east of Bisbee is Douglas, known in the southwest as the "Smelter City," chosen as the location of both the Copper Queen and Calumet & Arizona smelters, and it is around that branch of the copper industry that the city has grown. North to Miami are the Inspiration Consolidated and Miami properties, two

A VIEW OF MIAMI, ARIZ.

large low-grade copper mines. In this section of the state are also Ray Consolidated, at Ray, and the mines at Globe, both leading copper producers.

To the east of the Miami district are the Clifton-Morenci mines. Farther north at Jerome are the United Verde and United Verde Extension, the former having been developed by ex-Senator W. A. Clark and associates and the latter largely due to the efforts of James Douglas. These mines have, like those at Bisbee and Ajo, been the keystone in the growth of their respective communities.

The part copper has played in the development of Arizona has its parallel in various other states, such as Michigan, Montana, with its rich mines at Butte, and Utah, where are situated the famous Bingham Canyon deposits.

There is a thrill of romance about copper mining districts—the tales of early prospectors, of their successes and failures, and the final locating of the "pay-streak," the early boom days, and the mushroom growth of the camps. But always, with the history of each one of them, has been associated the name of some man with brains and vision, who, realizing the great significance of copper as a national resource, has builded both thoroughly and scientifically, not for the present alone, but with an eye to the future.

And so the story of copper is not that of the gold rush to Alaska, not the spectacular dash to be the first on the ground, but an even, steady growth, backed always

THE PLAZA AND SCHOOL AT AJO, ARIZ.

by a capable organization working with perseverance to build up a permanent industry.

The importance of copper has hardly yet been realized. Its possibilities are so great that they can scarcely be listed in so brief a presentation. Probably its most important work will be in connection with the increasing use of electrical power. No other agent has been found which can approach it as a suitable conductor of electricity, the motive power which will move the world during coming generations.

Because of the vital necessity of copper in world industry, the present depression in the copper industry can, at the most, be only temporary, and, after the period of readjustment, it is safe to predict that the demand for copper will be greater than ever before.

Bahia as a Mineral and Precious Stone Producer

Bahia, Brazil, is an important South American trade center, and is situated in a region rich in minerals and oil-shale deposits which have not as yet been developed. Diamonds and carbonados, monazite sand, manganese, and chrome ore are some of the minerals exploited and exported. Bahia is the only region in the world where the carbonados ("black" diamond) are found. They are harder than white diamonds, are used in diamond drills, and are worth almost as much as those of the finest white variety.

Exports of minerals to the United States in 1918 and 1919, according to Consul Thomas H. Bevan, follow:

	1918		1919	
	Quantity	Value	Quantity	Value
Chrome ore (tons)	13,200	$709,224	1,000	$56,719
Manganese (tons)	53,053	2,409,546	7,330	297,176
Bortz (carats)	738	9,232	375	2,026
Carbonados (carats)	10,752	475,505	10,859	530,170
Rough diamonds (carats)	10,366	318,525	10,684	471,181
Industrial diamonds (carats)	.....	.....	126	3 853
Tourmalines, etc. (carats)	.....	.....	133,475	8.599

A Mining Engineer in Honduras

Impressions of a Brief Visit—Country's Wealth, If Any, Not Readily Apparent—Transportation Facilities Poor and Population Scanty—Customs of Inhabitants Primitive—Native Dairy Hygiene Offers Hope of Progress

By Paul T. Bruhl
Written for *Engineering and Mining Journal*

PASSENGERS between New Orleans and Puerto Cortes are conveyed by steamers operated under the Honduran flag by the Cuyamel Fruit Co. Shortly before the tug which was to convey us upstream from the landing to the fuel-oil station arrived on the scene, a tanker, in avoiding a ferry, crashed into the steamer moored at a wharf just ahead of us. Considerable damage resulted.

Early Sunday morning we got under way, but an hour later engine trouble developed, which caused a short delay. The stretch of the Mississippi between New Orleans and the sea is 110 miles long and from three-quarters to one mile wide. The water was unusually high, and in some places, indeed, it seemed as if only a few buckets more would cause the river to inundate the adjoining lands. It is a curious sight to see houses along the levee standing below the river level so that one can look in at the upper windows.

The scenery is rather monotonous—vast flat fields or wide expanses of tangled undergrowth. Vessels ahead, following the sinuous course of the stream, present the optical illusion of seeming to be at a higher elevation.

At the lower pilot station, situated eighteen miles from the mouth, a change of pilots is made. At this point the channel narrows down to about 300 yards. A few miles out at sea one crosses a clean-cut line of demarkation between the muddy river water and the soiled green of the Gulf.

Early on Tuesday morning the first land was sighted. It was the Island of Contoy, off the low-lying mainland of Yucatan. On the evening of the following day we made Puerto Cortes, where after a perfunctory medical and customs examination we went to a hotel. The town partially encircles the bay and consists of bungalows on either side of the railroad track. The vegetation is tropical. The ground, marshy in places, is rendered beautiful at dusk by swarms of fireflies. The south side of the bay is bordered by fairly high well-wooded hills. The entrance to the hotel is given over to a bar, the sight of which to the newcomer from the United States is, as it were, a lifting of the veil which shrouds the past.

In the patio the chickens and turkeys lead their precarious lives, and their early morning bickerings make an alarm clock unnecessary—at first, at any rate.

TEGUCIGALPA, CAPITAL OF HONDURAS

I left Puerto Cortes in the Ferrocarril Nacional de Honduras, a line which I understand has been taken over by the fruit company. The track is not in the best condition at present, as the roadbed consists of tamped earth. It is said that formerly the passengers were obliged to wear spurs so as to secure a good grip under the seat when the train was in motion.

The boiler is wood fired. The engine made curious spasmodic spurts as if the engineer realized at intervals that he was not running on time and wished to remedy the situation.

We passed at first through banana plantations and by heavily wooded hills, but further along the vegetation became less dense and the foreground was dominated by the stately and beautiful native palm.

At San Pedro Sula, a thriving town of about 4,000 inhabitants, I changed trains for Potrerillos, the end of the line, thirty-five kilometers further on. Potrerillos is a typical village with a few whitewashed houses, either thatched or covered with home-made tiles; a place of no interest whatsoever to the passer by, and noticeable chiefly for the want of any distinguishing feature.

Al-Fresco Accommodations

Owing to a late start, due to the failure of the *mozo* to put in an appearance at daybreak, I stopped for the night at Rio Blanco, about twelve miles away, and obtained hospitality at the ferryman's very modest habitation. The yard was in full possession of an

intimate group of children, goats, monkeys, poultry, and pigs. I passed the night in a hammock slung out-of-doors, and the mosquitoes saw to it that my rest was broken and fitful. I rose at daybreak and paddled a canoe downstream in an endeavor to whet an appetite for the inevitable beans and tortillas. The river, which was in fact no wider than a brook, was overhung by trees, through the leafy branches of which the sunlight struggled with difficulty. It was too sombre to be

THE COW SPECIAL

entirely enjoyable, and I was glad to return to the breakfast that was now in course of preparation.

The kitchen stove was made of stone and clay, and as there was no chimney the smoke curled lazily to the roof, where, caught in little eddies, it was hurried into the outer air through the many crevices in the thatch. The beds were of the simplest design—one-inch poles laid lengthwise on crosspieces, with a mat inadequately serving the purpose of a mattress. Alongside the bed was a hammock cradle just a few inches above the floor. One could not help feeling sorry for the baby, exposed as it was to the inquisitive nose of every wandering pig.

I got away at 6 o'clock and traveled along a fairly good road, occasionally rocky, that made a gradual ascent to the small town of Santa Cruz. The hills at first appear to be a jumble of peaks, but gradually they straighten themselves out into some semblance of order, and one can trace out the various ranges. Some good cattle can be seen along the wayside, but owing to the dry season they seemed to be suffering from lack of nourishment.

After lunch I rode a further twenty miles over some very rough ground to the resting place for the day. In the early night a thunderstorm awakened the echoes of the surrounding hills and obliged me to sleep *en famille* with my hosts. One is, of course, in complete privacy when the light is turned off, but as there was no light at all, not even a splinter of pine or a guttering candle, the privacy one enjoyed might even be said to have exceeded 100 per cent!

HONDURAN LEAGUE A VARIABLE QUANTITY

The next day I reached Cuevas, distant about thirty-two miles. Here I may remark upon the elasticity of the Honduran league. The Irishman, we know, rejoiced that he was at least keeping up with the place. In Honduras at times one's objective actually seems to get away from one. It is a little discouraging to ride for an hour on a none-too-attractive mule only to find that the next village has increased its lead by a league or two. In Chile, the traveler on asking the distance to his destination is told "*Dos horas mas*," or "*Tres horas mas*." In Bolivia, the Indian usually replies "*Quien sabe*." Both terms are preferable to the Honduran "*legua*," which is too much subject to purely local interpretation.

Some of these *leguas* unraveled their uncertain length through woods redolent with the scent of pine. The country, although still sparsely inhabited, appeared to have more frequent patches under cultivation with sugarcane and corn. There was, however, no organized work, and as the people cannot raise with certainty more than suffices for their personal needs, their existence must be one in which ready money plays but an inconspicuous part.

Cuevas, a village, is the proud possessor of a church, a whitewashed structure with an impossible pair of plaster angels reclining over the main entrance. Cows are used for "snaking" logs. There is a brotherhood existing between the men who snake logs. My Spanish is not fluent, but I am positive that the sentiments that the man was endeavoring to express were identical with those held by the man I met last summer in the pine woods of Georgia.

DR. DARLINGTON'S INFLUENCE FAR FROM HOME

In the evening I saw a woman sit down to milk a cow. She was about to begin without any of the preparations considered necessary by the Board of Health, but at the last moment, her soul nudged, perhaps, by the spirit of some hygienic ancestor, she wiped the udders—with the tuft at the end of the animal's tail! She did not do it furtively but with an

MILL OF NEW YORK & HONDURAS ROSARIO MINING CO.

earnest deliberation. Yet we say that half a loaf is better than no bread.

The next day, an eight-hour ride along a trail that clung to the rocky edge of precipices or followed the grassy banks of a stream brought me to the town of Comayagua, which years ago enjoyed the distinction of being the capital. It is not a large town nor a busy one, and the inhabitants spend, I think, a few moments

of each day in wondering why the seat of government was removed to Tegucigalpa. There are two large churches belonging to different ecclesiastical orders. The cathedral fronting the plaza is inclosed by a fence made out of the barrels of old Spanish muskets. The high altar within is prettily, if a little garishly, decorated. At the other church there used to be a valuable Murillo. Its genuineness was unfortunately recognized by some unprincipled collector.

Wayside Crosses Frequent

I left Comayagua by automobile at 1 o'clock the following afternoon, and followed the valley till we came to the range that had to be crossed. The road winds up the mountain side through pine woods where the air is cool and invigorating. All the bridges, a few of them of stone, were in good condition and well cared for. One could not but be impressed by the number of crosses, each marking the resting place of the party of the second part in some wayside difference of opinion. I am informed, however, that every cross does not necessarily indicate a violent end—some of the departed may have met death as the result of a perfectly legitimate illness. However, that may be, I think that the custom of erecting these crosses creates an erroneous opinion in the minds of foreigners as to the degree of culture of the natives. A similar custom adopted in some other towns I know would cause a radical change in the scenery.

The men in Honduras go about armed either with a revolver or with a machete. I cannot see the need for so lavish a display of artillery, but I am told it is advisable, inasmuch as it discourages the acquisitive tendencies of a certain class. The high cost of marriage fees causes the marriage ceremony to be dispensed with in many instances, so that mutual consent is regarded as an adequate substitute for the blessing of the Church.

From what I have seen of Honduras it is not as yet in fact a rich country, whatever its potentialities may be. The great lack of transport facilities and the paucity of numbers of the inhabitants are two obstacles in the way of financial progress. I am indebted for the photographs to Mr. S. Weld.

Numerous Mineral Deposits in the Malaga District, Spain

The western district of Malaga, Spain, contains the Serrania de Ronda mining field, in which nearly all kinds of mineral deposits may be found, such as lead, copper, zinc, antimony, nickel, gold, and platinum, according to *Commerce Reports*. During the last four years the Spanish government did not permit prospecting, and concessions could not be obtained. Only lately has this district been opened to prospectors, with the result that a number of mining companies have sent their engineers to investigate and report.

The northern part of the Province of Malaga is rich in red oxide of iron ore; the mines of Salinas, Archidona, and Rio Frio are well known. The ores found in this district are exported for use in the manufacture of paints. The eastern district of Malaga contains lead, iron, and zinc mines which are north of the town of Nerja and extend into the Province of Granada, where, east of Nava Chica, altitude 1,831 meters, many undeveloped lead, zinc, molybdenum, and vanadium concessions are located. The southern and central districts of Malaga, northeast and southwest of Santa Pitar, altitude 1,020 meters, also contain a number of lead, zinc, and copper deposits, most of them not yet sufficiently examined or developed.

The lack of proper transportation facilities and good roads is a drawback to the development of these mining districts. In many instances the ore has to be hauled to the railroad station in ox- or mule-drawn carts, or carried on muleback, for a distance of three to twenty-five miles at a cost of $2 to $10 per ton. Many of the mineral deposits in Spain are far from being exhausted, and only await the necessary capital, machinery, and aggressive action to make them successful investments.

In these districts there should be favorable opportunities for the sale of American motor trucks and tractors, to be used in overcoming the present difficulties in transportation, due to the lack of railroad cars and equipment. American mining machinery and supplies should also find a ready market, as, on account of the difficulties in obtaining machinery during the last few years, many mines have run short of equipment.

Decline in United States Gold and Silver Production

Final figures showing the production of gold and silver in the United States were recently issued by the Bureau of the Mint and the U. S. Geological Survey. They show that the production of gold in the United States during the calendar year 1919 totaled 2,918,628 fine ounces. The silver production was 56,682,445 fine ounces. The figures are as follows:

	Gold		Silver	
State or Territory	Fine Oz	Value	Fine Oz	Value(a)
Alaska	481,984	$9,963,500	690,151	$773,520
Arizona	222,965	4,609,100	5,702,911	6,392,222
California	841,638	17,398,200	1,153,614	1,293,051
Colorado	495,810	10,249,300	5,966,606	6,687,790
Georgia	34	700	8	9
Idaho	34,085	704,600	5,933,078	6,650,207
Illinois	0	0	6,000	6,725
Maine	10	200	4,142	4,643
Michigan	0	0	425,610	477,054
Missouri	14	300	75,991	85,176
Montana	116,918	2,416,900	15,012,258	16,826,290
Nevada	225,384	4,659,100	7,045,395	7,896,972
New Mexico	29,319	585,400	851,821	954,781
North Carolina	5	100	19	21
Oregon	53,029	1,096,200	236,620	265,220
Philippine Islands	41,119	850,000	15,715	17,614
South Carolina	5	100	2	2
South Dakota	255,889	5,289,700	122,068	136,822
Tennessee	271	5,600	97,554	109,345
Texas	19	400	539,483	604,690
Utah	109,661	2,266,900	12,542,623	14,058,650
Vermont	19	400	2,200	2,466
Virginia	0	0	8	9
Washington	11,436	236,400	258,220	289,487
Wyoming	14	300	300	336
Totals	2,918,628	$60,333,400	56,682,445	$63,533,652

(a) Valued at the average New York price of fine silver, $1.12087 per oz.

Compared with 1918 production these figures indicate reduction in gold output of $8,313,300, and in silver output, 11,127,694 oz.

Federated Malay States Tungsten Exports

The total export of tungsten ores from the Federated Malay States, as shown by the customs returns, was 355.41 tons in 1918, as against 761.31 tons in 1917, according to the Bureau of Foreign and Domestic Commerce. Of this total wolfram accounted for 244 tons and scheelite the remainder. Export duty on tungsten ores was not exacted, and free prospecting licenses continued to be granted.

Mining Experiences in Idaho in the Nineties

Narrative of Difficulties and Happenings at an Old Gold Mine—Transportation Over High Mountain Ridges—Isolation in Winter—Novel Method of Packing In an 8,400 ft. Wire Cable

By G. L. SHELDON
Written for *Engineering and Mining Journal*

THE Yellow Jacket Mine, in Lemhi County, Idaho, was purchased by friends of mine in October, 1892, and shortly after I was sent in to take over the property and start work. Ketchum, Idaho, on a branch from Shoshone on the main line of the Oregon Short Line, was the nearest railroad point. From Ketchum it was eighty miles by stage to Challis; thence by horseback, over a trail sixty miles long, across three mountain ranges from 9,000 to 10,000 ft. in altitude, to the milling plant of the property on Yellow Jacket Creek, at an altitude of 8,000 ft. The mine was on the mountain 1,200 ft. higher. The ten-stamp mill on the property had been put in by J. B. Haggin in 1866. The former owners, after working two weeks in cleaning up the mill, turned it over to us. In four days we cleaned up $3,000 from around the batteries.

In summer the ore was hauled from the mine to the mill by wagons and in winter by sleighs, at a cost of $2.50 per ton. It was decided to erect a Swem aërial tramway, the buckets to carry 125 lb. of ore each. No packer would contract to deliver the ¾-in. wire cable required in its construction. The company's pack train brought in the cable, 8,400 ft. in length, in three trips. Being too stiff to coil for individual coils on each mule, it was strung out upon the main street of Challis, six or seven runs on a side being tied together. The mules were placed in the center, with the cables lashed to each side, the loop at either end swinging clear of the leading and the end mules. Nearly all the inhabitants of the county were on hand to see the pack train start. They had plenty of excitement and fun. It took two men to manage each mule for the first few days. On uneven ground the individual loads would vary in weight. In a hollow the rope would lift the center mule off its feet. On a ridge or knoll one mule took the load of three. One wall-eyed cuss bucked and tore around on a ridge, throwing the whole pack train of twenty-two mules down the mountain 150 ft. into the timber in a tangled, twisted condition. It took two days to cut them out, no serious damage being done.

Owing to the stiffness of the several cables bound together the pack train could not make short turns, and a temporary straight trail, regardless of grades, was therefore made. Eventually the mules became accustomed to the novel loading, and the entire cable was delivered without serious mishap. The tramway reduced the transportation cost for delivery of the ore from mine to mill to seven cents per ton.

HARD SLEDDING

During the following January I went in again as confidential man, cashier, and bookkeeper. At the time snowshoes were required. I used the long six-foot Canadian web shoes. Along the route there was a cabin with provisions every fifteen miles. It was the hardest four days' work I ever did; but afterward, when I learned to use skis, I found them much easier.

Early in the spring of '93 our provisions began to run low. Supplies had been purchased for fifty men, but the superintendent often had a hundred. There were finally only potatoes, oatmeal, and some rusty "sowbelly" that had been in the warehouse for five years. I have never been able to eat "sowbelly" since.

The trail over the Yellow Jacket Divide was shoveled out to permit the pack train to get through. Before it reached the divide a "chinook" blew for two days and cut all the snow out. Clearing the trail had cost $1,200. We went over into the Basin, where deer wintered, and shot some. That helped out our larder.

Before the next winter it was known exactly how much sugar, butter, flour, baking powder, and other provisions were necessary per day per man, and supplies were purchased accordingly. The provisions for seven months had to be laid in by Nov. 25 of each year. This applied also to every article needed at the mine and mill, even to window glass and tacks.

PAYING UNDER DIFFICULTY

Early in June of '93 (the year of the panic) trouble began over certain checks upon which payment had been protested. I went to the railroad and, by telegraphing, secured by express from New York a few thousand dollars in currency. Under the terms of the purchase contract of the property, all of the gold bullion produced had to be deposited in the Wells Fargo Bank at Salt Lake within a certain time each month, and credited on the balance due upon purchase price of the property. Unless this had been done the property would have been forfeited.

Upon returning to the mill, I found that the superintendent had held the bullion, hoping to make sure of his own and his friends' pay. I paid him in full and discharged him. A man on horseback, together with another horse upon which the bullion was packed, was dispatched with instructions to proceed to Salt Lake without delay. The bullion reached the bank upon the last day of the forfeiture period, after banking hours. The bank being advised by wire, received it, and saved the mine. The owners were wired about the incident and informed me that I was in charge. I remained as superintendent until the mine again changed hands in May, 1895.

The old cam shaft on the stamp battery had been in use so long that key seats had been cut all over it, and there was room for no more. A new shaft was purchased. This weighed 625 lb. Jesus Urquida, a Mexican, was the only packer who would bring it in. He secured the largest mule in the locality. He then made two tripods the height of the shaft when loaded. These were packed on another mule. The big mule was led with the load, one, two or three hours, depending upon the condition of the trail. Urquida would then stop and set up the tripods just behind the loaded mule. Four men would next slide the shaft back onto the tripods. The mule was then allowed to rest and feed for a short time and the procedure repeated.

The mill was operated by a Leffel water wheel, which was connected to a penstock forty-two feet in length. A ditch, about 1,500 ft. long, conveyed the water from a six-foot dam on Yellow Jacket Creek. Anchor ice that formed on very cold nights in the creek would sometimes, when the temperature rose suddenly, break loose and in the form of a fine, slushy material, before we knew it, fill the penstock full of ice, stopping the water wheel. It took two days to dig it out. The ditch on the hillside would often break, causing many shutdowns.

During the winter of '93, logs were cut and two-inch plank was sawed from them for a flume. To cut a groove in the edges of the planks, an old broken saw blade was cut to about seven inches in diameter. Teeth were filed in it. It was wedged at a slight angle on a shaft, thus enabling a groove three-eighths of an inch wide and of the same depth to be cut in the edge of the two-inch plank. Small tongues were sawed out for the grooves. The primative tongue-and-groove joint thus made was practically leak-proof.

The following May the mill was shut down. Part of the mine force was brought down to put in the new flume. The weather was dry and windy. The roof of the mill had been in place twenty-seven years, and the shakes that covered it had become worn and frayed. When it was seen that the flume would be completed within the day, the mill men put on new shoes and dies. It had been customary to fasten on the shoes with wedges made from hard wood obtained from plug-tobacco boxes. The shavings and refuse from making the wedges were burnt in a large heating stove in the mill, and under the prevailing conditions of wind the sparks resulting set fire to the shakes. The fire spread the length of the roof almost instantly. The mill was lost. The flume at the time lacked two plank lengths of completion. At the suggestion of Tom Kelley, boss carpenter, a force of men was sent to throw in the two plank lengths, weight them down with rocks and place side boards. The water was turned in and the flume and penstock were saved.

Changes in Power Plant and Construction of New Mill

The dam was deepened to about twelve feet and a plank apron twenty-four feet wide on a fifteen degree pitch into the water was constructed. The crest of the apron was six inches lower than the rest of the dam. This spillway was effective in carrying off the anchor ice.

The flume was four feet high and six feet wide and covered with loose one-inch boards. It received the water from the bottom of the dam. A sawmill was put up, and during the summer a half million feet of lumber were cut for a new mill. On Oct. 4, 1894, the plans for the new mill were received. The building was 75 x 150 ft. It was double sheathed with building paper between the boards and battens outside. Twenty new stamps and the ten old ones that went through the fire were used. Some of the stems of the old battery were badly bent, but our mechanic, George Ferguson, made a contrivance and then heated and straightened them in the blacksmith shop. The freight route was changed to Pedrock, on the Butte branch of the O. S. L. R.R., thence by wagon road to Salmon City and Leesburg, over the first divide. This cut the packing over the trail to a distance of about thirty-odd miles. Contracts were made with the packers at 2½c. per lb. They agreed to see the job through, even if it took all of the winter.

The water supply for the batteries was obtained from a spring about 2,000 ft. up the gulch on the road to the mine. It was brought to the mill in a 4 x 4 in. wooden box made of 1-in. lumber. The box was covered with earth, thus keeping the temperature of the water in the battery and upon the plates about 56 to 58 deg. This water was used for hydraulicking soil and gravel on the hillside at the mill site. Gold being found in the excavated material, sluice boxes and riffles were put in, and some gold was recovered. Snows came the last of November. The trail became icy. Occasionally a mule was lost. Hay for the mules had to be packed in. Feeling that trouble was brewing, we went outside and purchased a pack train of thirty mules, hiring the former owner to handle it. Along in December, all of the packers came to the office and struck for more pay. Asked if their contract required them to pack all of the freight in at the agreed price, even if it took all winter, they replied, "Yes, but we can't do it." "Is this your last word?" we asked. "Yes," was the reply. Our answer was that the company would pack the freight if the contract was broken. We had been constructing additional road, so that the packing distance was then not over twenty-two miles. The packers stuck and delivered the freight.

Record Made in Constructing Mill

The twenty new stamps began dropping on ore in 110 days from the time the plans were received, a record when the transportation conditions are taken into consideration. The work was expedited, as the bill of lading showed numbers and exact contents of each box. Box contents were checked at the factory by three separate checkers. We never found a bolt or nut missing, and it often became necessary to send a man and a mule out on the trail until he found a certain numbered box which was needed. The machinery was purchased from Fraser & Chalmers.

The Leffel water wheel contained an important hardwood bearing. During the winter of '93-'94 sand cut out the bearing. No hard wood was available nearer than Salt Lake, the round trip thereto requiring over two weeks. Some of the boys recalled that during the previous autumn, while hunting on the Middlefork, they had seen some mountain mahogany, which at that altitude often grows a knurly knob just at the grass roots. Two of the men sent out on snowshoes came back on the second day with several of the knurly knobs. Twenty-four hours later the mill was running on a better bearing than the original white-oak bearing that had been replaced.

The men were charged $1 per day for board. When the company took over the property board cost 98c. per day per man. By judicious buying and discounting all bills the cost was cut to 68c. per day. No complaints were made. In fact the table had the best reputation in Idaho. Fat beef cattle were driven in as late as possible and killed at the mill. The dressed quarters were hung in a cool, dry place, and kept all winter.

During the '93-'94 winter there were twenty-four cases of pneumonia in the camp. The nearest physician was sixty miles away and had to make the trip on snowshoes. A man was put with each case as a nurse. Our medicines were limited to quinine, cathartic pills, and nitric acid from the assay office. Hot corn-meal poultices were used, being changed in the early stages of

the pneumonia every twenty minutes. Only one case was lost, and this was due to the patient's disobeying orders.

The sawmill was on the hillside on the tramway level. All lagging was cut ready for use from slabs and poor lumber and sent up on hooks on the tram to the mine. This situation placed the sawmill about 75 ft. vertically above the penstock and a similar distance to one side. A quarter-turn belt from the vertical waterwheel shaft drove a pulley on a horizontal shaft. A grooved cast-iron pulley lined with rubber was placed on this shaft and a pair of similarly lined pulleys at the turning point. On the saw shaft was another pulley of the same kind. Power was transmitted by a §-in. wire cable. A traveling pulley was placed on the power cable at the saw level and a weighted box took up the slack of the cable.

Pitch as a Substitute for Rubber Lining

During the winter of '94-'95, when lumber was still required, the hard rubber linings cut out. New ones could be obtained only from Chicago. Men on snowshoes, with axes and sacks, were sent into the hills to cut pine pitch wherever found. The pitch was placed in a five-gallon can, and the can placed in a larger kettle filled with water. By applying heat the pitch was melted. A single strand from an old manila rope was wound into the groove of the wheel, and, as the wheel was turned slowly, the hot pitch was poured in. This gave even better results than the rubber lining, and only two days were lost by the delay.

The years covering the experiences here detailed were during the troublous period in the Cœur d'Alenes. Many miners drifted into Yellow Jacket from there. Although they had a union affiliated with the Western Federation of Miners, we had no trouble and always had sufficient workers.

The ore was free milling and averaged just under $10 per ton. The original ten-stamp battery that Haggin put in was made by the Union Iron Works, of San Francisco. The battery was a double discharge one, but only one side was used. An extra set of silver-plated copper plates was put in, and both discharges of the battery were used, better results in tonnage and extraction being obtained. In the new mill the plate surface was doubled by placing a full-sized table below the apron plates, a sharp drop being left between the two sets of plates. Small pieces of copper plates were cut and put in the launders clear out to the tailings pond. These were cleaned up once a month, with satisfactory results. With the new mill the tailings assays were cut to between 40 and 50c. per ton.

Downward Extension of Vein Lost

The vein was first discovered and worked on the top of a ridge. It was high grade and was stoped 50 ft. wide, 90 ft. deep and about 200 ft. along its course. It was cut by a fault and picked up lower down upon the ridge on rather flat ground. Here the vein material was a hard, white quartz 48 ft. in width. Much of the intervening ground from grass roots down to between 50 and 60 ft. in depth was fine, erosional material containing bunches of white quartz. All of this milled from $7 to $10 per ton. The ground was heavy. Square sets were used, the red fir posts being from 12 to 15 in. in diameter.

A crosscut about 200 ft. vertically below the lowest workings was begun prior to the change of management. I understand that considerable crosscutting has since been done to the south in endeavoring to find the vein, but the work was unsuccessful. I have often wondered if a reverse fault had not thrown the vein north of the original discovery. The country rock is porphyry and is broken. The new management, succeeding our control, contrary to competent advice, doubled the mill, water power and tramway. It is known that $72,000 was spent and $68,000 won. The mine has been idle since that time.

Gold, Bauxite, and Quicksilver in Dutch Guiana

The production of gold in Dutch Guiana shows a steady decline, according to Consular Agent James S Lawton in *Commerce Reports*. No new discoveries were made in 1919, although there has been a revival of interest in the old Sara Creek mining district, principally by small lessees. Total gold production for the year 1919 was valued at $357,027, and of this $144,083 worth was produced by one company, working entirely by hand, in the Marowyne district. On this same river, an American company continued prospecting with a view toward dredging. Results are reported as having been satisfactory.

A law now provides conditions under which exploitation of the bauxite deposits of the colony may be undertaken. Some of the chief features of this ruling are: Concession may be granted for any length of time not exceeding fifty years. No company or individual may hold at one time more than 125,000 hectares (1 hectare = 2.47 acres). The taxes on the bauxite land are as follows: For the first year, 10c. Dutch currency per hectare (1.6c. American currency per acre); for the second year, 20c. per hectare (3.2c. per acre); for the third year, 50c. per hectare (8c. per acre); for the fourth year, 75c. per hectare (12.1c. per acre); for the following years the tax is 1 guilder per hectare (16.2c. per acre).

Every concession holder is bound to mine yearly during the five years, commencing from the date of the concession, twenty tons on each 100 hectares or part thereof held. After the fifth year the minimum mined shall be ten tons per 100 hectares, and on each ton mined a royalty of 25c., Dutch currency (10c. American currency), shall be paid to the government. Corporations holding concessions now know under what conditions they must work, and preparation to mine and export bauxite are going forward rapidly.

Prospecting has continued, in a small way, for quicksilver ores, float of which has been found in a number of places near the Marowyne River, and it is reported that quicksilver has been found in place on one concession. The government, in connection with a Dutch company, continued to explore large areas of ground said to contain high-grade iron-ore deposits.

Spectroscopic Analysis of Gold

Nine standard samples of gold alloyed with silver, copper, and iron have been examined spectroscopically to establish a method for making quantitative analyses of mint gold from spark spectra, according to the Bureau of Standards, Washington. As a result of this work, it appears that the common impurities of gold can be estimated in the range of 0.0001 per cent to 1 or more per cent, with a probable error of not greater than a few hundredths of 1 per cent.

THE PLANE SURVEYOR IN MEXICO

Metallurgists of Note

E. A. Cappelen Smith

THE Chicago World's Fair in 1893 was more of an aid to progress in American metallurgy than has been generally thought. To see that exposition, E. A. Cappelen Smith came to this country from Norway, where he was born, at Trondhjem, twenty years before. Then, being offered a job with Armour & Co. at $40 per month, he decided to stay awhile, and is still with us. When Mr. Cappelen Smith accepted the post of assistant chemist in the stockyards the application of chemistry to the meat-packing industry was comparatively unknown. Practically no byproducts were manufactured, and he was one of the first to show that a lot of things besides meat could be obtained from livestock. He still believes that food chemistry offers even more opportunities for profitable research than does metallurgy. A year and a half later, a position with the old Blue Island Works of the Chicago Copper Refining Co. offered almost double the salary, so was accepted. This was really more in line with the training which he had received at the Technical College of Trondhjem. The Blue Island plant had a small sample of almost every kind of furnace and apparatus used in treating copper ores in those days, and therefore gave Cappelen Smith an excellent opportunity to become familiar with many different operations. Although employed as chemist, he took a great interest in picking up practical knowledge from the workmen, and he considers this one of the most important essentials to success. It is not necessary, Mr. Cappelen Smith thinks, actually to work up as a laborer from the bottom, but one with only theoretical knowledge should unquestionably become familiar with actual operating through close observance and friendly discussions with the foremen and others who conduct the work. The value of this knowledge was proved a short time after Mr. Cappelen Smith had further progressed to Anaconda. After hanging around the refining furnaces for awhile, Pat Shea, the foreman, one day threw up his hands just at the point when a charge was about ready to be poured and intimated that with so much technical ability around his services certainly were not required. To Pat's amazement Mr. Cappelen Smith took the furnace, carried the refining to the proper point and successfully cast the charge; they were firm friends thereafter. Pat said that he had played that trick on a good many others, with unfortunate results. Mr. Cappelen Smith's ability had been gained, not by actually doing the work, but by close observation, questioning and common sense. Leaving Anaconda in 1901, where he had been superintendent of the electrolytic refinery, the Baltimore Copper Smelting & Rolling Co. proved a fertile field for metallurgical research during the next nine years. In this time Mr. Cappelen Smith developed the process of basic converting and, with W. H. Peirce, patented the Peirce-Smith horizontal basic converter. He was also the first to use magnesite brick in reverberatory construction and to blow air into the molten bath of copper-refining furnaces. "We burned up miles of pipe," says Mr. Cappelen Smith, "and finally I tried a water-jacketed pipe." "Jim, I want you to put this pipe in that bath of copper," he told the furnace operator, "but first I want to tell you what it is." Its construction having been explained, Jim said, "You want me to put that water pipe in that copper?" "Yes." "Where are *you* going to stand?" "Right here." "All right, if you are willing to stand there, I will." There and then the problem was solved, and with a leaky jacket too, for the thread on one of the nipples had given way and a stream of water was spouting out when the pipe was removed.

E. A. CAPPELEN SMITH

Mr. Cappelen Smith's more recent activities in the art of hydrometallurgy are well known. Devising the leaching process used at the Chuquicamata deposit in Chile was all pioneer work, but it has been most successful. Through his genius the largest copper deposit in the world, heretofore thought of no economic importance, is being profitably treated. The first unit has a capacity of over 15,000 tons of ore per day.

Mr. Cappelen Smith is a member of many engineering clubs and societies, acts in a consulting capacity for several interests and is a director of several mining and financial companies. His headquarters are now with the Guggenheim Bros., in New York.

HANDY KNOWLEDGE

Repairing Lips and Bottoms of Steel Ladles

Owing to the smelting process followed at the Nickelton, Ont., plant of the British American Nickel Corporation, the slag obtained sometimes runs high in matte, the action of which is destructive to steel ladles, tending to corrode the steel at the point of contact and injure the kettle beyond further practical usefulness. The company has recently been reclaiming such ladles by means of thermit welding. In making repairs, pieces of steel were forged and welded into the ladle by an in-between casting of thermit rather than by completely filling the burnt or holed area by a thermit steel casting. By this method excessive strains were minimized.

FIG. 1. LADLE WITH THREE BOTTOM PATCHES IN PLACE BEFORE APPLYING WAX COLLARS TO PATCHES

In repairing a ladle with holes in the bottom, three patches were made owing to the irregularity of the holes and the greater ease of making three patches than one irregular patch. In lining up the patches, approximately one inch was provided at the edges for the entrance later of thermit steel. These patches were surrounded by a yellow wax pattern, and the usual thermit welding practice then followed. Riser patterns were used both inside and outside, the ladle resting on its side, one coming off at the high point and two others placed about half-way down on the wax. These latter two served to take care of the shrinkage of metal.

In making welds on the sides of kettles care must be taken not to put too much metal in the "collar" of the weld, as otherwise there would be a tendency to interfere with the clearing or "skulling" of the ladle. In applying the wax collar the wax should be from $\frac{1}{8}$ to $\frac{1}{4}$ in. fuller than the finished shape, to allow for shrinkage during contraction.

In forging a lip patch, the blacksmiths followed the outline of the cut ladle, cutting and shaping the patch to provide a peripheral space of about one inch width. It was no small job to shape the patch, and it is believed that in future repairs of this kind time can be saved by cutting away the kettle to a square shape, as shown by Fig. 3. The lower portion will not then lend itself readily to melting down during the pre-heating operation. It may also be preferable to cast the lips of steel, rather than to forge them.

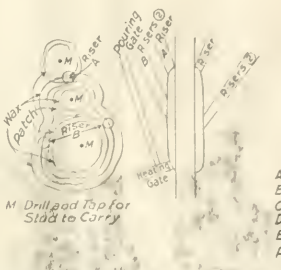


FIG. 2. PLAN AND SECTION, WITH PATCHES AND RISERS

FIG. 3. SKETCH SHOWING A LIP PATCH

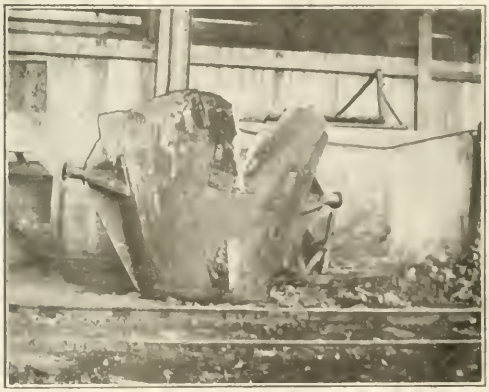


FIG. 4. LADLE SHOWING EXTENT TO WHICH LIP IS CUT OR CORRODED AWAY BY STREAM OF HOT MATTE

Preventing Accidents From Overhead Traveling Cranes

In the Nov. 22 and 29 issues of the *National Safety News* two methods for preventing accidents from overhead traveling cranes are shown. The method ordinarily used is a street-car warning gong placed on the floor of the crane cab and operated by the craneman as occasion requires. Both of the suggested methods are better than the one described. In one case the "crane hitcher" is required to walk a few yards ahead of every moving crane load and to clear the way of workmen. In the other, an electrically operated horn or an electrically operated gong is placed as near to the moving load as possible. The best position is immediately above the crane hook, and the device is operated by a push button in the cab.

Drilling Frozen Chunks With a Steam Jet

Written for *Engineering and Mining Journal*

On the Mesabi iron range of Minnesota the work of stripping or removing of overburden at the open-pit mines is carried on during the winter months. Some stripping is done in the summer also, but as this season is the period for shipping the ore by Lake boats,

APPLICATION OF STEAM JET DRILLING FROZEN CHUNKS IN IRON MINING

the steam shovels are employed principally in loading iron ore into cars for shipment to the docks.

In ordinary practice the ground in front of the shovel is loosened by means of blasting, and in this procedure holes are first drilled, either by means of jumper drills or steam jets, loaded with dynamite, and then fired. It frequently happens that large masses of earth are overcast by the shovel and occupy positions above the shovel cut, where they are not only a source of danger, but are of such size that they cannot be conveniently handled by the steam-shovel dipper. In this event the chunks are drilled and then blasted.

The accompanying illustration shows a large frozen chunk being drilled by means of a steam jet. A length of steel pipe is sharpened at one end and the other is placed in a steam hose. Steam is obtained from the steam-shovel boiler, and in some instances several lines of hose are supplied. When the steam is turned on, the operator forces the point of the drill into the frozen ground, turning it as he does so. A steel plate, which may be seen in the cut, is placed on the pipe in such a manner as to protect the operator from the steam or pieces of earth that may be blown out of the drill.

Sampling Hot Gases

Written for *Engineering and Mining Journal*

In sampling the gas in a roasting or reverberatory furnace, or a converter, considerable care must be taken not to have misleading results. One thing which must be prevented is any reaction between the sample tube and the gas. An ordinary iron pipe cannot be used in a hot furnace, for example, even though the temperature is below the melting point of iron, for any oxygen in the gas may react with the iron, and then the analysis will erroneously show absence of oxygen. The proportions of the other gases present will of course also be incorrectly reported. The sample pipe should be thoroughly water-cooled, or, better, a fused silica tube should be used. The rubber tubing must be carefully tested for leaks and all joints wired and shellacked. Atmospheric air must be completely expelled before taking the sample.

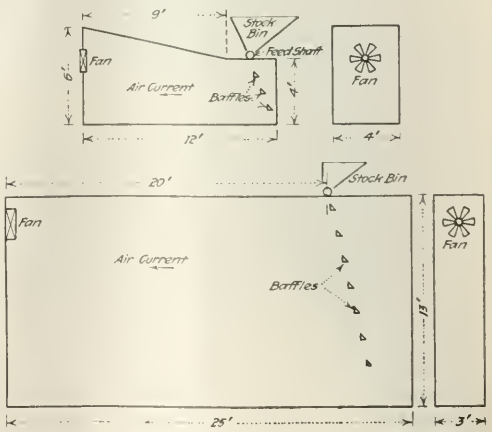
Another point not to be overlooked, especially when taking samples in flues, is that the gas stream is not homogeneous. Near the wall free oxygen will often be found, whereas at the center of the flue the gas composition may be entirely different. Also, the gas is usually changing from minute to minute, and to get a true average a large number of samples must be intelligently taken.

Air Classification in Ore Dressing

Written for *Engineering and Mining Journal*

Air classification is used in most graphite refining plants, and forms an important step in the refining process. The accompanying cut shows sketches of air classifiers usually made at the plant. So far as is known no experimental work has been done by the large majority of operators with a view to determining the most efficient proportions and shape for this device.

In principle, an air suction created by a fan at the back of each chamber is applied to a falling stream of graphite ore or concentrate. The heavier material, which is made up of quartz grains with attached graphite, is practically unaffected by the air suction, and falls into a hopper furthest from the fan. The lightest particles are drawn closest to the fan, which draws the finest dust into the atmosphere. When this



TWO TYPES OF AIR CLASSIFIERS

apparatus is used on crude concentrates, the middlings —which include the heaviest flake—form No. 1 flake stock, going to the No. 1 buhr mills, whereas the finer material closest to the fan is screened to remove as much finished No. 1 flake as possible.

By The Way

Greek Meets Greek

The War Minerals Relief Commission has been advised of a case of profiteering in commissions. An award was made recently in the neighborhood of $40,000 on a certain claim. Despite the frequent intimation, on the part of members of the commission, that claims could be handled without the intervention of lawyers, the claimant in this instance employed an attorney, to whom a power of attorney was given. This specified that he was to collect any award made on the claim. He made the collection, took one-half of the amount for his fee and deducted a liberal expense account from the remainder before forwarding the claimant his share.

An Unsuitable Fit

"W'en Tom Pengilley firs' h'arrived from Camborne, m'son," said Cap'n Dick, "'e went to work daown to tha h'Ophir mine, w'ere 'is cousin, Sam Treloar, wuz shifter. One day tha chap 'oo druv tha mule on tha ten 'underd main 'aulage laid h'off without reportin', so Sam sez, 'Gos' 'long do, Tommy, an 'itch up they gert grey mule an' drive un for tha shif'. Naow, Tom 'ad never put 'arness h'on a mule or a 'orse in 'is 'ole bloody life, but not wishin' to h'appear h'ignorant 'e gaws forth, not sayin' a word, to carry h'out tha boss's h'orders. In baout a hour, w'en no cars 'ad come to tha station, Sam went in to see w'ot's tha matter, an', dam-me, 'e meets Tom commin' h'out tha level with tha mule's collar in 'is 'and. 'Wot's tha matter 'ere naow, Tommy? 'Are'nt thee put 'arness to that mule yet.' sez Sam. 'So I 'ave,' sez Tom. 'I put un h'on right away; h'all 'cept this ere gert leather gasket w'ich 'pears to me to be too bloody small to pass h'over tha gert h'ears of un.'"

Africa for the Africans

Permission to sell 100,000 shares of stock at par "to colored people only" has been asked of the Arizona State Corporation Commission by the Comobabi Consolidated Mines Co. The promoters and all stockholders are said to be negroes. The company's property is in the Comobabi district of Pima County. This is bad business. In the promotion end of the mining game all questions as to creed and color should be forgotten. The one thing needful is to get rid of the stock before the condition of the "mine" becomes known to the public. Then again, what if other promoters should retaliate and refuse to let colored people in on the ground floor of some of their matchless propositions. Besides, discrimination of the sort mentioned is likely to stir up racial strife, and Arizona has been happily free from this so far. Imagine the envy that will be aroused if Comobabi comes through a winner. The Corporation Commission will do well to consider these things carefully before coming to a decision.

Annual Assessment Abolishment

Things were quiet in the old mining town. There was the sting of winter in the air. A snarl of the wind and a rattle of gravel against the worn front of the little hotel gave place to a moment of silence. The faint tolling of a bell was heard. Old Birdseye Porphyry stirred uneasily in his worn leather chair and said to Phenocryst Jones, his close-by neighbor: "What's that?" Phenocryst shifted his tobacco and said: "Haven't you heard? It's old Ground Mass Murphy. Died of starvation." "Died of starvation! How's that possible?" said Birdseye Porphyry. Phenocryst stretched himself and hunched back into his chair, saying: "You are very much behind the times, Birdseye. Haven't you heard what those law makers have done over there in Washington? No! Well they've abolished the mining assessment law again. This makes the third year of the annual abolishment of assessment. Old Ground Mass used to pick up a few dollars every year by doing the assessment on the ten claims of the Wild Gallop Mining Co. up in Depravity Gulch, on the other side of Pick Handle flat. He did the work for $40 a claim, and laid in enough grub to last him over the winter. Now those 'cheap skates' have found a better way. They just write to their Representatives and Senators and say, 'Have a law passed cutting out the assessment work. We're up against it again and can't pay our bills, and we must have the claims.' Of course those 'birds down at Washington' want to be accommodating, and they just press a button and summon their secretaries and direct them to 'shoot the law through.' But they did it this time. Poor old Ground Mass got thinner and thinner. He had a desperate struggle each winter. Where have you been? Haven't you seen him getting gaunter and leaner? Well, he borrowed from all of us; but, you know, he had pride. When he heard that the assessment was to be abolished again he just kind of disappeared, and Magmatic Segregation went over to his cabin yesterday and found him all cashed in. It beats all, don't it? Well, of course, those fellows down at Washington don't know how they are interfering with the living of fellows like us. I have half a mind to write to the *Engineering and Mining Journal* and ask them to call off these abolishments and get things back to normal, or this old town is going right to smash. We've had the gilt-edge taken off of two winters, and now this is the third, and it's getting almost personal."

"Have you read the last *Journal?*" said Birdseye, as he rubbed one shoe over the toe of the other and pressed his tobacco down into his pipe. "No, by heck, I haven't," said Phenocryst. "What does it say?" "Well!" said Birdseye, "it says that the Senate has put the 'kibosh' on the original bill by changing it to six months' grace." Phenocryst moved closer and waving a finger at Birdseye he said, "How in heck is that going to help Ground Mass?"

No Gold for Santa

Those in banking circles will doubtless be as much surprised at the recent request of the Treasurer of the United States that they should not distribute gold coins for holiday purposes as they will be relieved to have a further excuse for refusing to pass out gold through the paying teller's window. Their surprise will be but natural with the recent utterance of their Bankers' Association committee still in their recollection that "no national emergency exists calling for special treatment of the gold-mining industry." This admonition from Treasurer Burke must seem as needless to them as the passage of the McFadden gold bonus bill would be. But they will heed it and hang on to their gold. Indeed, their tenacious grasp makes one suspect that they value gold beyond its intrinsic worth.

CONSULTATION

Manganese Bronze and the Dry Cell

"Will you be kind enough to give me an answer to the following questions?

"What is manganese bronze, how made and its uses?

"Where can I get information as to the manufacture of dry-cell batteries?

"Are carbonated gases made from manganese dioxide and by whom?"

Manganese bronze is an alloy designed to develop a maximum resistance to corrosion by ordinary mine and sea water and at the same time have strength and toughness, with light weight similar to a mild steel. These essential characteristics are secured by many alloy combinations, actual or proposed, the most popular of which is manganese bronze. This is a brass to which have been added small quantities of aluminum, iron, and manganese to strengthen and render the alloy dense and close grained. An important consideration in the quality of the alloy produced is the amount of lead present, as it is a deleterious impurity and should be kept below 0.03 per cent. The composition of manganese bronze as given by W. C. Phalen is ordinarily about as follows:

	Per cent
Copper	57.00-59.00
Zinc	38.00-40.00
Iron, manganese, aluminum and tin	.25- 1.00
Lead	.10- .50

From which it can be seen that a relatively small proportion of manganese enters into the composition of this bronze. The amount of manganese used in the bronze, according to J. L. Jones, of the Westinghouse Electric & Manufacturing Co., should not exceed 0.05 per cent, and many of the best manganese bronzes show on analysis only a trace of manganese. However, some manganese bronze of good quality has been made containing about 4 per cent manganese, particularly the grades first produced. As a source of manganese consumption the manufacture of the alloy is relatively unimportant; in fact, its name is rather misleading in point of manganese content.

Manganese bronze is widely used, particularly in marine construction or in machinery where corrosion is counteracted (mining machinery), and it has gained in popularity because of its advantageous physical properties. Hence its use in propeller blades, where resistance to the action of sea water, strength, and toughness are highly essential.

The object of the manganese is to serve as a carrier of the iron necessary to insure the proper strength, and it serves but one purpose, which is to introduce the iron, for without the presence of manganese the iron would not alloy with the copper. Ferromanganese may be used as the medium for introducing the manganese.

The alloy can be made either from a pure brass to which aluminum, iron, manganese, and tin is added, or it can be made from low-grade scrap material, skimmings from the brass foundry, zinc, iron recovered from galvanizing plants, aluminum turnings, and other byproducts. It is necessary, however, to use a reverberatory or other furnace in which it is possible to accumulate a bath of considerable volume, so that refining is facilitated. Details of the operation will be found in a paper by P. E. McKinney published in the *Transactions* of the American Institute of Mining and Metallurgical Engineers, Vol. LX (1919) pages 374-385.

Bulletin 173 of the U. S. Bureau of Mines, entitled "Manganese Uses, Preparation, Mining Costs, and the Production of Ferro-Alloys," is a valuable publication on the subject, and contains several pages upon the manufacture and operation of the dry cell. The dry cell consists essentially of a zinc container holding a central carbon electrode and packed with a chemical depolarizing mixture.

The use of manganese in the dry cell is confined to the chemical mixture or "mix," which is placed around the centrally located carbon electrode about one inch from the top of the container and is a depolarizing mass. It is essentially a mixture of ground carbon (calcined petroleum coke and graphite), manganese-dioxide ore, and the electrolyte (ammonium chloride). The manganese dioxide serves as a depolarizing agent and oxidizes the hydrogen evolved during the operation of the cell which would ordinarily polarize the chemical reaction.

The rigorous physical and chemical characteristics required of manganese are suitable for use in dry cells and have been enumerated in an article in the consultation department in the issue of Aug. 14, 1920, to which reference should be had.

The *Engineering and Mining Journal* does not know of any attempt to produce carbonated gases from manganese ore, although no doubt it can be obtained from the carbonate. Limestone is much cheaper for the purpose.

Oil-Shale Information

"Can you advise me where I can look for authoritative information on the method now in use for the distillation of oil shales?"

A publication of the Bureau of Mines of the State of Colorado, entitled "The Oil Shales of Northwestern Colorado" (Bulletin No. 8), which can be obtained from the department at Denver, gives a valuable bibliography on the subject of oil shales and contains an excellent résumé of the oil-shale industry in this country up to the middle of last year, and, although written with particular reference to Colorado's deposits of oil shale, the text applies equally well to shale formations of other states.

The U. S. Bureau of Mines at Washington, D. C., has published from time to time brief papers on the oil-shale industry in this country, and it might be a good plan to communicate with the Bureau in order to obtain a set of these recent special investigation papers.

The *Engineering and Mining Journal* has also published articles upon the subject, particularly during the last year, and reference should be had to the files of the publication.

THE PETROLEUM INDUSTRY

The Burkburnett Field—A Lesson to Oil Men

Operations Conducted in Texas District Represent Needless Extravagance and Emphasize the Viciousness of Stock Schemes Promoted by Adventurers—A Plea for More Careful and Systematic Exploitation*

By R. E. COLLOM
Petroleum Technologist, Bureau of Mines

THE development of the Burkburnett oil district, Wichita County, Tex., took place in three stages over a period of eight years. In June, 1912, a well was completed on the Schmoker farm, about three miles southwest of the town of Burkburnett. This well was drilled to a depth of 1,847 ft. by the Corsicana Petroleum Co. Its initial production was 75 bbl. of oil per day. This was the beginning of what is now known as the Old Burkburnett pool.

During the two years following the discovery, considerable drilling was done in the pool. Adverse marketing conditions caused a slump in drilling operations during 1915, but toward the end of that year there was an improvement, and active drilling, both in proved and wildcat areas, was resumed. The total production of 1916 was a little more than 2,000,000 bbl.

During 1917 and 1918 the Old Burkburnett pool reached the height of its development. The productive limits of the field were determined by the drilling of numerous "dry" holes on the edges of the pool. A shallow pool, of small producers, lying in the south central part of the field, was also developed. Some of the wells in Old Burkburnett pool showed high initial productions. Two wells on the Serrien farm came in at an initial production of 2,500 bbl. daily. A number of wells were reported as having initial production of 300 to 750 bbl.

EARLY DEVELOPMENT OF FIELD WITHOUT SPECULATION

These productions are as high as those which caused the country-wide excitement, comparable only to the old-time rushes for gold, in the later drilling of Burkburnett Townsite and Northwest Extension pools. Old Burkburnett was never known by the speculating public. Apparently, during the development of this pool the psychological moment for speculation had not arrived. Then, too, the properties were in large tracts, owned and operated by experienced oil companies. Drilling was carried on in a businesslike manner, and the fortunes of exploration, whether gushers or "dusters," were accepted as part of the day's work. There was little opportunity for the stockjobber to get a foothold in the development of Old Burkburnett.

The development at Sunshine Hill, about six months before the discovery of Burkburnett Townsite pool, gave a preliminary test of the public's speculative temper. A forty-six-acre tract at Sunshine Hill was plotted into lots twenty feet square, and these were sold at $10 each.

The first well drilled on the track struck a good-looking oil sand at a depth of 580 ft. In a short time the lots were covered with derricks and drilling machines. By the end of April, 1918, there were seventy-five producing wells in the pool, and in many cases two wells were drilled on a 20-ft. lot. In a little over two years 245 wells were drilled on a tract of about 500 proved acres. The average production, in June, 1920, was two barrels per well daily.

Among the prospectors seeking oil in north Texas was a group of individuals known as the Fowler Oil Co., who pooled $12,000 to drill a test well on the northern edge of the townsite of Burkburnett. This well was known as Fowler No. 1. The nearest producing wells were in Old Burkburnett pool, three miles to the southwest. A dry hole had been drilled one-fourth mile north of the well, and the Roswell Oil Co. drilled a 2,450-ft. hole some distance southeast of the well without getting oil. During the last week of July, 1918, the drill in Fowler No. 1 entered an oil sand at 1,718 ft. The well came in flowing 2,200 bbl. of oil per day.

This was a big gusher for Wichita County. It was drilled near land, such as the Burkburnett Townsite, which had not been acquired by oil operators. The Fowler well started a town-lot boom in Burkburnett. Drilling for oil became anybody's game, and town lots were sold for $1,000 each.

Three weeks after the Fowler well came in there were fifty-six strings of tools running in Burkburnett Townsite. The larger operating companies were doing some development work but not crowding the holes like the town-lot speculators.

OIL GAMBLING BECOMES RIFE IN BURKBURNETT

Speculators and lease brokers flocked into Burkburnett. Leases were divided into acre and half-acre tracts—even drilling sites—and became the physical basis for the organization of stock companies. Burkburnett and near-by towns were crowded with people, a small proportion of whom were oil operators. The gambling spirit ran high. Adventurers, tender from the cities of the east, as yet to see their first oil well, milled about in the hotel lobbies in search of oil. They overflowed into the streets. Barrels were set on end and used, in lieu of desks, for transacting "oil" business. The rotary table became the "wheel," and the "numbers" to be played were shown on the checkerboard map of the townsite. Each successive gusher was a signal that some new number had won.

Drilling activity in Burkburnett Townsite continued until well into the spring of 1919, at which time the

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pool had lost most of its glamour, owing to a rapid decline in production. About the middle of April, 1919, the Ryan Petroleum Co., wildcatting 3½ miles northwest of Burkburnett Townsite, brought in a gusher in the northeast quarter of Block 84 on the R. M. Waggoner farm. This well started producing at the rate of 2,000 bbl. per day, and was the beginner of an intensified drilling campaign in the Northwest Extension or Waggoner pool.

By the end of June, 1919, the Northwest Extension was producing 16,000 bbl. of oil daily. It was estimated that if all producing wells in Burkburnett district could be connected to gathering lines, the daily production would show in excess of 110,000 bbl.

There were no town lots in the Northwest Extension to facilitate the division of the pool into small holdings. However, many properties were divided into tracts of five acres, two acres, or less. It was a common custom to drill four wells on a five-acre tract.

When intensive drilling operations first started in the Northwest Extension, one of the larger pipe-line companies warned operators that unless drilling activities were retarded production would soon exceed storage and transportation facilities. This warning was not seriously heeded. Much oil was wasted because stock promotion companies insisted upon immediate completion of test wells, regardless of whether or not there was adequate storage to take care of the oil. Oil, as a commodity, they did not desire. A big flow of oil, regardless of what was done with it after it gushed from the well, boomed the value of the stock. In many cases, however, these values were transitory and the final holders of stocks learned that their "play" could never be interpreted in terms of investment or dividends. Many companies had tracts in favorable areas, but were delayed in getting a well drilled to the sand. When the well was finally drilled it was found that neighboring wells had literally taken the oil away from under their properties. As a result of these conditions, flow tanks were full and running over at a number of wells. Wells were permitted to flow because it was claimed that a well, if once shut in, would not produce as strongly again. When storage failed the oil was wasted into the ground or turned into the Red River.

Overproduction, lack of storage, railroad embargoes, and continuous overdrilling all contributed to the congested conditions in Burkburnett. In an attempt to relieve this congestion, a producers' committee was selected to go to Austin to request the Railroad Commission of Texas to issue orders to close down flowing wells, stop swabbing and suspend drilling for a period of thirty days. It was hoped that such an order would give pipe lines a chance to make storage space and, by cessation of drilling activities, the railroads could clear the congestion in their yards. A five-day shutdown was finally attempted. This met with considerable opposition, and many concerns allowed their wells to continue to flow and waste oil in spite of the necessity for conservation.

Productive Limits of Field Reached Early in 1920

In October, 1919, development of the General, or River, pool in the bed of the Red River northwest of the Northwest Extension and, later, the George pool, on the westerly edge of the Northwest Extension, helped to maintain the average daily production per well for the district. Except for the contributions from the George and General pools, the productive limits of the Townsite and Northwest Extension pools had been determined early in the spring of 1920.

Both the Northwest Extension and Townsite pools are practically surrounded by dry holes. Owing to the dispute between Oklahoma and Texas, drilling in the Red River on the northern boundary of Northwest Extension was somewhat curtailed. There is not much probability, however, that the productive area of Northwest Extension will be greatly increased beyond its present northerly limits.

As a result of speculative operations in the Burkburnett Townsite pool, 885 wells were drilled in a proved area of 1,265 acres. This is an average of 1.4 acres per well. The drilling in the Townsite proper averaged slightly less than one acre per well. It is probable that a normal development program for this pool, considering depths of holes, would be one well for every five acres. In other words, 250 wells, or one-third of the number actually drilled, should have been suffcient to economically drain the pool. Up to the end of June, 1920, about 13,000,000 bbl. of oil had been credited to Burkburnett Townsite pool. This does not include wasted oil and gas. The present average daily production per well is about 25 bbl.

In the Northwest Extension pool, at the end of June, 1920, there had been 1,251 wells drilled in a proved area of 2,440 acres. This is an average of 1.8 acres per well. This does not include the George and General pools. Up to the end of June, 1920, the Northwest Extension had produced 20,000,000 bbl. of oil. The average daily production, fourteen months after discovery, was 45 bbl. per well.

The average production, per acre, of the Townsite pool up to the end of June, 1920, was 10,275 bbl. and for Northwest Extension it was 8,200 bbl. Using an average sand thickness of 21 ft. for Northwest Extension and 28 ft. for Burkburnett Townsite and an assumed porosity of 15 per cent, the original oil content of the two pools is estimated at 24,070 bbl. per acre for Northwest Extension and 32,097 bbl. per acre for the Townsite pool. This would indicate a higher expectation for the Townsite pool than for Northwest Extension. Production decline curves indicate, however, that the Northwest Extension can be expected ultimately to produce at least as much again per acre as it has produced to date, but the Townsite pool will do well to produce half again as much oil as it has produced to date. This would give an ultimate recovery of 16,400 bbl. per acre for Northwest Extension and 15,400 bbl. per acre for Townsite pool.

One Well to Five Acres Constitutes Normal Drilling Plan

It has been stated that one well to each five acres would have been a normal program for oil men to follow if the field had been left to them to develop, instead of to speculators. In getting oil out of the ground there are naturally two extremes which can be followed. The wells can be drilled as close together as possible and the oil quickly removed, or, theoretically, one well, drilled near the center of a pool, should ultimately exhaust the pool.

Even with one well to five acres there will be interference. Each well, and its future behavior, becomes affected by its neighbors. As the gas pressures, which drive oil into the wells, drop, productions of old wells decline. Gushers stop flowing and are put to pumping. Presently there is not sufficient pressure to force oil

into the hole, and vacuums are placed on the wells. Close drilling aggravates all of these conditions. In June, 1920, the fluid level had dropped so low in the Burkburnett Townsite pool that oil would only rise, in the hole, half way up through the sand. Because of close drilling and marked interference of wells, the productive history of Burkburnett Townsite and Northwest Extension is practically a duplicate of the productive history of any oil well of either pool. The result of this interference was that in the Burkburnett Townsite pool, for example, within six months after the discovery well was drilled, the average *initial* productions of wells had dropped to 300 bbl. in the first twenty-four hours, and, in July, 1919, in this same field, which a year previous had boasted of 2,000-bbl. gushers, the average initial production of new wells was 36 bbl. per day.

Naturally, it seems that where so much oil was produced and sold, a profit must have been made. A rough accounting, as between costs of development and receipts from production up to June, 1920, for Burkburnett Townsite and Northwest Extension, not including George and Central pools, shows that much oil must yet be produced to show a profit on the venture as a whole. As it stands, many concerns have undoubtedly operated at a profit and still many more are represented by stock certificates with only a historical value. In addition, there are many dependent operations of a magnitude almost as great as oil production. These include oil and gas pipe lines, tank-car transportation systems, refineries and casing-head gasoline plants.

The following are items of cost of development, production, and losses compared with the sales value of oil produced to date:

COSTS

Wells and equipment within proved acreage—2,136 wells (Estimated at $18,000 per well, including drilling, buildings, tanks and production equipment)	$38,448,000
Acreage:	
3,705 proved acres at $7,500	27,787,500
1,665 contiguous barren acres at $1,000	1,665,000
"Dry" wells—226 wells at $15,000 (Dry wells surrounding two pools, junked and abandoned)	3,390,000
Cost of production—33,000,000 bbl. at 20c. per bbl.	6,600,000
Losses:	
Lightning, fire and wind	1,020,000
Oil (660,000 bbl. at $2.25)	1,485,000
Total	$80,395,500

SALES OF OIL

33,000,000 bbl. of oil at $2.25	74,250,000
Deficit	$6,145,500

The above account is not given as a valuation, as it is by no means a complete statement of expenditures, losses, and gains in the Burkburnett speculation. It simply shows costs of putting holes into the ground to take oil out of the ground up to the time the two pools had passed into the depleted class and were, therefore, of no further interest to the speculator. There were two other phases of the speculation not entirely dependent upon the basic receipts from production—(1) expenditures in the promotion and sale of stock and (2) bartering in royalties. If all of the wells had been gushers and all of the oil had been turned into the Red River most of this business would have gone merrily on.

In setting an estimated cost of $18,000 per well for development, the costs of cleaning out with cable tools, buildings, tanks and all equipment necessary for the operation of a producing property are included. It is thought that this is a conservative figure and that it is probably low.

A value of $7,500 per acre is given for proved acreage. It is probable that, as an average, this figure is also low. Some acreages started off at a low figure, and much trading was done in acreage, with profit. After the trading was all over, however, the then holders of acreage had to look to sales of production for a profit on their investment. Many wells on small tracts in Northwest Extension were still waiting, six months or more after discovery of the pool, to be drilled into the sand. The owners of these tracts could hardly hope to get sufficient production to pay for the investment.

The 1,665 contiguous barren acres represent narrow strips on the edges of the pools in which "dry" holes were drilled, thus proving the productive limits of the pools. These are justly chargeable against the venture, because in most cases stock was sold and wells were drilled with the promise and expectancy of being classed among the winners.

The cost of those "dry" wells is set at $20,000, and $5,000 per well is allowed for junk value, making an average net cost per well of $15,000. Many of these were deep holes and cost much more than $20,000 to drill.

Pumping Expenses Consumed Fuel Oil

The cost of production is set at 20c. per barrel. This is thought to be a reasonable figure, although probably low. Many wells were swabbed during the first thirty to ninety days of their productive life at a cost of $100 or more per day. As the wells declined, production costs rose, and in single-unit steam pumping plants, using 12 to 18 bbl. of fuel oil daily, operators were literally burning all the oil they produced to keep the wells pumping.

Under losses, the estimated losses owing to the destruction of property by lightning, fire, and wind, as reported by various oil-trade journals, are summarized. Undoubtedly there were other losses which did not come to my attention. The hazard of loss by fire was greatly aggravated by the way buildings, boilers, derricks and oil storage were crowded together.

It is known that a great deal of oil was lost through willful wastage, through seepage and evaporation. Two per cent of total production is the quantity used for this item. Losses owing to evaporation alone would more than cover this amount.

Against all of the above costs are set the receipts for 33,000,000 bbl. of oil sold at an estimated average price of $2.25 at the well. That is, up to June 20, 1920, $74,250,000 had been returned, from oil, on expenditures and losses amounting to more than $106,000,000.

Enterprise Represents Extravagance

The two pools could have been developed economically with 740 wells, which would be sufficiently rapid and close drilling on 3,700 acres of land in two years' operations. These wells at $18,000 each would have cost $15,380,000, as against the cost of $38,448,000 for the wells actually drilled. The pool would have been developed by oil operators, and because of the smaller number of wells there would have been no need to employ hundreds of workers inexperienced in either drilling for or producing oil. There would have been less congestion and therefore less hazard from losses owing to lightning, boiler explosions, and accidental fires. Wells would have been operated in larger groups and production costs correspondingly lowered. More careful drilling would have possibly proved the presence of shallow productive sands which, there is good reason to believe, exist.

NEWS FROM THE OIL FIELDS

The Situation of Austria's Petroleum Industry

From Our Vienna Correspondent

Vienna, Nov. 28, 1920—The two great world-embracing oil concerns, Standard Oil and the Dutch-English group, continue their struggle for the dominant power in all the producing and consuming territories. There is no sign of any relaxation of the compulsory rationing (Zwangbewirtschaftung) among Central European consumers. In the past few weeks the supplementary supplies (Zuschübe) were very satisfactory because the wares delayed in Poland by previous military conditions could now be forwarded and the oil boats on the Danube loaded during the summer also arrived from time to time. The previous shortness in petroleum products has now given way to heavy offerings of benzine, gas oil, and lubricating oil. On the other hand, the supplies of illuminating oil are far from meeting the need.

The Austrian situation has also been slightly improved, because the shipments of the last few weeks seem to have been sufficient with existing supplies to meet needs up to the end of January. The persistent shortage in illuminating oil is due to the lack of tank cars on the railways and the extraordinary low stage of the Danube, so that the purchased supplies have not been able to materialize in sufficient volume just at this season of maximum consumption. However, the supply of illuminating oil already stored in Austria, together with the amount on the way, permits the domestic ration to be increased beyond that of November, and also an increase in the supplementary reserves assigned for distribution by the government. The latter will probably be able to increase the quotas for factory and house industrials. Appropriate quantities are also assured for agricultural premiums offered for grain deliveries. In the face of this apparently favorable situation one cannot suppress a fear that traffic disturbances, such as are all too frequent in the winter, and an over early closing of Danube navigation may again interrupt supplies. It therefore seems necessary to continue the existing economic measures, particularly in the case of illuminating oil.

The rise in Polish exchange, which continued into the first days of November, and the sudden rise in Rumanian values have further increased prices, and no fall may be expected until existing stocks, purchased under high exchange, have been disposed of. Petroleum stations would have held the oil price at its former level while raising prices for benzine and other products.

Wyoming Districts Produce in Excess of Handling Facilities

From Our Special Correspondent

The Standard Oil Co. of Indiana is adding 135 high-pressure stills to its plant at Casper. The number now in operation is 100.

One of the largest wells in the Salt Creek field was completed a short time ago by the Salt Creek Consolidated Oil Co. on Sec. 31-39-78. The well is making 3,500 bbl. daily.

During October 38 wells were completed in the state. Of these nine were failures, four were gas wells, and the others made a combined production of 2,415 bbl. daily. On the first of November 385 rigs were in operation.

Production in the Wertz and Ferris districts has reached the stage that pipe lines are no longer able to handle the oil. Several wells have been drilled to the producing sand and must wait, while some producing wells have been shut in. In a few cases the gas pressure is too great to permit the wells to be shut in without injury and the oil is run into earthen tanks.

Oil, together with a great deal of water, has been struck in a well being drilled at the Centennial Valley Oil Co. near Centennial. An attempt will be made to case off the water. The well is located in T. 15 R. 7, in the Laramie region.

Increase in Kentucky Production

From Our Special Correspondent

A total of 7,147,089 bbl. of oil was produced in Kentucky during the ten months ended Oct. 31, according to the report of E. E. Loomis, secretary of the Kentucky Oil Men's Association, made at the annual meeting in Lexington on Dec. 11. This is an average monthly production of 714,708 bbl. The production in October was 746,819 lb., which shows that there has been a gradual increase during the current year.

An influx of oil operators is expected in Edmonson County following the recent discovery of oil near the Warren County line. This is new territory. Late reports from Johnson County show that the initial well of R. A. Chiles and the Cumberland Petroleum Co., recently brought in on Keaton's Fork, is one of the best in that territory, the first day's production amounting to 135 bbl.

Work on the test well on the Burchett farm, Logan County, is progressing favorably. The test is now down over 200 ft.

Drilling operations in the Lawrence County field have been suspended by the Ohio Fuel Oil Co. and some of the other companies.

Texas Notes

From Our Special Correspondent

Fire at Baytown on Dec. 8 destroyed the Humble Oil & Refining Co.'s unloading dock and trestle, together with several empty oil tank cars. Total loss was about $250,000.

It is reported that Stone & Webster have acquired a controlling interest in the Simms Oil Co. The general office will be moved from Houston to Dallas.

Some wells of considerable interest have been completed recently in the Gulf Coast region. In the old, nearly dormant field of Markham, Matagorda County, the No. 1 Meyers well was completed by C. G. Hamil et al. and came in flowing 500 bbl., with the bailer stuck in the hole. Later report states this flow has materially increased. The well is on the northeast edge of the dome, and is 1,590 ft. deep. The salt in this dome is 2,800 ft. deep, and all wells so far have made their production from strata immediately above the cap rock.

At Goose Creek the No. 1 Adey well of the International Oil Co. came in flowing 800 to 1,000 bbl. per day. This well is only 2,100 ft. deep and is west of the creek. Both the depth and location are new for Goose Creek.

The Sinclair Oil Co.'s No. 10 Masterson well, at Damon Mound, came in making an initial flow of 5,000 bbl. from 3,140 ft. This well extends the field somewhat farther to the east around the south end of the dome.

The big wells of the north extension at West Columbia are showing a little less basic sediment in their flow. The percentage of water in these wells is as yet small. The Humble Oil & Refining Co. recently completed its No. 27 Japhet well in this field, with an initial flow of 14,000 bbl. from 3,395 ft.

Louisiana Court Decides Lessee Liable If He Fails To Drill

From Our Special Correspondent

In the suit between Oliver S. Pendar and the Empire Gas & Fuel Co., Pendar has been awarded $60,000. The Empire Co. had promised to drill on Pendar's land and failed to carry out its agreement. This suit has been watched with interest, as it indicates that the lessee, contracting to drill a well and pay the lessor a certain amount out of the proceeds from sales of oil from the well, is liable to the lessor for the consideration promised if the well is not drilled.

The coastal fields have been quiet. The only completion at Vinton recently was the Texas Co.'s No. 14 Gray well, now producing 75 bbl. by pumping from 2,275 ft. Vinton field is producing about 3,600 bbl. daily.

Book Reviews

A Student Reverie: An Album of Saxony Days. By Frederick Gleason Corning, E.M., L.L.D. Cloth; pp. 69; 7½ x 10¾. New York, 1920. Published privately.

This is a charming and unusual volume, written in an instructive yet leisurely and at times whimsical mood, which plainly it was a recreation to the writer to pen. The book will be a treasured memorial for his friends. An old Freiberg man, he sends his thoughts back to the picturing of the famous old mining school which produced so many great American engineers, in the days before our own mining schools had grown to full stature. He pictures Freiberg from the educational, mining, social, and sentimental side, with delightful leisurely reminiscences of old-time friends, like "Jack" Hammond (John Hays), Franklin Guiterman, R. W. Raymond, and others. To illustrate his freedom from strain, it may be noted that the author, happening to touch on the charms of Saxon girls in those good old days, digresses for a couple of pages to comment humorously on the extremely elevated skirt of the present-day fashion.

As a record of a notable period in the history of American mining education, with a group of distinguished engineers who did so much to develop mining in this country and the rest of the world, this book has real historic value.

In these days of poor paper and indifferent typography, the book is also surprising, for it is a modest "edition de luxe" and the details of paper, type, and illustration have evidently been attended to with artistic and loving care. The volume is dedicated by the author to his wife. J. E. S.

The Mining Laws of the British Empire and of Foreign Countries, Vol. 1, Nigeria. By Gilbert Stone. Cloth; pp. 254; 6½ x 10. Published by H. M. Stationery Office, Imperial House, Kingsway, London W.C.2. Price, 15s.

The author of this book worked under the advice of the legal committee of the Imperial Mineral Resources Bureau, assuring comparative accuracy and correctness in its preparation. He had little or nothing to guide him, having to gather his materials from various sources, so the difficulty of his task may be appreciated.

With the union of Northern and Southern Nigeria, in 1914, into a single British Protectorate, all former mineral ordinances and regulations were repealed, their place being taken by the Minerals Ordinance of 1916, as amended by the Minerals (Amendment) Ordinance of 1918, and, so far as mining for mineral oil is concerned, by the Mineral Oil Ordinance of 1914.

Various regulations have been issued under the Minerals Ordinance of 1916. Other ordinances, concerned in part with mining law, or relating to collateral subjects, such as land registration, stamps, master and servant, surveys, explosives and leaseholds, are considered. Being a British colony, the English common law, the doctrines of equity and the statutes of general application of Great Britain in force in England on Jan. 1, 1900, are in force in Nigeria, subject to the terms of any Nigerian ordinance.

The author has arranged the matter into two parts, the first being a general analysis of the country's mining law, and the second devoted to an orderly statement of the ordinances and regulations, notices and forms. A detailed index adds much value to the volume. As yet there is no case law in Nigeria except that applied from outside decisions.

Mining engineers and executives, prospectors, and financiers may depend more on their own knowledge of the mineral law of Nigeria by making use of this book. W. G.

Technical Papers

Marble—U. S. Geological Survey Bulletin 682 (price 30c. from the Superintendent of Documents, Washington, D. C.) is a 118-page pamphlet entitled "Marble Resources of Southeastern Alaska." It is a very practical treatment of the subject, describing the deposits not only from the standpoint of the geologist and miner but also devoting many pages to commercial considerations. Many excellent photographs showing the uses of marble are included, as well as colored plates of attractive specimens.

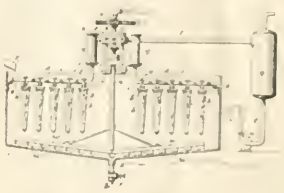
Oklahoma Oil Map—The Petroleum Station of the Bureau of Mines, in cooperation with the Bartlesville Chamber of Commerce, has issued a map of the Hewitt oil field, Carter County, Okla. This map is drawn to the scale of 1 in. equals 1,000 ft. and shows locations of all rigs, drilling wells, producing wells and abandoned holes in Township 4 south, Range 2 west, up to the date of Nov. 1, 1920. Copies may be obtained from the Bartlesville, Okla., Chamber of Commerce for 35c. each.

Talc—"Talc Mining in New York" is the subject of the Bureau of Mines *Reports of Investigations*, Serial No. 2,171, obtainable upon request from the Bureau at Washington. This pamphlet of fifteen pages is confined largely to brief descriptions of the mines and mills of four companies. Flow sheets are given in each case.

British Columbia—The Geological Survey of Canada, Ottawa, has published as Memoir 117 a seventy-three-page bulletin on the geology and ore deposits of the Ainsworth mining camp, in British Columbia. The valuable metals are lead and silver. The Consolidated Mining & Smelting Co. and the Florence Silver Mining Co. are actively interested in the district.

Recent Patents

Thickener—No. 1,359,162. A. L. Genter, Salt Lake City, Utah. A modification of the earlier design of Genter thickener, in which the filter elements



are suspended in a tank as shown in the illustration. A vacuum is maintained inside of the filter elements.

Classifier—No. 1,359,105. R. H. Richards, Jamaica Plain, Mass. A method of separating granular matter from the colloidal material in slimes, which consists in feeding diluted slime to a circular table the surface of which is inclined sufficiently to cause the forward movement of colloids, but insufficiently to permit a substantial forward movement of granular material.

Hydrometallurgy of Copper—No. 1,358,619. N. C. Christensen, Salt Lake City, Utah. The process patented consists in lixiviating the ore with a solution of SO_2 and precipitating the copper from the pregnant solution as a cuprocuprie sulphite by adding Cu_2O. By means of the process outlined in another patent, No. 1,357,952, Mr. Christensen precipitates the copper in the same form by adding metallic copper.

Roasting Copper Ore—No. 1,358,293. W. H. Corbould, Selwyn, Queensland, Australia. The process described embodies roasting in a furnace of special design in which the ore is alternately subjected to pressure and vacuum during the calcining operation.

Flotation Process—No. 1,357,556. D. F. Haley, Wallace, Idaho. By this process the ore pulp is circulated through a pipe which terminates somewhat above the pulp level in the cell. The air is entrained as the stream of pulp strikes the surface of pulp in the cell, somewhat in the manner of the cascade system of flotation.

Hydrometallurgy of Copper—No. 1,357,495. W. E. Greenawalt, Denver, Col. The copper is dissolved from the ore by acid, resulting lean and rich solutions being kept separate. The rich solutions are electrolyzed, the salts of the elements with a variable valency being raised to a higher valency. From the lean solution the copper is precipitated as the sulphide, the resulting copper sulphide, along with SO_2, being used in treating the rich solution.

Amalgamator—No. 1,351,497. Francis M. Lewis, Seattle, Wash. A new design of amalgamating plates.

Oil-Well Controller—No. 1,354,694. Charles E. Sage, Rochester, N. Y.

COURT DECISIONS IN MINING CASES

By Wellington Gustin

Government Recovers Kern County, Cal., Oil Lands

Companies' Claims, Resting on Conveyances and Contracts, Found To Be Void—Fixtures and Improvement's Revert to Public

A decision of the U. S. Circuit Court of Appeals denying a rehearing in the case of the United States against the Chanslor-Canfield Midway Oil Co., the Recovery Oil Co., Fred H. Hall and others, re-establishes the right of the Government in certain public mineral lands in Kern County, Cal. This land came with the area of the Presidential withdrawal order of Sept. 27, 1909. It had been located as an oil placer mining claim in 1903 by Hall, in the names of two members of his family and seven of his neighbors. These neighbors were ignorant of this action, and when subsequently advised thereof declined to pay any of the expenses incident thereto, or to ratify what had been done; but they did execute a deed to one of Hall's family for his benefit, conveying what interest they might have, if any. About five years later the family holdings were conveyed to Hall, who in 1909 made the development contract under which the Midway Oil Co. entered in possession. By this contract Hall retained one-half of the quarter section, which half was conveyed to the Recovery company in 1910.

The United States brought suit to restrain waste and depletion of the oil from the lands, to enjoin defendants from asserting title or interest in the lands, from trespassing thereon, for the appointment of a receiver and for an accounting. The District Court found that, although there was no previous agreement between Hall and his neighbors that the location made in their names should inure to Hall's benefit, and no conscious intent to violate the law, the manifest effect of the transaction, if valid, was to enable Hall to acquire more land by one location than the law permits, and would therefore be invalid. The rule of law is quoted:

"Any scheme or device entered into whereby one individual is to acquire more than that amount (twenty acres) or proportion in area constitutes a fraud upon the law, and consequently upon the Government, from which the title is to be acquired, and any location made in pursuance of such a scheme or device is without legal support and void."

The Circuit Court of Appeals is satisfied that the locations were wholly invalid, that Hall gained nothing by taking the deed from the named locators to a member of his family, and thereafter from this party to himself. Therefore he had no right or interest to convey and conveyed nothing.

Another point contended for by the companies was that by the Pickett Act, the act of Congress of June 25, 1910, they were given the right to continue in possession of the lands and prosecute their work to a discovery, and thereupon to have patent to said lands, thereby to that extent abrogating whatever effect the Presidential withdrawal order of 1909 had on the lands; that the entry of the lands and the development thereof was pursuant to invitation of the United States under its policy established long before the withdrawal order. But the court found the facts did not show such diligent prosecution of work for discovery on the lands at the date of withdrawal as to take them out of the operation of the withdrawal order. It was admitted that there was no work on the lands at that time, or for months afterward, but it was claimed that the companies were then making preparations by assembling material and employing labor for future development. The companies owned or controlled many claims in the neighborhood, some of which were being operated and developed, but it did not appear that any work or preparation therefor was intended for the development of the particular lands in question, as distinguished from the company's other undeveloped holdings. The court said the law contemplates and requires something more to bring an occupant or claimant within the saving clause of order of withdrawal on the Pickett Act (Comp. Sts. 4523-4525).

Again, it was contended that because the agents of the Government had full knowledge of the situation, and not only refrained from advising people but induced them to proceed and expend money in good faith, the United States is estopped to enforce its claims. But the court said the law on this proposition is that the United States is neither bound nor estopped by acts of its officers or agents in entering into an arrangement to do or cause to be done what the law does not sanction or permit; neither is laches or neglect of the United States, as a general rule, on the part of officers of the Government a defense to suit by the Government to enforce a public right or protect a public interest.

The District Court gave the United States judgment in damages for $76,751 and decreed that all fixed improvements upon the lands belonged to the United States and should be turned over, together with the lands, free of all claims of the companies or others. The Circuit Court of Appeals modified this decree so as to allow 7 per cent interest to the Government upon the value of the oil from date of its conversion.

Osceola Lead & Zinc Co. Loses Appeal

Missouri Supreme Court Upholds Circuit Court in Sustaining Lien of Forest City Lumber Co.

The Osceola Lead & Zinc Mining Co. has lost its appeal to the Supreme Court of Missouri from judgment against it in the Jasper County Circuit Court in favor of the Forest City Lumber Co. Damages were claimed by the latter because the mining company had removed two steam boilers, an engine, and other pieces of machinery and appliances used in carrying on lead and zinc mining, upon which the lumber company held a mechanic's lien, from Newton County to Jasper County. The lien had been filed against the Sleepy Hollow Mining & Development Co., in Newton County. The articles of equipment and machinery had been in Jasper County before the lien claim was filed, and had been taken from Jasper County to Newton County by the Sleepy Hollow company after it had acquired title to them by purchase from their original owner, the Leroy Mining Co. To secure payment of the purchase price the Sleepy Hollow gave a deed of trust on the articles in favor of the Leroy Mining Co. The Sleepy Hollow company moved the property to Newton County and the deed of trust was recorded in this county. The mechanic's lien of the lumber company was established in this county. Later the property was sold under the deed of trust and purchased by the Osceola company, which moved it back to Jasper County.

The lumber company established its lien as prior to defendant's lien under its deed of trust in the Newton Circuit Court; and in the Jasper Circuit Court it obtained a judgment against the defendant Osceola Mining Co. for the latter's removal of the property. The appeal of the Osceola company from the judgment in the Jasper Circuit Court has been dismissed by the Supreme Court.

Colorado Court Holds Contract Power Rate Valid

The Supreme Court of Colorado has handed down a decision favorable to the Golden Cycle Mining & Reduction Co. in each of two suits brought by it to secure modification of an order of the Public Utilities Commisson requiring the mining company to pay a greater rate for electric current than that stipulated under a contract with the Colorado Springs Light, Heat & Power Co. The order from which appeal was made in one case required the mining company to pay about $10,000 a year more than its contract price. The court held the rate was fixed without authority.

ECHOES FROM THE FRATERNITY

New Mexico's Legislative Commission Recommends Repeal of Mine Taxation Laws

The commission appointed at the last session of the New Mexico Legislature to investigate and report on proposed changes in the laws and methods of administration of the state recently issued additional portions of its report.

In the chapter on mine taxation the report brands the whole system of the law as inexact and arbitrary in its methods of arriving at market value, and as inequitable both as between mines and other classes of property, and as between different mining properties within the class.

Concerning the "contiguous property" clauses, the report regards them as lacking an adequate excuse for their existence. It recommends that, whatever method of taxing mines is adopted, only such reserves shall be allocated to producing mines as are reasonable from an engineering and economic point of view.

As to the new plan the report continues: "In our opinion the only proper way to arrive at valuations of mineral reserves is to vest the State Tax Commission with power to fix the values and to provide them with professional assistance. Any attempt to impose arbitrary limitations is apt to result in under-assessment and is certain to result in inequality. In case of over-assessment there is always resort to the courts, and since properties of this type are usually held in large blocks that resort will not be closed because the expense of appeals is out of proportion to the amounts involved."

Specific Recommendations

The specific recommendations are:

"1. That all legislation providing for special procedure in connection with the taxation of mines, including the contiguous property clause, be at once repealed.

"2. That new legislation be passed specifying that all mining property shall be valued on precisely the same general principles as other real estate.

"3. That power to assess all mines and mineral property be vested in the State Tax Commission as reorganized in accordance with our recommendations made elsewhere in this report.

"4. That the tax commissioner be supplied with the necessary professional assistance."

The sum of $25,000 is named as necessary to make the initial valuation. It is further recommended that an engineer of national reputation be engaged to undertake the work; that it would be highly desirable to retain one of the principal assistants in the original valuation as a permanent employee of the Tax Commission at a salary of about $4,500.

Le Roy Memorial Scholarship Needs More Funds

At a smoker held by members of the British Columbia University Service Club in Vancouver, B. C., last month, Dean R. W. Brock of that university outlined the present standing of the Le Roy Memorial Scholarship and expressed confidence that no difficulty will be experienced in raising the $10,000 required to place the fund on a secure basis. Major Brock explained that "the scholarship, which is in memory of comrades killed in the late war, is for the purpose of enabling a returned soldier student at the British Columbia University to commence or complete a degree course when, through wounds or other disability, he could not afford to do so. The first scholarship award, made last spring, was of the value of $250, for which a capital sum of $3,000 had been raised; but this sum was quite inadequate to meet the expenses of a beneficiary. The scholarship is named in honor of the late Capt. O. E. Le Roy, who commanded the British Columbia detachment of the Western Universities Battalion, and who was killed while serving with the 46th Battalion in front of Passchendaele." Three hundred members of the club were allotted to two teams to make a "drive" to raise the needed money. The late Captain Le Roy was one of the geologists of the Geological Survey of Canada, and did much geological field work in mining districts of British Columbia for a number of years.

Secretary Payne Would Improve Alaskan Steamship Service

Discussing Alaska's needs the Secretary of the Interior in his report to Congress has the following to say:

"At the threshold of Alaskan development is the subject of transportation. Adequate steamship service with reasonable rates for passengers and freight from the Pacific Coast to Alaska is imperative; now the service is inadequate. The Alaska Steamship Co., under the same control as the Copper River Railroad and the copper interests in Alaska, and the Pacific Steamship Co., operate a more or less regular service. There is not enough business for both companies. Ordinarily the boats run about 50 per cent capacity, while during the spring and fall, peak-load seasons, persons and freight are compelled at times to wait weeks for space. The Alaska Steamship Co. has a strong position in that its copper ores mined in Alaska furnish return cargoes for its boats.

"A simple solution of the problem would be to consolidate the two companies, and reduce expenses by taking off unnecessary boats during ordinary times. This would give a reasonably full cargo at all times. Then secure from the Shipping Board, if need be, additional boats to meet peak load demands which come uniformly in the early spring and early fall, the Shipping Board to see that a substantial reduction in rates and fares results. The board has ample power to do this. Efforts have been made to accomplish this result but so far without success, the Alaska Steamship Co. refusing to sell.

"Unless some such plan is effected the necessity for a genuine development of Alaska may make it necessary for the government to operate its own line of steamships to Alaska, even at a loss, and provide an adequate service at reasonable rates."

Engineering Standards Committee Adds New Member Bodies

Twenty-four Organizations Now Represented—Officers and Executive Committee Elected at Annual Meeting

The American Engineering Standards Committee has recently been enlarged by the representatives of the following four additional member bodies: Department of Agriculture, Department of the Interior, Gas Group, consisting of American Gas Association, Compressed Gas Manufacturers' Association, International Acetylene Association, and the American Electric Railway Association.

There are now forty-seven members of the committee, representing seventeen member bodies in all. Twenty-four organizations are represented on the committee, as three of the member bodies are groups of organizations.

At the annual meeting of the committee held in New York City on Dec. 4 A. A. Stevenson, of the American Society for Testing Materials, was re-elected chairman for 1921 and George C. Stone, of the American Institute of Mining and Metallurgical Engineers, was re-elected vice-chairman.

The following were also elected to represent the respective member bodies on the Executive Committee: Comfort A. Adams, American Institute of Electrical Engineers; Martin Schreiber, American Society of Civil Engineers; Fred E. Rogers, American Society of Mechanical Engineers; A. H. Moore, Electrical Manufacturers' Council; Dana Pierce, Fire Protection Group; A. Cressy Morrison, Gas Group; N. A. Carle, National Electric Light Association; Albert W. Whitney, National Safety Council; Coker F. Clarkson, Society of Automotive Engineers; Thomas H. MacDonald, Chief of Bureau of Public Roads; E. B. Rosa, chief physicist, Bureau of Standards; O. P. Hood, chief mechanical engineer, Bureau of Mines; F. J. Cleary, Navy Department, and J. H. Rice, War Department.

MEN YOU SHOULD KNOW ABOUT

Harris & Ewing, Photo.
MARION E. RHODES

Quite contrary to the usual order, the new chairman of the Committee on Mines and Mining of the House of Representatives, **Marion E. Rhodes**, is intimately familiar with the mining industry. Mr. Rhodes comes from Potosi, Mo., and represents in Congress the Thirteenth Missouri district, which includes the counties of Bollinger, Carter, Iron, Jefferson, Madison, Perry, Reynolds, St. François, Ste. Genevieve, Washington, and Wayne. These counties in 1919 produced 92 per cent of the lead output of Missouri, the prime lead-producing state of the union for twenty years past. When the census of 1910 was taken Mr. Rhodes' Congressional district was a large contributor to the state's output of zinc and barytes, in whose production the state also led at that time. Washington County, Mo., the new chairman's home, produces 75 per cent of Missouri's output of barytes; and Madison County is the only point in the United States where cobalt is continuously produced.

Mr. Rhodes will resign his place on other committees that he may give his undivided attention to the Committee on Mines and Mining. In conversation with the correspondent of the *Engineering and Mining Journal* Mr. Rhodes stated that he has noticed the great zeal of the chairman of the Committee on Agriculture, and the chairmen of other committees, to be intensely active to better the conditions surrounding the industries with which their committees have to deal. It is his intention to do exactly that thing for the mining industry. In his opinion the mining industry today as never before needs encouragement, when lead, zinc, copper and other metals are selling at prices entirely out of proportion to the costs of their production.

Immediately after the first of the year Mr. Rhodes plans to begin a series of hearings on various measures which are before his committee. In addition, he expects to make inquiry into some of the economic phases of the mining industry, in an effort to determine what steps are possible to provide for the stimulation of mining.

George I. Adams has accepted the chair in geology at the University of Alabama.

E. C. Harder has returned from a trip to South America in the interest of the Aluminum Company of America.

J. P. Dunlop is making a tour of the mines in the Middle West in connection with mineral-resources statistics.

F. W. McNair, president of Michigan College of Mines, Houghton, Mich., was a recent visitor in New York City.

H. G. Palsgrove has been appointed superintendent of mines for the Smuggler Union Mining Co., Telluride, Col.

John White, field engineer for American Metals Co., Ltd., is making examinations in the Lordsburg, N. M., district.

W. Motherwell, who has been running a series of flotation tests at Allenby, B. C., has returned to San Francisco, Cal.

James P. Porteus, superintendent of the Bonney mine at Lordsburg, N. M., will be in San Francisco until the first of the new year.

Ross B. Hoffmann, mining engineer of Oakland, Cal., is in New York City, and expects to sail for London on professional business Dec. 28.

F. Leslie Ransome is engaged in geologic work on the ore deposits of the Oatman district of Arizona. He is being assisted by **M. G. Gulley**.

"Pat" Sweeney, mill superintendent for the Kennecott Copper Co., and **William Clulow**, assistant engineer, have resigned those positions and are now in Seattle.

Max G. F. Söhnlein, consulting mining engineer, of Santiago, Chile, was in New York City this week. He sailed for Chile on the "Essequibo," on Dec. 21.

W. J. Loring and **James F. Callbreath, Jr.**, president and secretary, respectively, of the American Mining Congress, were in New York City last week.

Edward J. Maney, general manager of mines on the Mesabi Range, Minnesota, for the Shenango Furnace Co., has gone East to attend to business matters.

E. S. Larsen, of the Geological Survey, has completed an examination of certain contact-metamorphic tungsten deposits in New Mexico, California, and Oregon, and has returned to Washington, D. C.

Charles N. Bell, of Telluride, Col., has resigned as superintendent of mines for the Smuggler Union Mining Co. to accept an appointment with the Mines Exploration Co. Hereafter his headquarters will be in Denver, Col.

W. J. Olcott, president of the Oliver Iron Mining Co., and **F. E. House**, president of the Duluth & Iron Range R.R., are in New York attending a meeting of the presidents of the subsidiary companies of the U. S. Steel Corporation.

Dr. Eugene F. R. Haanel has retired from the position of Canadian Director of Mines in accordance with the provisions of the superannuation act. Dr. Haanel became superintendent of mines in connection with the Interior Department at Ottawa in 1901, and was appointed Director of Mines in 1907, when that department was organized. On Dec. 14, 1920, he was presented with an appreciative farewell address from forty of his recent associates in the Department of Mines, testifying to the value of his scientific work and his personal worth.

SOCIETY MEETINGS ANNOUNCED

The American Society of Mechanical Engineers announces that the Waterbury, Conn., branch meeting in the Chase Company Office Building, will be addressed on Jan. 3, 1921, by Capt. Harry George, who will describe "Mining Experiences of a Prospector." On Jan. 10 the Hartford, Conn., branch will be addressed, at the City Club, by Carl L. Lesher, editor of *Coal Age*, on "The Responsibility of the Coal Buyer."

On Jan. 14 the "Story of Petroleum" cinema, by the Bureau of Mines, will be shown before the meeting of the Columbus, Ohio, section of the A. S. M. E. at the Engineers' Club in the Southern Hotel, that city.

On Jan. 25 the Atlanta, Ga., section of the A. S. M. E. meets with the local section of the A. S. C. E. in the Carnegie library building. B. M. Hall will speak on "Water Power Development." Mr. Hall, who is now with the Georgia Railway & Power Co., was a supervising engineer with the U. S. Reclamation Service and organizer and chief engineer of the Porto Rico Irrigation Service from 1908 to 1910.

OBITUARY

Capt. George Brewer, of Bessemer, Mich., died suddenly of heart failure on Dec. 14, while answering a summons to appear as a talesman at the courthouse. Capt. Brewer was seventy-eight years old, and one of the oldest mining captains on the Gogebic Range. In 1885 he opened the Aurora mine, near Biwabik, Minn., one of the oldest properties on the Mesabi Range, and since that time had been directly affiliated with the mining industry. He was generally in the employ of the Oliver Iron Mining Co.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

LEADING EVENTS

WEEKLY RÉSUMÉ

The number of mining companies that have been compelled to reduce wages, and to curtail or suspend production altogether, owing to market conditions, is steadily increasing. Prominent in the list of camps so affected is Butte, where a reduction of $1 per day, affecting all miners, has been announced. Charles Butters has proposed in a letter to E. P. Earle, president of Nipissing, that all copper and silver producers shut down, the quicker to bring about a better market. The Consolidated M. & S. Co., at Trail, is said to be refining custom ore except where the shipper is prepared to finance the carrying or marketing of the bullion. In Arizona, a receiver has been appointed for the Tennessee and Schuylkill mining interests. At Douglas the Apache Powder Co. is erecting a fuming acid plant at the C. & A. smelter. In California, a friendly suit for a receiver has been brought against the New Idria Mining Co. In Nevada, the Prince Consolidated and Virginia Louise mining companies are both planning to increase their capitalization. Drilling by the Nevada Consolidated at Ruth has indicated the presence of a new ore-body.

In Washington both Senate and House favor the plan requiring assessment work on mining claims to be done in 1920, but allowing six months' grace for doing this work. Mineral export tariff bills are likely to be held over until next session.

Cananea's Suspension Postponed

The Cananea Consolidated Copper Co. of Cananea, Sonora, Mex., has decided to postpone until Jan. 15 the suspension of operations that had been announced for Dec. 15. No new men are being engaged and the operating force is now at a minimum. Five furnaces are being operated.

Canada Copper Mill Shuts Down

The new 2,000-ton concentrator of the Canada Copper Corporation at Allenby, British Columbia, has shut down owing to the condition of the copper market. This mill was placed in operation on Oct. 18 of this year, since when twenty-five carloads of copper concentrates, running from 40 to 50 tons per car, have been shipped to the smelter of the Consolidated Mining & Smelting Co. of Canada at Trail.

Control of American Smelting & Refining Co. Assailed By Karl Eilers

Guggenheims Disregard Stockholders' Interests and Operate Company for Own Ends, Says Former Vice-President—Asks Writ of Mandamus To Inspect Stock Books

Asserting that access to the stock books of the American Smelting & Refining Co. had been denied him, Karl Eilers, formerly a director and officer of the company and who was defeated for re-election as vice-president at the last annual meeting, has asked the New York Supreme Court to issue a writ of mandamus requiring the company to permit him to inspect the books. In his petition Mr. Eilers alleges that the management of the smelting company is directing its affairs to further its own personal and selfish ends, in disregard of the company's interest, thereby retarding its development and causing it to lose millions of dollars. His purpose in seeking the writ, he states, is to enable him to communicate with other stockholders relative to a change in management at the annual meeting next April. In his personal and representative capacities, Mr. Eilers states, his total holdings of the company's stock are 3,538 shares, a greater number than held by all the officers and directors of the company combined. The petition reads in part as follows:

"In or about 1907 the holdings of stock of the Messrs. Guggenheim, except for a very small portion, were sold by them. As I am informed and believe, such sale was forced upon the Messrs. Guggenheim by reason of business reverses. From that time the Messrs. Guggenheim apparently ceased to regard the interests of the corporation and sought to employ it solely to serve their own ends. In spite of the fact that they no longer held stock in the corporation to an amount which gave them any substantial interest in its affairs, they continued their membership on its board of directors and insisted upon dominating that board and the affairs of the corporation.

"Early in 1919 the said Solomon R. Guggenheim resigned from the board; the said Messrs. Isaac, Daniel and Murry Guggenheim remained upon the board, and the said Simon Guggenheim became president of the company. By that time the Messrs. Guggenheim had so perfected their domination of the company that they did and could with confidence presume the acquiescence of a majority of the directors. When in January of that year they decided that Mr. Simon Guggenheim should become president of the company, Mr. Daniel Guggenheim, the then president, announced this in a circular letter to the stockholders as "the expressed wish of the board of directors." The board of directors had not in fact been notified, much less consulted, in respect of the proposed change in the presidency of the company; they had been given no opportunity to express any wish in the matter. The board met the expressed wish of the Messrs. Guggenheim and elected Mr. Simon Guggenheim their president.

"During all the time aforesaid, from 1907 to 1920, while I was a director and officer of said corporation, I found it impossible for me, or any of my associates on the board of directors, to secure the adoption of any plan for the operation of the company against the opposition of the Messrs. Guggenheim. The majority of the members of the board of directors were controlled absolutely by the orders of the Messrs. Guggenheim and were in fact merely dummies representing the Guggenheim interests. . . .

"About 1910 the board of directors on the orders of the Messrs. Guggenheim and over the protest of myself and Mr. Morse adopted a resolution that the salaries of officers, directors and employees should be fixed by a so-called salary committee, of which Mr. Murry Guggenheim was then made chairman. At this time Mr. Daniel Guggenheim and Mr. Sol Guggenheim had been drawing salaries ranging from $25,000 to $50,000 per annum, while they were devoting almost their entire time and attention to business matters not connected with the affairs of the company. This was a cause of irritation among the other officers and directors. From that time the board of directors had no power to fix the salaries of the officers and directors of the company, and the board of directors could obtain no information from the Messrs. Guggenheim or from those directors who acted in concert with them as to the amount paid to the officers and directors of the company.

"About 1910 Mr. Newhouse and Mr.

Stewart reported an opportunity to enter the business of tin mining in Bolivia. The company with the consent of the Messrs. Guggenheim expended considerable money in a thorough investigation of this proposition. Upon the report of such investigation coming in, the Messrs. Guggenheim opposed any action relative to the proposition. Thereafter the sons of Messrs. Murry and Daniel Guggenheim, representing Guggenheim Brothers, the Messrs. Guggenheim's co-partnership, were permitted to examine the report of the investigation on file with this company, and thereupon Guggenheim Brothers sent representatives to Bolivia and have since engaged in large tin mining operations there. A demand by certain of the directors of the company that it be allowed to share in such operations was refused by the Messrs. Guggenheim.

Company Acquires Interest in Premier Mine

"In 1919 Mr. Guess, managing director of mines for the company, advised the board of directors that he had secured an opportunity to purchase a one-fourth interest in the Premier Silver & Gold Mine in British Columbia at a price which would be most advantageous to the company. A majority of the members of the executive committee of the company to which the matter was referred were in favor of accepting this offer, but Mr. Simon Guggenheim, a member of the executive committee, and Mr. Murry Guggenheim, a director, objected and opposed its acceptance. It later developed that the sons of Messrs. Murry and Daniel Guggenheim, representing Guggenheim Brothers, desired to purchase one-half of such one-fourth interest. Upon an arrangement being effected which permitted Guggenheim Brothers to purchase one-half of said one-fourth interest, Messrs. Simon and Murry Guggenheim withdrew their objection to a purchase by the company of the remaining half of such one-fourth interest.

Company Formerly Sold Metal as Fast as Refined

"The business of the company is the purchase and smelting of ores of various kinds, and the sale of metals, copper, lead, silver, etc., thus produced. The prices paid by the company for the various ores are based on the current New York quotations for the metals in such ores. The company learned from bitter experience that if losses from fluctuations in the prices of metals were to be avoided, metals must be sold as fast as smelted and refined, and only to the quantity smelted and refined; no sales substantially in advance of production could be made. Prior to the domination of the company by the Guggenheim interests this was the established policy of the company.

"In respect of sales of copper, this policy was abandoned as soon as the Messrs. Guggenheim secured predominating influence in the company's affairs. In copper, under the direction of Mr. Murry Guggenheim, futures were dealt in by the company; that is to say, the company made sales for future delivery against ore to be purchased and copper to be produced therefrom. I believe the Messrs. Guggenheim were influenced to this change in policy in respect of copper sales by their interests in various copper companies. I know that through the Messrs. Guggenheim contracts were entered into making this company selling agent for such copper companies. In 1915 I was informed by a Mr. Willard Morse, one of the company's directors, that as the result of this method of selling for future delivery the company was losing on copper at the rate of $1,000,000 per year. A statement prepared by a Mr. F. W. Hills, the comptroller of the company, disclosed losses from this source for the seven years 1912-1919 to aggregate over $5.000,000.

"My fellow directors, Mr. Morse, Mr. Brush, Mr. Newhouse, as well as myself, protested against this policy, but Mr. Murry Guggenheim insisted upon it and its continuance. Mr. Murry Guggenheim attempted to justify these losses upon the ground that the company, through sales for future delivery, was enabled to retain the business of selling for the group of copper companies with which it had entered into the aforesaid contracts to act as sales agent; that this company could thereby retain 1 per cent selling commission from such copper companies. . . . The copper companies to which I refer are the Utah, Nevada Consolidated, Kennecott, Braden, Chino and Ray Consolidated.

"In 1920 the Messrs. Guggenheim carried their policy of gambling in metals further. At this time the copper market showed a tendency toward a sharp decline in prices. Having made the mistake of selling for future delivery in a rising market, the Messrs. Guggenheim now withheld copper from sale in a falling market. In April, 1920, as the result of this policy, the company had on hand approximately 160,000 tons of refined copper. In the meantime the price of copper had declined at least 5c. per lb. ($100 per ton) with a consequent loss, traceable to the Guggenheim influence, of at least $15,000,000 to the stockholders of the companies concerned, the copper companies and this company.

Loss on Lead Much Smaller—Gain on Silver

"In the company's purchase and sales of silver and lead, Mr. Brush continued to follow the policy, previously followed in sales of copper, of selling currently instead of for future delivery. . . . Under Mr. Brush's policy the company made a profit on its transactions in silver, and the company's losses from fluctuation in prices of lead were held down to the comparatively small sum of $465,060.71 for the period 1904-1918. For the same period, under Mr. Murry Guggenheim's policy, the company's losses in sales of copper, according to a statement by Mr. F. W. Hills, amounted to $4,638,934.85. The Messrs. Guggenheim were not so largely interested in silver or lead producing companies as in copper companies.

"Of the directors of the company, Messrs. Prosser, Newhouse, Stewart, Morse, McGowan and I were those who were outspoken in expressing their views relative to the business and policies of the company. . . . At the time when Mr. Simon Guggenheim was elected president of the company, Mr. Newhouse was made chairman of the board of directors. It is significant that immediately after the annual meeting in April, 1920, when I was forced from the board, to which I shall hereafter refer, Mr. Prosser was promoted to the position of vice-president and at the same time three new vice-presidencies were created and three other directors were placed in those offices. The opposition . . . was silenced.

"Immediately after his election as president, Mr. Simon Guggenheim informed Messrs. Stewart and Morse that their services were no longer required, and demanded their resignations. Mr. Stewart ceased to be a director. . . . Mr. Morse was allowed to continue as a director of the company but in a position of no influence and at a greatly reduced salary. At this time Mr. McGowan declined to continue as a director of the company under Mr. Simon Guggenheim and resigned from the board of directors.

"In March, 1920, a few days prior to the regular annual meeting of the stockholders of the company, I received from Mr. Simon Guggenheim a letter informing me that because of the difference in our views relative to the management of the company, I must sever my connection with the company (Mr. Eilers says he refused to resign). In the next month (April) I failed of re-election as a director."

STOCK OF THE AMERICAN SMELTING & REFINING CO. HELD BY MEMBERS OF THE BOARD OF DIRECTORS

	April 1, 1919		April 1, 1920	
	Preferred	Common	Preferred	Common
E. L. Newhouse	700	.....	700	.....
E. L. Newhouse family	340	.....	340	.....
F. H. Brownell	.....	5	.....	5
Mrs. F. H. Brownell	.....	100	.....	.....
E. Brush and family	205	10	.....	.....
J. Clendenin	390	179	390	179
W. M. Drury	100	120	100	200
Charles Earl	.....	40	.....	40
L. G. Eakins	10	.....	10	.....
Karl Eilers and family	3,375	502	3,575	47
L. Frederick	.....	1	.....	1
H. A. Guess	5	.....	5	.....
D. Guggenheim	.....	100	.....	100
Isaac Guggenheim	1	.....	123	.....
Murry Guggenheim	100	.....	.....	1,500
Simon Guggenheim	500	.....	100	.....
F. W. Hills	132	16	132	16
William Loeb, Jr.	.....	100	.....	10
W. S. McCornick	.....	1	.....	1
W. E. Merris	.....	.....	.....	8
W. S. Morse	10	.....	10	.....
Walter T. Page	500	.....	600	.....
H. A. Prosser	10	100	10	.....
F. Raiff	.....	.....	.....	5
E. R. Reets	.....	.....	.....	12
C. A. H. deSaulles	100	.....	100	.....
E. B. Schley	.....	100	.....	100
John N. Steele	.....	5	.....	205
Roger W. Straus	1	.....	1	.....
Mrs. Roger W. Straus	.....	.....	74	.....
H. R. Wagner	.....	.....	.....	200
C. W. Whitley (Dorothy)	10	.....	.....	.....
C. W. Whitley	.....	.....	10	.....
Total held by directors	6,489	1,279	6,380	2,629

Out of a total of 500,000 preferred and 610,000 common.

Copper and Silver Producers Should Shut Down, Says Charles Butters

Maintains in Letter to E. P. Earle Drastic Action Will Bring Readjustment More Quickly

The following letter has been sent by Charles Butters to E. P. Earle, president of the Nipissing Mining Co., of Ontario:

"My dear Mr. Earle:

"Shall we run or shall we close down? Every copper and silver mining company in the world today is asking itself this question. Every board of directors and every manager is debating whether or not it is best to go on. I have had this question up with our mines for the last six weeks. At the mines they naturally feel that if they can keep on going without a loss or without too much loss it is better to keep running, because they are keeping their organization together. From the point of view of the people employed at the mine and the mercantile community whose life depends upon the running of the mine so long as the mine keeps running everything is all right; but from the owner's point of view things look very different. His capital is invested in the mine, and although the mine can be kept running and paying expenses he sees no interest return on his capital, and meanwhile his ore reserves are being steadily depleted.

"I think it is far better to keep the ore in the mine than it is to go on and knock the price of silver by producing on such a market as we have at the present time. Selling conditions are in no way bettered by the production of copper or silver at the present time. I cannot see the object of increasing the supply of metal, even if the supply is withheld, in the face of such an extremely light demand. It will be very difficult to get the price back on silver if we let it sink to 50c. or 60c., which it can do with perfect ease if we keep on producing in the face of no demand, because every time we offer we get a little less. If we are going to have low-price silver in the future the quicker we stop and wait for cheaper supplies and for labor to readjust itself the better off we are. We are all standing in our own light producing silver on the down-grade. It isn't as if we were producing clothing, food or any necessity. We are doing no public service. On the contrary, we are hurting the whole of the Chinese and the Indian market and reducing their ability to buy by making our offerings of fresh silver in the face of the low demand. Instead of benefiting the world we are hurting hundreds of millions of people by trying to force silver on a market already surfeited and unable to absorb the smallest amount without lowering the price.

"I urge every silver and copper mining company to close down definitely for either six months or a year, making a definite period in which they will not reopen and staying closed even longer if it is necessary. I know this is a hard thing for any mine to do, but I feel that we all ought to face it, and the more of us who face it together the quicker readjustment will take place.

"Sincerely yours,
"CHARLES BUTTERS."

Wages Cut at Butte

Miners To Receive Dollar Less per Day; Craftsmen's Wages 50 to 75c. Lower—9,500 Men Affected

Mining companies in the Butte district, Montana, announced on Dec. 16 that miners' wages will be reduced from $5.75 to $4.75 per day. The various craftsmen employed by the companies will receive from 50c. to 75c. less per day than they have been getting. The unions have received a thirty-day notice of the termination of existing contracts. In all about 9,500 men at Butte, Anaconda and Great Falls are affected. According to the operators this reduction was decided upon as an alternative to shutting down the mining industry in Montana altogether.

Copper mining is at the lowest ebb in a number of years in the Butte district. It is stated in producing circles that a sufficient number of inquiries as to copper have been received within the last year to give hope for the future. The Anaconda company is now operating upon a 40 per cent basis and it is hinted that a further reduction to 25 per cent is not unlikely, unless there is an immediate improvement in the outlook. The company now apparently has in mind a minimum of operation consistent with the maintenance of its organization. The present wage scale, it is pointed out, is one predicated upon a rise in the price of copper, but the schedule does not take into reckoning a possible drop in price. Instead the scale is pegged at $5.75.

It must be said to the credit of the Butte companies that a far more drastic curtailment could have been put into effect months ago, but in the hope that the copper situation might show an improvement, development and repair work has been carried on. Incidentally, this program has put the mines of the Anaconda in excellent shape.

Wages Cut by Arizona Copper Companies

Practically all the copper mining companies of Arizona have made reduction of wages on an average of $1 a day per man, with 20 per cent reduction on the office and supervisory salary accounts. The only declared opposition was at Globe, soon stilled by suggestion that the only alternative was the closing of the mines and works. Miners will continue to receive over $5 a day for about seven hours net work. The new adjustment has been somewhat different in such low-grade concentrating camps as Clifton, Morenci, Ray and Ajo, where the labor largely is Mexican.

Miners' Wages Cut in Missouri

From 9 to 20 Per Cent Less in Lead Belt—Decrease $1 Per Day in Joplin District

With the severe shrinkage from 10c. to 5c. per lb. in the price of lead in four months the operators in the lead belt of southeast Missouri have notified the miners that after Jan. 1 there will be a cut of 20 per cent in the wages of all men receiving over $4 a day and 9 per cent for those receiving under $4, with a minimum of wage of $3.

In the Joplin zinc district a horizontal cut of $1 per day has been made.

Apache Powder Co. Erecting Acid Plant at Douglas Smelter

A fuming acid plant is to be erected at the Calumet & Arizona smelter at Douglas, Ariz., by the Apache Powder Co., which is building a large explosives plant at Land Station in the San Pedro Valley, seven miles south of Benson, Ariz. The local plant, which will not be of large size, will be entirely distinct from the large Calumet & Arizona sulphuric acid works, which now supply the acid used in the leaching operations of the New Cornelia company at Ajo. For the making of powder there will be required a relatively high grade of acid.

Arizona's Income From Mines To Be Less This Year

Following the approaching tax assessment, it is expected that the average Arizona taxpayer will have better appreciation of the part the mines of Arizona have in support of the rather expensive state government. Mining tax assessments are based upon the average mine production for a period of five years, this period set to equalize any fluctuation in the value of the product. For a number of years copper has been high, with its peak price reached during the early period of the war. But for two years, and especially during 1920, the mine profits have been low, or have been non-existent. At the time of the last assessment the drop of value and of product had its effect upon the five-year average, and the gross mine tax assessment went down $24,000,000 in Arizona. At that, the mines paid on a valuation of $454,000,000 in a total state assessment of $884,000,000. When the coming assessment is made with two lean years figured in with the three good years, the drop in the mine assessment may reach 15 per cent additional. Naturally, to keep up the same state income there must be a material increase in the tax rate, with possibly 60 per cent collected from the assessment on city property, farm lands, live stock and general industry, including railroads. The state has an official organization on a broad scale, with equipment of offices and commissions that probably would serve for the administration of thrice its population of 330,000.

German Iron Prices To Go Lower

Effect of November Cut Disappointing —Buyers Holding Off—Dealers Forestalling Foreign Bids

Vienna, Nov. 19—The expectation that the average decrease of 400 marks per tonne in German prices for iron, which went into effect Nov. 1, would bring greater activity in sales has not been realized. When it became known in October that the companies proposed to make a further reduction in prices, the consumers cancelled a very considerable amount of ordered materials in order to be able to take advantage of the anticipated lower prices. On the other hand, the works insisted that materials ordered be accepted and paid for at the contract prices, so that considerable material was delivered. The uncertainty of the whole economic situation is causing consumers to hold back. Purchases indicate the immediate needs, because most buyers are not stocking up. Relying on the present ability of the plants to make prompt deliveries and encouraged by the whole state of the market, consumers feel that there is and will be no lack of iron and that they need not buy for future needs. Since the price cut did not bring the hoped-for results consumers are already counting on a further cut by Jan. 1, and accordingly are buying very cautiously. Uniform prices have wholly disappeared from the market. Both works and dealers are very accommodating to customers, for it is feared that as the foreign exchange falls, the foreign iron markets that are also suffering somewhat will cut in on German markets more strongly. Therefore discounts from official minimum prices are readily allowed when one can thereby secure larger orders for early delivery.

Broken Hill Miners Resume Work

Melbourne, Nov. 22—After a struggle lasting over eighteen months, the Broken Hill mines in Western Australia have been reopened, and work has been resumed under the terms of the award made by the tribunal over which Justice Edmunds presided. Since the reopening of the mines, engineers, carpenters, joiners, and boilermakers have applied for a reduction of hours similar to that awarded to miners. The companies have therefore offered the unions concerned a 43-hour week, on the understanding that the fortnight's holiday yearly on full pay, as previously arranged, would not obtain under this arrangement.

Arizona Chapter of Mining Congress Elects Officers

Robert E. Tally, of the United Verde Copper Co. at Jerome, Ariz., has been elected governor of the Arizona Chapter of the American Mining Congress. The vice-governors are T. H. O'Brien, of Globe; G. M. Colvocoresses, of Humboldt, and John C. Greenway, of Warren. J. E. Curry, of Bisbee, is retained as secretary and H. J. McClung, of Phoenix, as treasurer.

Norwegian Nickel Company Seeking Loan

It is stated in the Norwegian press that Minister Sam Eyde and Captain D. Vogt left Norway recently for London to confer with the British interests in the British America Nickel Corporation, operating in the Sudbury district of Ontario, on behalf of A. S. Kristiansands Nickel Raffinerings Verk. The object of the conference is assumed to be the securing, through the medium of the board of trade, of a favorable loan. As previously referred to in the *Engineering and Mining Journal* of Feb. 7, 1920, the Norwegian company is strongly interested in the Canadian undertaking at Nickelton, Ont., its shares in the latter being book entered at over 16,500,000 kroner.

Pessimistic as to Swedish Iron Industry's Future

A Swedish engineer, A. Walberg, is by no means optimistic in his views on the future of Sweden's iron industry. In a statement, reproduced in the Swedish press, he points out that foreign competition in the near future will be very severe and even in the internal market foreign wares will compete with advantage with Swedish iron and steel. The enormous increase in fuel costs will burden the Swedish industry far more than that of foreign competitors who would reap additional advantage from the existing conditions of exchange values. So far as export conditions are concerned the position is far worse. During the war a large number of those consumers who had previously used Swedish pig iron and steel were compelled to resort to their own country's products. At first these home products were considerably inferior in quality to pre-war Swedish goods, but as the war progressed the quality (especially in the electric refining branches) improved in a very high degree. These disabilities, quite apart from the depression prevailing in all quarters, will make it especially difficult for the Swedish iron industry to recapture the old export market that it formerly had.

Old Copper Mines in Norway Close Down

The ancient copper mines of Röros, Norway, have recently been closed down, and will probably not be operated again until the period for the compulsory increase in wages fixed by the Arbitration Court expires in 1922. The reasons given by the press for this step are the increase above referred to and the steadily rising cost of all working materials. The Röros Mines were opened on Aug. 28, 1644, and have been in continuous operation ever since. They comprise the three chief mines of Storvarts, Kongen, and Muggruben, and five auxiliary workings. The output from 1644 to 1911 is stated at about 80,000 tons of copper and 400,000 tons of export pyrites.

New Idria Receiver Asked

Friendly Suit Brought To Preserve Assets Until Re-financing Plan Can Be Worked Out

Application has been made for the appointment of a receiver for the New Idria Quicksilver Mining Co., of California, in order to preserve the company's assets and property until some plan of re-financing can be formulated and carried out. In a circular to stockholders president Andrew Adie says that the suit instituted for this purpose is a friendly one with the company consenting. The causes of the present condition of the company's finances are: Excess cost, overestimates of rebuilding the company's plant after the fire of last June; the loss of production during reconstruction; and the decreased price of quicksilver caused by dumping of surplus war stocks on the market.

Katanga To Try Pulverized Coal in Blast Furnaces

Arrangements have been made by the Union Minière du Haut-Katanga, operating in the Belgian Congo, with the Garred-Cavers Corporation, of New York, for the use of the latter's process, whereby pulverized coal is used to replace coke in blast furnaces. The Katanga company has placed orders for a 42-in. Fuller mill and a Fuller-Kenyon pump for the coal preparation plant which will be used in connection with the process at its copper smelter.

Licenses were secured from the Garred-Cavers Corporation some time ago by the Cerro de Pasco Copper Corporation, the International Nickel Co., and the Tennessee Copper Co., for the use of this process at their various smelters.

Recent Production Reports

Cie. du Boleo, Baja California, produced 771,680 lb. copper in November as against 617,120 in October.

Calumet & Hecla produced 7,326,763 lb. copper in November compared with 7,943,502 in October. November's output by subsidiaries was as follows: Ahmeek, 1,840,600; Allouez, nothing; C. & H., 4,227,099; Centennial, nothing; Isle Royale, 768,684; La Salle, 22,700; Osceola, 436,280; Superior, nothing; Tamarack, nothing; and White Pine, 31,400.

Greene-Cananea produced 3,350,000 lb. copper in November, the same as in October.

East Butte produced 1,658,860 lb. copper in November, as against 1,626,980 in October.

Chile Copper produced 8,859,984 lb. copper in November, compared with 9,420,000 in October.

The Rand's gold output for November was £2,740,250, compared with £2,813,500 in October.

The output of silver from the Kongsberg mines in Norway for October was 1,408 kg. with an addition of 134 kg. of coarse silver from the Gabe Gottes workings.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Assessment Work Compromise Accepted by Both Houses

House Votes in Favor of Senate Bill for Six Months' Grace for Claim Holders

After some discussion but without the necessity for a rollcall, the House of Representatives passed the measure already approved by the Senate for extending the period for doing assessment work on mining claims until July 1, 1921. There was some objection to the measure on the ground that it had been stated when the assessment work was suspended for 1919 that no further requests of that character would be made. It was pointed out, however, that while individual members of Congress had made such statements, the owners of mining claims faced much more difficult conditions than in 1919. Instances were cited where labor was absolutely unprocurable. During the discussion of the measure it was intimated that prior to July 1, further legislation would be asked extending still further the period for doing the 1920 assessment work. It was stated that the snow does not leave the mountains in many areas until the middle of June, leaving insufficient time to complete the work prior to July 1. Owing to the shortness of the time available, the bill had to be passed in exactly the same language as that contained in the Senate bill. The President is expected to sign the bill promptly.

In a letter to Representative Rhodes Secretary Payne said:

"House joint resolution 396 is similar in language to the act of November 13, 1919, and would extend relief to mining claims in the United States, including Alaska. I recommend that this or similar legislation be adopted."

Sentiment in the Senate, however, was strongly opposed to further relief from assessment work, despite the fact that most of the members from mining states were in favor of its being excused in 1920. The majority, however, was against any such proposal, but there was no objection to extending the time for performing this work.

Provides Tariff on Imports of Asbestos Manufactures

In a bill introduced in the House of Representatives by Representative Watson of Pennsylvania provision is made for high import duties on the manufactures of asbestos. The bill provides that unmanufactured asbestos is to be admitted free of duty.

Although emergency tariff legislation probably will be enacted at this session of Congress placing high import duties on several agricultural products, live stock and wool, there is little chance that the list will be extended to include any of the minerals. It is very doubtful if the dyestuffs bill can be passed at this session. This means that the various tariff measures on minerals which are now before the Senate are likely to wait for general tariff revision that will take place at the extra session which will probably be called.

Means Appointed Chief Engineer of War Minerals Commission

Secretary Payne has appointed John H. Means to be chief engineer of the War Minerals Relief Commission. Mr. Means has been acting in this capacity since W. R. Crane resigned.

Awards totaling $8,924.45 were recommended by the War Minerals Relief Commission during the week ended Dec. 11. The awards were as follows (the name of the claimant, the mineral, the amount recommended and its percentage relationship to the amount claimed are shown): Liberty Mining Co., chrome, $3,352.25, 41 per cent; Atlantic Manganese Co., manganese, $3,309.64, 15 per cent; W. Michelini, chrome and manganese, $2,182.54, 43 per cent.

George Otis Smith Defines Noble Minerals

Speaking at a recent meeting of the Portland Cement Association Dr. George Otis Smith, the director of the U. S. Geological Survey, said:

"We are apt not to pay enough honor to the humble but useful things of life. The dominant position of our country in a world of industry and commerce is due largely to our wealth in the essential minerals, and the statistical record of the growth of our mineral industry shows how the baser metals have taken the leadership from gold and silver. Indeed the non-metals, once of subordinate rank, now far exceed the metals in value of annual output. To make a more specific comparison, the three building materials, cement, stone and clay products, reached last year an output valued at $500,000,000 and exceeded the total value of all the metals except iron. The annual output of your own product, cement, exceeds in value that of any two of the metals except iron and copper. The noble minerals of today are the mineral fuels, the metals, iron and copper and the structural materials. Upon these the daily life of our industries depends."

Brass cartridge cases to the extent of 56,250,000 lb. are to be sold by the Director of Sales. Bids are to be received until noon Jan. 5.

Process for Making Phosphoric Acid Improved

Bureau of Soils Has Devised Method Involving Briquetting and Smelting —Cottrell Plant Used

After comprehensive experiments officials of the Bureau of Soils are convinced that a method has been devised which offers advantages over the present process for extracting phosphoric acid from phosphate rock. The rock is briquetted with sand and coke and smelted in a fuel-fed furnace. In addition to the laboratory work which has been done the method has been tested on a commercial scale at a plant built for the purpose by the Bureau.

Since it has been possible to make in a small plant a product which could be sold in competition with the product of the large plants using the sulphuric acid process, it is regarded as practically certain that a large scale plant could make even a better showing. The development not only means cheaper fertilizer, it is believed, but will make possible the extension of the life of the rapidly diminishing phosphate deposits. In handling the Florida material by the old method one of the most troublesome impurities is the clay. This clay is particularly gluey in character. Advantage has been taken of this property, which forms a splendid binder for the briquettes. Due to the difficulties of keeping the fuel in direct contact with loose material, results of an encouraging nature were not obtained until the briquetting plan was worked out. Sufficient sand to furnish the required silica also occurs in the deposits as an impurity. The only needed materials which are not right at hand are coke and fuel oil, but the Florida phosphate deposits are splendidly situated in regard to those materials. Coke is made in large quantities in the Alabama coal fields, and fuel oil may be brought directly across the Gulf from the Mexican oil fields. Under the present methods of handling phosphate rock elaborate screening and washing must be done to separate the rock from the impurities. This led to the waste of some two-thirds of the rock. In the experimental runs the Bureau of Soils chemists were able to recover a 64 per cent phosphoric acid, which is equal to 47 per cent P_2O_5.

It is predicted at the department that the new method will revolutionize the fertilizer trade. It is possible that it will have a decided bearing on the plans of Western smelters to ship superphosphate into the Middle West.

The work on this problem was begun by the Bureau of Soils five years ago under the direction of Dr. W. H. Ross.

His experiments were confined almost entirely to the use of the electric furnace and the Cottrell precipitator. Dr. Ross succeeded in getting a very concentrated product, but the costs were considerably higher than those of the sulphuric acid process. J. N. Carrothers, one of the bureau's electrochemists, continued the work begun by Dr. Ross and in co-operation with the R. B. Davis Co. experimented on a semi-commercial scale. He reduced costs to the point where they were almost identical with the sulphuric acid method, but the general conclusion was reached that the electric furnace could not be used except in cases where an exceptional high-grade product is required.

Early in 1918 W. H. Waggaman was placed in charge of the work and began experiments with fuel instead of the electric arc. Many obstacles had to be overcome, some of which had to do with furnace construction. Finally a sort of combined blast and open-hearth furnace was devised. By using fuel oil and the briquetting process it soon became evident that the major problem was solved. There still remain some mechanical details which must be worked out. Complete success of the process is anticipated.

NEWS BY MINING DISTRICTS

Special London Letter

Public's Lack of Confidence Makes Financing Difficult—Santa Gertrudis' Notes at Discount—Little Mine Development Reported

BY W. A. DOMAN

London, Dec. 7—In these days when the financial position has got upon people's nerves, confidence in the immediate future seems to have received a nasty blow. Perhaps it is not to be wondered at. Deflation and the consequent fall in commodity prices are making themselves felt. Trouble is reported in the produce markets, and in the various trade directions; metals have tumbled to an alarming extent, and there is talk of assistance having to be given to firms in Mincing Lane, Liverpool, and, it is whispered, the Stock Exchange. With tin below £209, a drop of something like £59 in a month; with lead at about £25 10s., copper at £77 10s., and spelter under £30, base-metal companies are experiencing a drab time. Investors are selling in all directions, and mining shares cannot exempt themselves from the influence. Fortunately tin, copper, and lead companies never reckon upon a stable price for the metal, so that there is always a margin; the position at the moment, however, is far from pleasant. Gold has fallen to 117/1d. per oz. and silver to 46¾d., so that the whole gamut of mining descriptions is affected. From the standpoint of mining operations no one cares to take a lead, partly because of the virtual impossibility of doing so. Where so many companies need money, and where the demand for their products has fallen off, the public cannot be induced even with big baits to assist at the moment. Sound as the notes offered by the Santa Gertrudis were regarded as being, the times are unpropitious, and subscriptions did not roll in as they would have done normally. Yesterday for the first time dealings took place, and it was a disappointment to all to find that the notes were quoted at £10 discount. Not a satisfactory beginning by any means. But Santa Gertrudis is not solus in this respect. Large industrial corporations that will live long after Santa Gertrudis is wound up have the mortification of seeing their notes, even better secured, knocking about at a discount. Companies must have money, it is true, if their operations are to be continued. The Buena Tierra, a Mexican undertaking, is asking for £66,000 in five-year notes, carrying 10 per cent interest cumulative, and redeemable with a bonus of 25 per cent. This offer is at the rate of one note to every five shares held. The notes have a prior lien on all the profits, and as the issue is small, the security, though it cannot be divorced from the speculative, is nevertheless of its kind quite good, and the management and the 25 per cent bonus would get the money readily ordinarily. Some of the American mining companies directed from this side have in the past proved very successful in financing on some such lines.

Strangely enough—or perhaps it is not strange — new mining companies report much in the way of developments in these days. It is so noticeable that after a spell of dullness quite a number of companies find something to announce, and as sometimes from 50 to 100 ft. of driving are mentioned it is pretty obvious that the news has been saved up.

If emphasis were needed upon the parlous condition of many of the gold mines on the Witwatersrand it could be found in the speech of Lord Harris at the annual meeting of the Consolidated Gold Fields. This finance company has the misfortune to be interested in several mining areas where nature has been rather parsimonious in distributing the gold. No one can blame the company, for the claims were acquired when the belief obtained that the deep levels of the Rand would prove as profitable as the outcrops, and when boring at great depths had indicated the continuity of the Main Reef series of reefs. The metallic content, however, is so low that there would be no surplus of revenue over expenditure were it not for the existence of the gold premium. Recognizing that the prospects are far from hopeful so far as the Central Rand is concerned, the Gold Fields has altered its constitution somewhat and will in future pay greater attention to industrial enterprises. It has already invested fairly substantial sums in South Africa, in England and in America, as regards the last named in power undertakings and the American Trona Corporation. Several of these, especially in South Africa, have yet to be developed, but the change is a sign of the times.

During the war all South African mining shares held by enemies were placed in the hands of either the Public Trustee in this country or with the Custodian of Enemy Property in South Africa. Some of the mining and finance companies have purchased such holdings and issued them at low rates to the other shareholders. There are still remaining, however, shares to the value of about £6,000,000, mainly held in South Africa, which the two officials mentioned are endeavoring to realize. The finance corporations here would be only too pleased to take the shares but there seems to be considerable difficulty in coming to an arrangement.

A Rhodesian mine, the Lonely Reef, in which Rothschilds were interested in a way at its inception, has more than borne out the estimates then made. It is one of the brilliant exceptions of the country, and although it has been in existence ten years its ore reserves at September 30, just announced, stood at 207,912 tons of an average assay value of 21.39 dwt. Three months earlier the quantity was 198,341 tons and the value 22.2 dwt. Not many mines can maintain an average exceeding an ounce. There is another, the Globe & Phoenix, which has more than surprised its management. What seems like a new reef has been discovered at the 14th level and capital values are shown, i.e., 51 dwt. over a stoping width. In the 15th level the first assays exceed 5 oz. over a stoping width. The interesting problem at the moment is whether this reef will junction with one previously worked.

AUSTRALIA

Queensland Government Secures Yampi Sound Iron Ore

From Our Special Correspondent

Brisbane, Nov. 5—Notwithstanding that London financiers turned down the State Premier's request for a loan, a part of which was for establishing a

government iron and steel works, the Minister for Mines has just stated that it is intended to go on with the enterprise, and with this end in view to buy the large and rich iron ore deposit at Yampi Sound that has been under offer for the past four months. This iron and steel works project is, on account of its magnitude, mixed up with the political situation of Queensland more prominently than any other state schemes which the present government has in hand. When the British refused the loan it was decided by the Queensland government to appeal to the country to show that the people approved of its policy, and the result of a general election which was brought about six months before the term of the old parliament would otherwise have expired is that the government has come back to power with a small (and very much reduced) majority of members, but with a considerable majority of the people as a whole against them if all the other parties in the new House are numbered against them. The government now announce that they are going to carry on, and that they intend to get the money for the proposed iron and steel works at Bowen as well as for other purposes. As a matter of fact they have closed with the Yampi Sound iron ore deal and are paying the £30,000 which is the price in debentures. A sum of £3,000 had previously been paid for the option to purchase.

The ore deposit is on Cockatoo Island, belonging to Western Australia, on the northwestern coast of the continent, 250 miles north of Broome, 1,500 miles from Perth, W. A., and nearly 2,000 miles by sea from the port of Bowen, Q., on the east coast. The Minister for Mines describes the deposit as one of the best if not the very best in the world, and it certainly is a good one. Borings carried out by the Queensland government show that the ore contains 69.6 per cent of metallic iron, with only 0.1 per cent of silica, 0.1 per cent phosphorus and 0.005 per cent sulphur. The quantity of ore on the island has been officially estimated at 20,750,000 tons above sea level, with an unknown quantity below the level and large supplies that have been shed into the deep water of the foreshore from its precipitous slopes.

The principal Queensland iron ore deposits are in the Cloncurry district, 600 miles by rail from Bowen. This ore runs only 50 per cent metallic iron, and, as it is high in silica, it is proposed to blend it with the Yampi Sound ore in the manufacture of iron and steel at Bowen.

The coal for these works is to come by rail from the Bowen River, 60 miles inland. From this coalfield an almost unlimited supply of good coal will be available as soon as the railway to that place is finished, probably in twelve or fifteen months. In addition to the State colliery three coal leases are being opened up by a private company, and it is officially estimated, as the result of extensive borings, that when the two mines are properly developed they will be capable of producing a million tons of first-rate coking coal per annum for over a hundred years, and that in addition to meeting the bunker requirements of oversea steamers calling at Bowen they will very soon be able to supply the needs of the whole of North Queensland at a reduction of 33 per cent in price compared with that paid for coal at present obtained from the south.

The only large iron and steel works at present in Australia are those of the Broken Hill Proprietary Co. at Newcastle, and these are doing so well that it is intended to add to the existing plant at once. These works are supplied with iron ore from South Australia, and this ore, which runs 61.70 per cent iron, has to be conveyed 35 miles by rail and about 1,300 miles by water. On the other hand, the coal used at the works is mined right on the spot at Newcastle, and the climatic conditions are all in their favor as compared with Bowen, which is within the tropics.

CANADA

British Columbia

Labor Abundant in Kootenays—Consolidated M. & S. Co. Refuses Custom Ore Unless Shipper Can Finance Marketing Bullion

Nelson—Abundant labor is now available for mining operations throughout the Kootenays, and in some cases a surplus even in the more skilled lines in contradistinction to the condition prevailing a few weeks ago. This change has been brought about largely through depression in the lumbering industry, releasing hundreds of men formerly employed in the woods, and by an influx of miners from across the line, who have been laid off. The One Big Union strike, which practically paralyzed the Slocan silver-lead mining industry during last summer and fall, is in consequence at an end.

Silversmith Mines, Ltd., operating the Silversmith mine (formerly the Slocan Star) at Sandon, B. C., has declared a dividend of 1c. per share. This will be the only dividend paid by Slocan companies during 1920. Silversmith, a silver-lead property, appears to be the only Slocan property in a position to operate profitably under present conditions.

The Blue Bell mine of the New Canadian Metal Co. on Kootenay Lake and scene of the earliest lode mining operations in this section continues operations, but with a reduced force, preference in employment being given, it is stated, to men with families who have been with the company for several years.

Complaint by the Associated Boards of Trade of Eastern British Columbia that charges for coal and coke used in smelting operations are excessive is resulting in an inquiry being made into costs of production and distribution of Crow's Nest Pass coal and coke products.

A further curtailment in Kootenay mineral production must inevitably follow notice served on shippers by the Consolidated Mining & Smelting Co. of Canada, Ltd., that no custom ore can be taken care of until further notice unless shippers are in a position to finance the carrying or marketing of the bullion themselves.

The Consolidated M. & S. Co. has sharply curtailed all new construction operations around the Trail smelter, following banking advices that no additional advances on metal stocks on hand or accumulating could be looked for. It is stated that following the curtailment order men employed on purely constructive work were laid off to the number of about 300 or 400. This may be taken to indicate that construction of the proposed concentrator, designed for handling lower grade Rossland ores, will be inevitably postponed for several months at least.

Victoria—Reference has been made to the incorporation of the Coast Range Steel, Ltd., an organization said to be backed by British capital to the extent of $15,000,000 and whose plans are to establish in British Columbia an iron and steel industry capable of taking care of all the requirements of northwestern America and as well of securing a large share of the foreign transpacific trade. It was said, too, that another British syndicate has had its engineers in the field in British Columbia investigating its natural resources with a view to starting a similar enterprise. A third announcement has been made in this connection which is of interest. It is that the Industrial Department of the provincial government has undertaken to loan $250,000 to finance the amalgamation of the Port Moody, Eburne and Tudhope electric plants, the new company to be known as the B. C. Steel Works, Ltd. No official confirmation, however, is available of the assistance said to be promised by the government.

Britannia Beach—The Britannia M. & S. Co. has shut down its mill and ceased shipments owing to the condition of the copper market. Mine development is being continued. The July, 1919, schedule of wages is again in force.

Ontario

Power Outlook Improving—Kerr Lake To Stop Production

Cobalt—The outlook as regards the supply of electric power is becoming more favorable, owing to increased rainfall and the continuance of open weather causing a rise in the level of the lakes and river.

It has been decided to discontinue production at the Kerr Lake mine for the present, but as many men as possible will be retained and employed in development work. Operations at the Dominion Reduction plant, which was running chiefly on ore from the Kerr Lake, will be considerably curtailed.

Porcupine — Development work on the Clifton Porcupine has been suspended. A circular issued to the share-

holders states that under the financial conditions prevailing during the last few months it has been found impossible to dispose of treasury stock in sufficient quantity to provide funds needed to carry on development on an adequate basis. It was therefore thought advisable to conserve the funds now in the treasury until such time as it is found expedient to resume work. The results of the work so far done give reason to believe that the property can be made a profitable producer and it is intended to seize on the first favorable opportunity to complete the financing of the company and proceed with development.

At the McIntyre the new vein system lying about 400 ft. south of the No. 5 shaft has been opened for about 225 ft. on the 1,375 level with highly favorable results, the vein showing a width of 20 ft., with gold content stated to average higher than in the main vein system.

Boston Creek—A find of almost pure chalcopyrite has been made in the west crosscut at the 500-ft. level of the Miller Independence. It occurs in the form of a small solid vein lying alongside a vein of calcite. Assays in bulk show 32.48 per cent copper, with $2.80 in gold and 1.3 oz. silver per ton. A copper-bearing vein on the surface has been traced for a considerable distance, assays from which seldom exceeded 3 and 4 per cent, indicating that mineralization is increasing at depth.

Gowganda—At the Trethewey property the drift on the "office" vein is in over 100 ft. with high grade showing all the way. A shipment of high-grade ore is being prepared.

The Miller Lake-O'Brien with a production of 708,872 oz. last year paid taxes on profits of $451,000.

NICARAGUA

Nicaragua Mining Co. Near Profit-Earning Stage After Nine Months' Work

Pis Pis District—The Nicaragua Mining Co. has developed between $500,000 and $1,000,000 worth of ore averaging about $22 per ton at the Neptune mines. A large tonnage of manta and disintegrated vein rock running $3 to $14 per ton has also been located. Operation of the first 3-stamp unit of the amalgamating mill was begun on Nov. 1. A $4 per ton profit is estimated with $12 mill heads and 60 per cent recovery. It is expected that the mill will be handling 100 tons daily this month. With nine stamps dropping the capacity, it is figured, will be 120 tons per day and the profit at least $10,000 per month. Barry Searle, consulting engineer and general manager, finds that the Neptune vein contains three paystreaks, one along the footwall, one along the hanging and one in between. These chutes in places come together to form a pay chute 35 ft. wide averaging better than $15. As developed thus far these chutes have an estimated length of 450 ft. with faces still in pay ore. Granville S. Borden has been appointed general superintendent in place of William B. Daniel, resigned.

The Eden Mines tunnel toward the Hidden Treasure vein is showing good stringers of ore which do not appear on the surface. The company hopes to cut the Hidden Treasure vein about Jan. 1.

MEXICO

Coahuila

Torreon Smelter Down Until Spring

Torreon—Persons arriving here from the Mapimi camp report that the smelter of the Penoles company and the Penoles mines have been closed down. The miners and outside laborers have been discharged and many of them are leaving with their families. A few of the Americans, heads of departments, are being retained in camp. Others have been sent to Monterrey or Aguascalientes.

The smelter at Torreon remains idle and the management does not anticipate the resumption of work until after March. They have notified all shippers that no more ores will be received until further notice.

Rafael Bustamante, a prominent rancher of this district, has filed on the vacant ground contiguous to the famous Buena Ventura and Cuatro de Julio mines in the Velardeña mining district. The A. S. & R. is still operating its smelter in this camp here.

Saltillo—Local mining men of this city are opening up some promising veins of lead and zinc ores in the Jaquez de Ferniza mountains near by. Their group of mines is composed of 26 pertenencias which are being thoroughly prospected and developed.

The Esperanza and Placeres mining companies with headquarters in this city have called for a general meeting of stockholders to be held the latter part of this month, at which time assessments will be levied in order to carry on development work until ore shipments can be resumed.

Guanajuato

New Ore Found at Melladito Group

La Luz.—Development work is being carried on in the Melladito Group of mines of the United Mines Co. This work has resulted in the finding of a new body of good milling ore. The company's 15-stamp mill at this property was shut down about a month ago and will remain down until conditions warrant a resumption of operations. Joseph MacDonald, Jr., is superintendent in charge of mines.

ARIZONA

Copper Queen and C. & A. To Cut Wages Jan. 1—May Resume Operations at Hardshell

Bisbee—The Arizona Bisbee Copper Co. has suspended operations indefinitely.

The Copper Queen and the Calumet & Arizona have posted notices advising a cut in wages effective Jan. 1, 1921. For all employees whose wages are $5.35 and above the reduction is $1 per day. For those receiving less than this amount the reduction is 80c. per day. For all salaried men there is a reduction of 20 per cent on the base rate of pay. The service bonus is to be discontinued.

The Shattuck mine and mill have been closed down. About 40 men are still retained at the mine to do the necessary repair work and continue some development work.

The Wolverine & Arizona are not now shipping. A few men have been retained doing some development on the 300 level.

Courtland—Shipments of ore have been discontinued at the Great Western Copper Co.'s property, at Courtland.

Patagonia—H. K. Welch is on his way to Patagonia from New York. Upon his return it is reported operations will be resumed at the Hardshell mine, of which he is general manager. The new shaft will be unwatered and the drift continued on the 500 level until it cuts the orebody. Operations have been suspended since last May.

The Mowry mine has resumed shipping lead-silver ore to the El Paso smelter.

The present campaign of diamond drilling has been completed at the Three R mine. Neither the future plans or the results of the diamond drilling have been announced. The property belongs to Magma Copper interests. Representatives of the Three R have been examining the Blue Nose mine.

Fred Kohlberg and C. C. Allen have taken a lease on the Flux mine and are milling lead carbonate ore. Several shipments of concentrates have been made recently.

Work in the tunnel of the Andes mine, which belongs to R. R. Richardson, is progressing and has now reached a point where the vein cut by higher workings is expected.

The Grey Brothers are doing some exploration work in the tunnel in which they encountered grey copper ore recently.

Duquesne—At the Duquesne and Washington camps owing to the slump in the price of copper most of the mines and leases have been shut down. Some lead-silver ore is still being shipped, which is mostly produced at the Kansas mine.

At Rosemont in the Santa Rita Mountains all mines are idle, operations having been suspended recently.

Silverbell—In its report for November, the management of El Tiro Leasing Co. will submit plans for financing an extensive development campaign during the period of market depression. Salaried employees have voluntarily accepted a 20-per cent cut in salaries.

Chloride—George N. MacBean, a Holbrook druggist, has been made receiver for the Tennessee and Schuylkill

mining interests of Chloride, in a hearing of corporation troubles lately held at Holbrook, before Superior Judge J. E. Crosby. Application had been made by Frank A. Garbutt, of Los Angeles, for foreclosure of a $300,000 mortgage held by him on the property, which, according to statement in court, has a value approximating $10,000,000. The application was denied, with some reference to the fact that Garbutt, while sole manager, had failed to make the mines pay. The receivership was asked by Charles A. Burke and associates, who have taken over the Garbutt mortgage. Announcement was made that production would be resumed soon at the mines, which have been the main support of Chloride, shipping silver-lead ores.

Jerome—The stockholders' fight has been suspended within the Jerome Superior Copper Co. till after the Arizona State Corporation Commission has investigated the books of the company. The bulk of the stock is held in Los Angeles, where allegations of mismanagement were made against Manager George Mitchell and President M. P. Frazier.

NEW MEXICO

Operations in Lordsburg District

Lordsburg—Shaft sinking is being continued at the Eighty-five mine. A station is being cut on the 1,050-ft. level. A sump, 10 x 10 x 28 ft., will be cut and an electric triplex pump installed with a capacity of 175 gal. per min., to pump direct to surface. Drifts are being carried both east and west on the vein on the 900-ft. level.

The Co-operative mine is sinking the main shaft at the rate of about 3 ft. per day.

Tyrone—A test run of the new cyanide mill on the Cora Miller mine has been completed with satisfactory results. Harry Wheeler, for many years with the Socorro Mines, at Mogollon, is mill foreman.

CALIFORNIA

Cyanide Installation at Juniper Mine Complete

Rough & Ready—It is reported here that the Old Black Bear mine, once owned by County Assessor Henry Schroeder and recently worked by Eastern interests, will be refinanced and operated under the name of the Kansas mine. William Buholz is promoting the deal. New equipment will be purchased if the transaction is consummated.

A. R. Archibald, of the same district, is at present in Omaha seeking to finance a company that will reopen the old Osceola mine.

Hayden Hill—Installation of the 40-ton cyanide plant and other machinery at the Juniper mine at Hayden Hill is now complete. Supplies for the winter's run are on the ground. The main shaft is down 386 ft. and still in pay ore. Two stopes have been cut and another will be started.

Sonora—Announcement has been made that Carson Hill Gold's new mill will be ready Jan. 15. The number of stamps dropping will be doubled and the mill capacity will thus be brought to 15,000 tons of ore monthly.

Amador City—The Bunker Hill company has resumed mining on the 1,750 and 2,800 levels. Sinking of the deep winze has been temporarily suspended but will be resumed when conditions are favorable.

NEVADA

Market Improved for Virginia Louise Ore—Nevada Con. Drills Into New Ore

Pioche—Virginia Louise stockholders met at Pioche on Dec. 20 to act upon a proposal to amend the articles of incorporation so as to permit an increase in the capital stock from 1,000,000 shares of $1 per value to 1,500,000 shares of the same par value. The principal reason for this is that the market for Virginia Louise fluxing ore has improved. From Sept. 10 to Nov. 15 the company had a market for only 75 tons daily delivered to the U. S. Smelting R. & M. Co. and the freight rate was 25 per cent higher than formerly. On Dec. 4 the old freight rate was restored. Additional contracts have also been made under which the A. S. & R. will take 100 tons daily and the International Smelting Co. from 50 to 250 tons daily. Shipments under this latter contract are to begin as soon as the requirements of the International demand it. Thus the company expects to be able to market about 400 tons daily. A larger hoist must be installed as well as better facilities for handling the ore between shaft and loading bins. New underground development is also planned.

Increase of the capitalization of the Prince Consolidated Mining & Smelting Co. was approved unanimously at the stockholders' special meeting held at Salt Lake City on Dec. 11, at which meeting a total of 850,000 shares out of 1,000,000 was represented.

An amendment to the articles of the company was passed providing for increasing the capital stock from 1,000,000 to 1,500,000 shares, and decreasing the par value of the stock from $2 to $1 per share. The 500,000 shares of capital stock increase is to be put in the treasury of the company.

Ore shipments from the Pioche district for the week ended Dec. 9 decreased, being 2,255 tons. Shipments were: Prince Consolidated, 1,110 tons; Virginia Louise, 855; Bristol Silver, 195; Black Metals, 45; and Combined Metals 50.

Ely—At the Ruth mine of the Nevada Consolidated, at a point about 600 ft. northeast of the Ruth shaft and 500 ft. from the orebody recently opened up, drilling has demonstrated a body of copper ore 150 ft. thick and considerably above the average in copper.

Both the Nevada Consolidated and the Consolidated Copper Mines have announced that no further reductions will be made in the working forces.

UTAH

Utah Apex Shuts Down—Utah Operators To Cut Wages

Wage decreases have been decided upon by Utah operators to go into effect Jan. 1. Silver-lead producers will make a cut of 75c. per day and copper producers a cut of $1.

Eureka—Ore shipments from the Tintic district for the week ended Dec. 10 amounted to 179 cars as compared with 199 cars the week before.

Park City—Shipments for the week ended Dec. 10 totaled 2,000 tons of ore and concentrates against 2,137 tons the week before.

Bingham Canyon—Utah Apex has suspended operations on account of market conditions.

COLORADO

Hidden Treasure Near Camp Bird Bought by Company Headed by Benedict Crowell

Ouray—The Hidden Treasure Mining Co., a new incorporation, of which Benedict Crowell is president, has purchased the Hidden Treasure property, located not far from the Camp Bird mine, from Mrs. Evelyn Walsh-McLean. The new company plans to advance the Hidden Treasure tunnel about 3,000 ft. and do considerable laternl development. Second-hand equipment has been purchased from the Silver Mountain Mining Co. at Ironton and will be moved to the Hidden Treasure property and installed as soon as possible. E. R. Bauer will be local superintendent.

Camp Bird has shut down indefinitely. This is the first time in years that the famous old mine has been absolutely idle. The reason given out was the high cost of operating. It is believed that the mine will resume work early in the spring.

Montezuma—The Bell mine, once a producer of high-grade silver ore, which has been idle for about 20 years, has been optioned to George H. Short, of Salt Lake City, who plans to organize a development company.

Leadville—Lessees who have been developing the Lillian property have opened a promising body of zinc ore, which assays 30 per cent to 35 per cent zinc. The tunnel has been advanced 400 ft. to a total distance of 700 ft. A raise from the tunnel cut the ore at a height of about 100 ft. The development work is not yet sufficient to determine the size of the ore shoot. Ore bins have been built at the portal. The ore will be shipped to Canon City for treatment.

Telluride—Shipments of concentrates during November were as follows: Tomboy, 50 cars; Smuggler-Union, 40; Liberty Bell, 12; total, 102.

Paradox—The Cummings Chemical Co. has discontinued operations on its carnotite properties temporarily, in view of unsatisfactory developments in the market for vanadium bearing minerals.

IDAHO

Coeur d'Alene District

Gold Hunter Shuts Down; Other Producers May Follow—Wage Cut Expected Soon

Wallace—Development work at the Interstate-Callahan since production was suspended on Oct. 1 has yielded gratifying results bearing on the continuity of the orebody at great depth. A short time before the shutdown the shaft had been completed to the No. 10 level and crosscutting started to the vein. This level is 1,250 ft. below the main working tunnel and probably 3,000 ft. from the surface. The crosscut disclosed over 4 ft. of high-grade zinc-lead ore and drifting is now progressing with every indication that the ore showing will be fully as good as on No. 9, 200 ft. above, where the shoot is 300 ft. long. After drifting to whatever extent deemed necessary, the company will sink another 200 ft. and open up No. 11 level. This and other developments work is making steady additions to the company's proved ore reserves and insures maximum production when a profitable zinc market comes back.

Gem—The Black Bear Mines Co. has suspended development operations after doing much preliminary work which has placed the property in excellent condition for future operations.

WASHINGTON

Washington Producers Forced To Curtail

The depression in the metal market is seriously effecting producers in Washington. The Electric Point mine in the Northport district, the major lead producer of the state, has reduced its crew to twenty-five men. These will be employed on development. All ore necessarily mined will be stored. The Sunset Copper mine in the Cascades its putting its mine and mill in shape and expects to close down some time this month. The United Silver-Copper at Chewelah has decreased its force. The copper ore in this last property is heavily "sweetened" with silver and the favorable silver market may encourage the continuation of operations.

Colville.—The Old Dominion mine, a bonanza twenty years ago, has been reopened. After a year's development work the lessees report that they have developed shipping ore. The ore is high-grade silver-lead occurring as replacement chimneys in limestone and the erratic occurrence of the ore makes development uncertain.

ILLINOIS

Cave-in-Rock Fluorspar Co. Buys Julia F. Mines

Elizabethtown—Winfred Ledbetter, of Rosiclare, Ill., underground foreman at the Rosiclare Fluorspar & Lead Co.'s mine, was run down by a mine motor on Dec. 11 and killed. It is reported that he was walking down the drift without a light.

MINNESOTA

Cuyuna Range

Only Six Mines Now Operating on Range

Crosby—With the closing of the open pit mines for the winter and the recent shutdown of several of the underground properties the Cuyuna Range is left with but six mines actively operating, and only five of these are producing ore at the present time. These are the Kennedy and Meacham mines, Rogers-Brown Ore Co.; the Croft mine, of the John A. Savage & Co.; the Armour No. 2 mine, of the Inland Steel Co.; and the Bonnie Belle mine, of the Liberty Mining Co. The Maroco mine at Trommald is developing an open-pit property of washable iron ore which is expected to be an active shipper with the opening of navigation in the spring.

Shipments from the Cuyuna through the Lake ports for the season of 1920 amounted 2,127,168 tons as compared with a total shipment of 1,819,935 tons last season. In addition to the above Lake shipments about 50,000 tons has gone forward by all-rail shipment to furnaces this season, chiefly from the Bonnie Belle, Sagamore and Arko mines. The bulk of the rail shipments were made to the Zenith Furnace Co., Duluth; smaller shipments went to the South Chicago plant of the Steel & Tube Co. of America.

Cuyuna—The Biwanago Mining Co., diamond drill contractors, is operating two drills underground at the Kennedy mine, drilling from upper levels to block out ore ahead of development on the new 362-ft. level.

Ironton—Installation of an electric hoisting plant and transfer of other surface equipment into new quarters at the Feigh mine of the Northwestern Improvement Co. is nearly completed and the operators plan to resume underground mining early next month.

Whitmarsh Mining Co. has begun exploring with two drills on lot 5, section 9-46-29, known as the Huntington mine. This property, operated as an underground mine in 1918 and 1919, has since been idle. The orebody may now be stripped and worked by steam shovel.

Riverton—It is reported that Williams, Carlson, et al., fee owners of the Rowe mine, recently closed down, will institute proceedings against the Pittsburg Steel Ore Co. to recover damages for alleged loss of several hundred thousand tons of ore in mining operations carried on by that company.

Mesabi Range

Construction of Mesabi Iron Co.'s Plant Progressing

Nashwauk—Due to a mud slide in La Rue pit, a shovel working on stripping was overturned, killing one man. Two were caught in the wreckage but one was recovered after a short duration of time.

Babbitt—Construction of the main mill and adjacent buildings comprising the plant of the Mesabi Iron Co. for the treatment of low-grade magnetic iron ore is in progress and it is estimated that the plant is 40 per cent complete. It is anticipated that under ordinary conditions the plant will be running by the first of the summer.

MICHIGAN

Marquette Range

Trumbull-Cliffs Furnace Stock Offered To C.-C. I. Employees

Ishpeming—Employees of the Cleveland-Cliffs Iron Co. are being offered stock of the Trumbull-Cliffs Furnace Co. on an installment basis. The stock is 8 per cent cumulative preferred and is guaranteed by the Cleveland-Cliffs. The par value is $100 and each employee has the privilege of subscribing to ten shares, making payments of 10 per cent per month for ten months. Many have already availed themselves of the offer, which expired on Dec. 20. The Cleveland-Cliffs Iron Co. is now being reorganized under the laws of Ohio instead of West Virginia, and the capital stock is being increased.

Negaunee—The first cut in wages on the Marquette Range has been announced for the Rolling Mill mine, operated by Clement K. Quinn & Co. The reduction amounts to 25 per cent and took effect Dec. 16. The only other mining company in the iron ore district to announce a new scale of wages is the Charcoal Iron Co. of America, operating the Yale mine on the Gogebic Range. It is expected that other companies will make cuts after Jan. 1.

Gogebic Range

"G" Pabst Shaft Has Two Accidents

Ironwood—The Oliver company has received eight electric mine locomotives which will be distributed among its several mines on this range. Several will be sent to the Tilden mine, where a rotary converter has been installed. They will be used on the stockpile trestles as well as underground.

There were two hoisting accidents in "G" shaft of the Pabst mine last week. On Dec. 3 a wheel came off one of the skips and when the skip came up into the shaft house the front end wedged between the rails, smashed some of the bracing in the shaft house and turned upside down. The damage was not so great but what hoisting could be resumed the next shift, however. On Dec. 8 when the cage was coming up with a load of men a broken rail caught on the bottom plates, tearing them and checking the cage. Then the rail was snapped off and the cage jerked upward, throwing all the men off their feet and bruising them severely, but fortunately causing no more serious injury. The cage continued to surface and the hoisting engineer did not know that anything had gone wrong.

At "H" shaft of the Pabst the skips have been run through the shaft for the first time. This is the fifth electrically equipped shaft which the Oliver company has fitted out in the past two years.

THE MARKET REPORT

Daily Prices of Metals

Dec	Copper, N. Y. net refinery* Electrolytic	Tin 99 Per Cent	Tin Straits	Lead N. Y.	Lead St. L.	Zinc N. Y.	Zinc St. L.
16	13.00@13.50	31.00	33.75@34.25	4.50	4.60@4.75	5.65@5.75	
17	13.00@13.50	31.00	34.00@34.50	4.50	4.60	5.65@5.75	
18	13.00@13.50	31.00	34.00@34.50	4.50	4.50	5.65@5.75	
20	12.85@13.35	30.75	33.50@33.75	4.50	4.50	5.65@5.75	
21	12.85@13.35	30.50	33.00@33.50	4.50	4.50	5.65@5.75	
22	13.00	30.00	32.50@32.75	4.50	4.50	5.65@5.75	

*These prices correspond to the following quotations for copper, "delivered": 13.25@13.75, 13.25@13.75, 13.25@13.75, 13.10@13.60, 13.10@13.60, and 13.25c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Dec.	Copper Standard Spot	Copper Standard 3 M	Copper Electrolytic	Tin Spot	Tin 3 M	Lead Spot	Lead 3 M	Zinc Spot	Zinc 3 M
16	75½	75½	86½	215	218	21½	23	25½	27½
17	74¼	74¼	86	211	215	22½	24	25¾	27¼
18	...	...	...	...	...	...	...	...	...
20	74	74¼	85	207½	211¼	23¼	24½	26	27⅝
21	73½	73½	84	205¼	210	22½	23½	25¼	26⅞
22	73	73¼	83	202	207½	21¼	22½	24	25⅞

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Dec.	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London	Dec	Sterling Exchange	Silver New York, Domestic Origin	Silver New York, Foreign Origin	Silver London
16	348½	99½	64¾	41⅞	20	348¼	99½	62	40
17	352½	99½	64	41	21	352½	99½	62½	40
18	349⅜	99½	63⅝	41	22	351½	99½	63¼	40½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

Metal Markets

New York, Dec. 22, 1920.

To those who have so kindly cooperated with us by furnishing confidential information; and to those who have accepted our report of the metal market as being honest and as accurate as may be: Greeting. May the coming year bring a return to normal conditions, which will mean the utmost of prosperity and happiness to us all!

Possibly in no week this year has business been more stagnant in the metal market than in the one just passed. There has been an utter lack of demand and also of pressure to sell on the part of producers, many of whom continue off the market at present prices. Under these conditions, our quotations are largely nominal. More interest is being taken in the internal affairs of the American Smelting & Refining Co., discussed on pages 1229 and 1230 of this issue, than in selling.

Transatlantic freight rates to England continue at the figure set by the conference, that is, $13 per ton for copper and $12 for lead, but rates from ports in the Hamburg area are quoted as low as $5 and $6. Transpacific rates to Hongkong and Kobe are given as $11.25 per ton.

Copper

Large producers continue to hold for 14c. delivered, and we have no reports that indicate that they are cutting under this figure. Smaller producers have offered copper during the week at 13.50@13.75c., and at least one large outside interest is willing to sell at 13.125@13.25c. delivered. Some business has been reported at each of these levels, but the total volume is insignificant. The dullness is incident to business conditions, as well as the season, and includes export as well as domestic demand.

The firm of Guggenheim Bros. announces that on and after Jan. 1, 1921, it will act as a sales agent for the sale of metals. This agency will sell the entire production of copper of Utah Copper Co., Chino Copper Co., Ray Consolidated Copper Co., Nevada Consolidated Copper Co., Chile Copper Co., Braden Copper Co., and Kennecott Copper Corporation. The sale of metals through this agency will be under the management and executive direction of Joseph Clendenin, who is now vice-president in charge of sales for the American Smelting & Refining Co. Hamilton M. Brush will take charge of the smelting company's copper sales. The copper smelting and refining contracts between the American Smelting & Refining Co. and the other companies mentioned will remain unaffected.

Lead

On Monday, Dec. 20, the A. S. & R. reduced its official price of lead from 5c. to 4.75c., New York and St. Louis.

Inquiries have been fairly numerous and well distributed during the last week. They have been for prompt delivery and have resulted in few sales, a fact which leads to the thought that they are made in many cases to establish a basis for inventories. Sellers of lead on contract report that such deliveries are being accepted fairly well at current prices, and most of the producers will go into the new year with little unsold lead on their hands. Demand for futures has been slack, however, and unless business picks up after January first, stocks are likely to accumulate rapidly, despite curtailed production.

Demand is utterly lacking in St. Louis.

Zinc

The price of zinc has remained stationary, with practically no business. It would seem that European zinc could be imported profitably, but it probably could not be sold except at markedly lower prices than the nominal ones which we quote. Also, domestic consumers, in general, demand a better quality than the Belgian product, which contains up to 2.5 per cent lead and 0.25 per cent iron.

Tin

Practically no business has been done in tin since our last report. Even an inquiry for a 25-ton lot is provocative of a great deal of noise and much tele-

phoning. We understand that the Straits government has advanced the price to be paid for the tin production of that country to an equivalent of £236 c.i.f. London. When this tin is finally sold, it will prevent any sudden rise in the price, although it will no duobt be marketed carefully.

Straits tin for future delivery: Dec. 16th, 35.50@36c.; 17th, 35.50@36c.; 18th, 35@35.50c.; 20th, 34.50@34.75c.; 21st, 34@34.50c.; 22d, 33.75@34c.

Arrivals of tin in long tons: Dec. 14th, Australia, 125; China, 10; 20th, Straits, 300.

Silver

Referring to our comments in last week's report, the market for the last week has justified these remarks, as prices have ruled at a slightly higher level than for the preceding week. The disposition to sell appears to be growing less, and at times considerable inquiry at current prices springs up. Buying for account of the Indian bazaars has been reported of late at the recent low points, which has added strength to the market. It would seem as if silver had steadied, at least for the present, at about current figures.

Mexican Dollars—Dec. 16th, 49¼; 17th, 49¼; 18th, 48½; 20th, 47⅞; 21st, 47⅞; 22d, 48¼c.

Gold

Gold in London: Dec. 16th, 117s. 6d.; 17th, 116s. 2d.; 20th, 117s. 5d.; 21st, 115s. 9d.; 22d, 116s. 6d.

Foreign Exchange

Sterling and most other foreign exchange has shown an upward tendency during the last week, owing to year-end settlements and Christmas remittances. On Tuesday, Dec. 21, francs were 5.89c.; lire, 3.41c.; and marks 1.365c. New York funds in Montreal have advanced to the highest point in many years, and were quoted at 19⅞ per cent premium.

Other Metals

Aluminum—For 50-ton lots: ingot, 99 per cent and purer, 33c.; 98@99 per cent, 32c.; nominal list prices. Sales reported as low as 22c.

Antimony — Chinese and Japanese brands, 5¾c.; market quiet. W.C.C. brand, 6¼@6½c. per lb. Cookson's "C" grade, 11@12½c. Chinese needle antimony, lump, nominal at 4½c. per lb. Standard powdered needle antimony (200 mesh), 7¼c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 7c.

Bismuth—$2.40 per lb., 500-lb. lots, and $2.42 per lb., 100-lb. lots.

Cadmium—Nominal, $1.40 per lb.

Cobalt—Metal, $6 per lb.; black oxide, $4.10 per lb.; sulphate, $1.60.

Iridium—Nominal, $350@$400 per oz.

Magnesium—Crude, 99 per cent or over pure, $1.75 per lb. for 100-lb. lots and over, f.o.b. Niagara Falls.

[1]**Molybdenum Metal in rod or wire** form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Ingot, 43c.; shot, 43c.; electrolytic, 45c., f.o.b. Bayonne, N. J.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—Open market, $70@$80 per troy oz.

Palladium—$75 per oz.

Platinum—Firm at $75 per oz.

Quicksilver—Nominally $50 per 75-lb. flask, with second-hands selling as low as $47 per 75-lb. flask. San Francisco wires $45. Market dull.

[1]**Rhodium**—$200@$225 per troy oz.

Ruthenium—$175@$200 per troy oz.

[1]**Selenium**—Black powdered, amorphous, 99.5 per cent pure, $2@$2.25 per lb.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $20 per lb.

[1]**Tungsten Metal**—$35@$60 per kilogram, according to purity and gage.

Metallic Ores

Chrome Ore—Guaranteed 50 per cent Cr_2O_3 foreign ore with a maximum of 6 per cent silica, 55@60c. per unit, New York. California concentrates, 50 per cent Cr_2O_3 and upward, 60@65c.

[1]**Manganese Ore**—45@50c. per unit, seaport; chemical ore (MnO_2) $60@$65 per gross ton, lump; $75@$80 per net ton, powdered.

Molybdenum Ore—85 per cent MoS_2, 55@60c. per lb. of contained sulphide, New York.

[1]**Tantalum Ore**—Guaranteed minimum 60 per cent tantalic acid, 45c. per lb. in ton lots.

[1]**Titanium Ores**—Ilmenite, 52 per cent TiO_2, 1½@2c. per lb. for ore. Rutile, 95 per cent TiO_2, 15c. per lb. for ore, with concessions on large lots or running contracts.

[1]**Tungsten Ore**—Scheelite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.50, f.o.b. mines; wolframite, 60 per cent WO_3 and over, per unit of WO_3, $4@$4.25, in New York.

Uranium Ore (Carnotite)—Ore containing 1½ per cent U_3O_8 and 5 per cent V_2O_5 sells for $1.50 per lb. of U_3O_8 and 75c. per lb. of V_2O_5; ore containing 2 per cent U_3O_8 and 5 per cent V_2O_5 sells for $2.25 and 75c. per lb., respectively; higher U_3O_8 and V_2O_5 content commands proportionately higher prices.

Vanadium Ore—$1.50 per lb. of V_2O_5 (guaranteed minimum of 18 per cent V_2O_5), New York.

[1]**Zircon**—Washed, iron free, 5c. per lb.

[1]**Zirkite**—According to conditions, $80 @$90 per ton, carload lots. Pure white oxide, 99 per cent, is quoted at $1.15 per lb. in ton lots.

Zinc and Lead Ore Markets

Joplin, Mo., Dec. 18—Zinc blende, per ton, high, $36.40, basis 60 per cent zinc; premium, $32; Prime Western, $30; fines and slimes, $27.50@$25. Calamine, basis 40 per cent zinc, $30. Average settling prices: Blende, $34.80; calamine, $30; all zinc ores, $34.72.

Lead, high, $58.50; basis 80 per cent lead, $55@$47.50; average settling price, $53.70 per ton.

Shipments for the week: Blende, 8,225; calamine, 153; lead, 835 tons. Value, all ores the week, $335,770.

Sellers were expecting continued favorable market conditions until Friday, when news of the metal trade of Germany with England was received. Sellers realized then that $30 was the best that could be expected, and a number marketed their ore. Purchases, however, were only 5,200 tons. Production practically balanced the shipment.

Platteville, Wis., Dec. 18—Three cars of blende was sold Monday at $37 base. Only thirteen producing mines remain operating. Shipments for the week: Blende, 456; lead, 39 tons. Shipments for the year: Blende, 60,341; calamine, 2,551; lead, 4,562; sulphur ore, 1,342 tons. Shipped during the week to separating plants, 1,182 tons blende.

Non-Metallic Minerals

Asbestos—Crude, No. 1, $2,000@$3,500; No. 2, $1,400@$2,000; spinning fibres, $400@$1,000; magnesia and compressed sheet fibres, $325@$500; shingle stock, $110@$150; paper stock, $60@$75; cement stock, $17.50@$30; floats $8.50@$15, all per short ton, f.o.b. Thetford, Broughton, and Black Lake mines, Quebec, Canada; 5 per cent to be added as Canadian royalty export sales tax.

Barytes—Crude, 88 to 94 per cent barium content, $10@$12 per net ton ground (white) $24@$30 in bags, car load lots; (off-color) $22@$26 in bags carload lots; all f.o.b. Kings Creek S. C. Crude, 88 to 94 per cent, $23; ground (white), $45; ground (off color) $30@$32 per net ton, less than carload lots, f.o.b. New York. Crude, first grade, $10 per ton, f.o.b. cars, Missouri; floated, $28 per ton in bbls.; $26.50 per ton in 100-lb. bags; extra charge for bags, f.o.b. St. Louis.

Chalk—English, extra light, 5@5½c.; light, 5@6c.; dense, 4½@5c. per lb., all f.o.b. New York.

China Clay (Kaolin) — Crude, $8@$12; washed, $12@$15; powdered, $18@$22; bags extra, per net ton, f.o.b mines, Georgia; crude, $8@$12; ground $15@$40, f.o.b. Virginia points. Domestic lump, $10@$20; powdered, $25@$30; imported lump, $25@$35; powdered, $30@$35, f.o.b. New York.

Feldspar—Crude, $8@$14 per gross ton, f.o.b. Maryland and North Carolina points; $7.50@$10, f.o.b. Maine; ground, $27@$30, car lots, f.o.b. Baltimore; ground, $17@$21, f.o.b. North Carolina points; $17@$21 per ton, No. 1 ground, f.o.b. New York State; $21@$23 per ton, ground, f.o.b. Maine. Crude spar very scarce.

Fluorspar — Gravel, guaranteed 85 per cent calcium fluoride and not over 6 per cent silica, $25 per ton, f.o.b. Illinois mines, and $25.50, f.o.b. Kentucky; ground, suitable for acid, chem-

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

ical or enameling purposes, $60; lump, $17.50, f.o.b. Tonuco, N. M. In Canada 85 per cent calcium fluoride sells for $20 per ton, f.o.b. Madoc; output limited. Canadian price generally $18 (Canadian currency) per ton, f.o.b. mines; market inactive.

Fuller's Earth—$16 per ton, carload lots, f.o.b. New York.

Graphite—The 90 per cent crucible grade is held in Alabama for 9c. per lb. and 85 per cent grade, 7@9c. Lubricating grade commanding the best price is a fine flake, passing a 100@120 mesh, and running higher than 96 per cent carbon. Linotype machines use a flake passing 90 mesh and standing on a 120 screen, with 90 per cent carbon, retailing at 75c. to $1 per lb. and selling to jobbers at 11@40c.

Gypsum—Plaster of paris in carload lots sells for $4.25 per 250-lb. bbl., alongside dock, New York. Raw crushed rock, $3.50@$4.50; calcined stucco, $9; f.o.b. works, Illinois.

Kaolin—See China Clay.

Limestone—Dolomite, 1@2 man size, $1.60@$1.65; 2@8 in., $1.55@$1.65 per net ton, f.o.b. Plymouth Meeting, Pa.; fluxing, $1.65@$1.75 per net ton, f.o.b. Howellville, Pa.

Magnesite, Calcined — High-grade caustic calcined, lump form, $35@$40 per ton, carload lots, f.o.b. California points. In Chicago district, $57.70; Atlantic seaboard, $61@$63.

Dead-Burned — $38 per net ton, Chewelah, Wash.; $58@$64, Chester, Pa. Austrian grade, $55@$60 per ton, f.o.b. Baltimore. (Magnesite brick—See Refractories.)

Mica—India block mica slightly stained, per lb.: No. 6, 50c.; No. 5, $1.20 @$1.40; No. 4, $2@$3; No. 3, $4.25@ $5; No. 2, $5.50@$7; No. 1, $8. Clear block; No. 6, 55c.; No. 5, $1.75; No. 4, $3.25; No. 3, $5; No. 2, $6.50; No. 1, $8; A1, $10; extra large, $25; all f.o.b. New York; ground, $150 per ton, Philadelphia. Domestic, uncut, f.o.b. Franklin, N. C., as follows: Scrap, $45 @$50 per ton; punch, 10c. per lb.; circle, 15@25c.; 1½ x 2 in., 75c.; 2 x 2 in., $1.15; 2 x 3 in., $1.65; 3 x 3 in., $2.10; 3 x 4 in., $2.50; 3 x 5 in., $2.75; 3 x 6 in., $3.75; ground 165 mesh, $150 @$170 per ton; ground roofing mica, $60; mica washers, 75c.@$2 per lb.; 1¼-in. disks, No. 1, $1.40 per lb.; No. 2, $1.25. The foregoing domestic prices obtain also in the Chicago district.

Monazite — Minimum of 6 per cent thorium oxide, $30 per unit, duty paid.

Phosphate Rock—Per long ton, Florida ports: 77 per cent tricalcium phosphate, $13; 75 per cent, $11.50; 75@74 per cent, $11; 70 per cent, $8.35; 68 per cent, $7.85; 68@66 per cent, $7.60. Finely ground Tennessee rock sells for $8.50 per net ton for 13 per cent phosphorus content, agricultural application; for acid-making, 14 per cent, $9; both prices being f.o.b. Centerville, Tenn.

Pumice Stone—Imported, lump, 4@ 50c. per lb.; domestic lump, 6c.; ground, 4@7c., all f.o.b New York

Pyrites—Spanish fines, per unit, 12c., c.i.f. Atlantic seaport; furnace size, 17c.; Spanish lump, 14@16c.; domestic fines, f.o.b. mines, Georgia, 12@14c.

Quartz—(Acid tower) fist to head, $10; 1½ to 2 in., $14; rice, $17; all net ton, f.o.b. Baltimore; lump, carload lots, $5@$7.50 net ton, f.o.b. North Carolina mines.

Sand (Glass)—Dry glass sand, $4 per net ton, f.o.b. cars Mapleton, Pa. Sand, f.o.b. Ottawa, Ill., is $3 per ton; $2.50 on annual contracts. Sand at Klondike, Gray Summit and Pacific, all in Missouri, is $2.50 on contract; some outside sales have been made at $4. St. Louis, open market, at $3.50; contract price on large quantities, $2.50; on small quantities, $3.

Sulphur—$18 per ton for domestic; $18@$20 for export, f.o.b. Texas and Louisiana mines. Market quiet.

Talc — Paper making, $12@$22 per ton; roofing grades, $9.50@$15; rubber grades, $12@$18; all f.o.b. Vermont. California talc, $20@$45, talcum powder grade. Southern talc, powdered, carload lots, $12@$15 per ton; less than carload, $25, f.o.b. cars; freight to New York $5.25 per ton, carload lots; less than carload lots, $9.25. Imported, $60 @$70; Canadian, $20@$40 per ton.

Mineral Products

Arsenic—White arsenic, 12@12½c. per lb.; sulphide, powdered, 15@15½c. per lb. in carload lots.

Sodium Nitrate—$3 per cwt., ex vessel, Atlantic ports. Market quiet.

Sodium Sulphate—For 95 per cent material, $22 per ton, f.o.b. mines, Idaho and Arizona, spot and six months' contract.

Potassium Sulphate—Domestic, $225 @$250 per net ton, basis 90 per cent, f.o.b. New York.

Ferro Alloys

Ferrocarbontitanium—For 15 to 18 per cent material, $200@$225 per ton, f.o.b. Niagara Falls, N. Y.

Ferrocerium—Per lb., $12@$15.

Ferrochrome—Carload lots, spot and contract, 60 to 70 per cent chromium, 6 to 8 per cent carbon, 16@17c. per lb. of chromium contained; 4 to 6 per cent carbon, 17@18c., f.o.b. works.

Ferromanganese—Domestic 76 to 80 per cent, $150, freight allowed; $145, f.o.b. seaboard bases; English, $135@ $140, c.i.f. Atlantic seaports. Spiegeleisen, 18@20 per cent, $60@$65, f.o.b. furnace.

Ferromolybdenum—Standard grades, carrying from 50 to 60 per cent molybdenum metal, with low sulphur, phosphorus, and arsenic, $2 per lb. of contained metal, f.o.b. works.

Ferrosilicon—For 10 to 15 per cent, per gross ton, f.o.b. works, $60@$65; 50 per cent, $78@$80; 75 per cent, $160.

Ferrotungsten—Domestic, 70 to 80 per cent W, 65@75c. per lb. of contained tungsten, f.o.b. works. Foreign, 65c.

Ferro-uranium—35 to 50 per cent U, $7 per lb. of U contained, f.o.b. works.

Ferrovanadium—Basis 30 to 40 per cent, $6.50@$7.50 per lb. of V contained, according to silicon content, f.o.b. works.

Metal Products

Copper Sheets — Current New York price, 22½c. per lb.; wire, 18c. Even lower quotations are heard.

Lead Sheets—Full lead sheets, 9½c.; cut lead sheets, 9½c. in quantity, mill lots.

Nickel Silver — Unchanged at 34½c. per lb. for 18 per cent nickel.

Yellow Metal — Dimension sheets, 21¼c.; sheathing, 21¼c.; rods, ½ to 3 in., 18¼c.

Zinc Sheets—$11.50 per 100 lb., less 8 per cent on carload lots, f.o.b. smelter: zinc plates, 11½c. per lb.

Refractories

Bauxite Brick—56 per cent alumina, $160 per 1,000, f.o.b. Pittsburgh.

Chrome Cement—40@45 per cent Cr_2O_3, $55@$60 per net ton, and $65 in sacks, carload lots, f.o.b. eastern shipping points.

Fire Brick—First quality, 9-in. shapes, $55@$60 per 1,000, Pennsylvania, Ohio and Kentucky. Second quality, $45@ $50.

Magnesite Brick — 9-in. straights, $110 per net ton; 9-in. arches, wedges and keys, $120; soaps and splits, $130

Silica Brick—9-in., per 1,000: Chicago district, $65@$70; Birmingham, Ala., $56@$61; Mount Union, Pa., $55 @$60.

Iron Trade Review

Pittsburgh, Dec. 21, 1920

The steel market is stagnant as regards most independents. The Steel Corporation is booking a fair amount of business from its regular customers, and has received at least one important order from a consumer of long standing, but not formerly a Steel Corporation customer.

The independent market remains, in general, on the level of the Steel Corporation prices, except that independent pipe prices are still $7 to $10 a ton above those of the Corporation. Shading is fully expected to develop in some products. An important inquiry just out, for 16,000 tons of sheets for first half, may test the situation with respect to sheets. Western mills are shading the Pittsburgh basis in some lines.

Pig Iron—The market remains stagnant, with prices nominal at $35 for bessemer and foundry and $33 for basic, Valley. Lower prices are likely next month.

Charcoal and Coke

Charcoal—Willow, 7c. per lb. in bbls.; hardwood, 5½c. per lb., in 250-lb. bbls. Barrel charge is 35c. additional.

Connellsville—Furnace, $7.00; foundry, $6.00.

[1]Furnished by Foote Mineral Co., Philadelphia, Pa

The Decline in Sulphur

SULPHUR is used principally in the paper, powder, chemical, fertilizer, and kindred trades, and the world now obtains its requirements chiefly from the United States, Sicily, and Japan. The presence of sulphur in the Gulf section of this country was discovered in boring for petroleum. It is found about 1,000 ft. below the surface of the earth, impregnated in limestone, and is recovered by the Frasch apparatus, which consists of a series of concentric pipes, through which superheated water is forced, melting the sulphur *in situ*, after which it is raised to the surface by air pressure, deposited in a bin, and readily solidifies after exposure to the atmosphere.

The three principal operating companies in the United States are the Union Sulphur Co., the Freeport Sulphur Co., and the Texas Gulf Sulphur Co., the last named being organized during the war, but did not begin to produce until after the armistice was signed.

It is estimated that the combined possible production of the three companies mentioned exceeds the normal domestic demand for sulphur. The pre-war consumption of sulphur in the United States amounted to about 350,000 tons, but in 1918, at the time the armistice was signed, owing to the extraordinary demand for war purposes, the United States was using at the rate of 1,350,000 tons per annum, and even now the consumption is still much larger than before the war, owing to the fact that the fertilizer companies are utilizing this mineral instead of pyrites in making sulphuric acid.

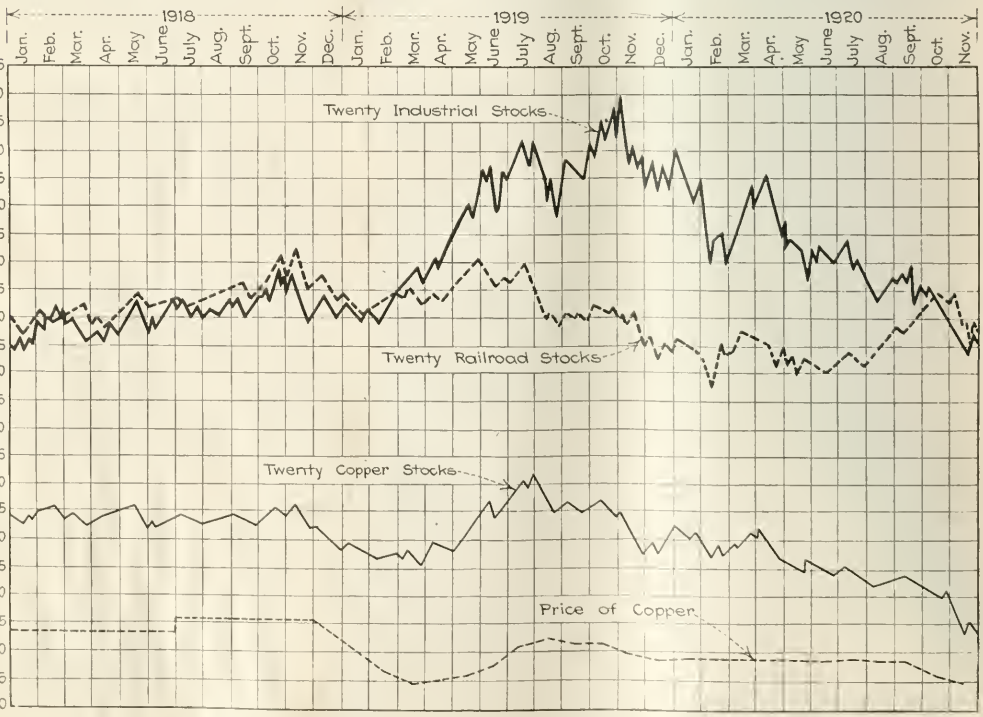
The United States must also supply the deficit abroad, as Sicily is turning out only about half of the quantity mined in pre-war days. The lack of labor in Sicily has reduced the output, and the cost of production has increased, owing to higher wages; in fact, the price at Sicilian mines is much higher than present quotations here.

The Japanese output, during the first half of 1920, was estimated at 21,000 tons, most of which was used locally. The price there is also much dearer than in the United States. It is interesting to compare the present prices of sulphur, with pre-war figures, inasmuch as this mineral today is relatively the cheapest heavy chemical. Prior to the war, the price was $20 per long ton at the mines, and $22 at eastern seaboard, say New York, Philadelphia, and Baltimore; whereas present quotations are $16 at the mines, and $20 to $22 at seaboard. When the current value of the dollar is considered, sulphur today is selling at practically half of its pre-war price.

Twenty-three Uses of Sulphur and Sulphuric Acid

For those whose interest in the uses of sulphur is extensive, the following comprehensive list will be informative: 1—Manufacture of sulphuric acid for a wide variety of uses. 2—Sulphurous acid. 3—Chemical reduction of wood in the pulp mills. 4—Warfare gases, gunpowder, and other explosives. 5—Fuses and matches. 6—As a fumigant, fungicide, and germicide. 7—Fertilizers. 8—Bleaching. 9—Rubber manufacture. 10—Drugs. 11—Making various colors. 12—Vulcanized oil. 13—Used by malt companies. 14—As a preservative for beef. 15—For evaporating apples. 16—Used by glue and photographic-film companies. 17—In certain processes of smelting and precipitation. 18—For the bedding of heavy machinery. 19—For the manufacture of strong acid for storage batteries, and for preparing rubber for insulation. 20—Carbon disulphide. 21—Sulphur chloride. 22—Carbon tetrachloride. 23—Manufacture of other chemicals.

Chart of New York Stock-Market Fluctuations for the Last Three Years



Taken in large part from the *Boston News Bureau*

COMPANY REPORTS

Alaska Gastineau Mining Co. Continues Operating at a Loss

Gold; Alaska

A summary of results of mining and milling of the Alaska Gastineau Mining Co. for the third quarter of the fiscal and calendar year 1920, together with comparisons of the principal items for the previous quarters, follows:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Tons milled	436,103	537,754	625,890
Gross value	$0 89	$0 85	$0 84
Yield	0 71	0 68	0 66
Tails	0 18	0 17	0 18
Extraction per cent.	79 82	79 39	79 16
Value recovered	$0 71	$0 68	$0 66
Operating expenses, less miscellaneous income	0 89	0 79	0 79
Loss per ton	$0 18	$0 11	$0 13

During the quarter, 488,103 tons of ore was broken in the mine and 435,931 tons trammed to the oreways, as compared with 646,327 tons broken and 535,874 tons trammed during the previous quarter. Of the amount trammed about 32.7 per cent represented excess ore drawn from the caved stopes. Various stopes on the 8th, 9th, 10th and 11th levels were mined during the period. Stoping was completed on the 11th level, and Nos. 1 and 2 West on the 9th level. A large tonnage of broken ore is therefore available in these stopes. A total of 716 ft. of development work was done.

Owing to the scarcity of labor and small tonnage of ore delivered, the mill was operated on a two-shift basis in the coarse- and fine-crushing departments throughout the quarter, the concentrating department being operated on a three-shift basis. A total of 436,103 tons of ore was milled, as compared with 537,754 tons for the previous quarter.

The company's generating stations and transmission lines operated without interruption during the quarter. Very little power was supplied to other industries in the district, owing to the abundance of water power during the summer months, which was available to these industries. The gross value of ore delivered to the mill during the quarter averaged $0.89 per ton, or an increase over the second quarter of $0.04. Operating expenses, less miscellaneous income, amounted to $0.89 per ton, as compared with $0.79 per ton for the previous period. The miscellaneous income showed a net loss of $8,156.18, the loss sustained in the operation of the company's boarding houses having been in excess of the amount received from the sale of power.

The following statement compares the operating results of the third quarter with those of previous quarters:

REVENUE

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Gross value of bullion and concentrates produced	$308,799.79	$364,866 48	$413,246.04

EXPENSES

Ore production and transportation	$202,827.84	$237,696.86	$285,406.01
Milling	137,606.97	150,980.00	172,441.83
Shipping and smelting charges	13,495.49	15,339.45	17,572 48
Administration and general expense	27,772.34	22,520.62	22,410.60
Total operating expenses	$381,702.64	$426,536.95	$497,830 92
	(a) $72,902.85	(a) $61,670.45	(a) $84,584 88
Miscellaneous income	(a) 8,156.18	(a) 10.67	2,966 94
Operating loss	$81,059 03	$61,681.12	$81,617 94

(a) Loss.

Included in costs in the above statement are prepaid development items representing costs of breaking and preparing ore in previous periods, which have been carried on the books as deferred charges. Consequently, although the above operating statement shows a loss of $81,059.03 after including these charges, the actual cash receipts and disbursements for the period reflect a cash loss of only $17,693.84.

Nevada Consolidated Copper Co. Increases Deficit

Copper; Nevada

A statement of production and the result of operations of the Nevada Consolidated Copper Co. for the third quarter of the fiscal and calendar year 1920 shows that during the three months ended Sept. 30 there was produced 13,297,364 lb. of copper, as compared with 13,063,667 lb. for the preceding three months. Operating at about one-half normal capacity during the quarter, a total of 671,063 dry tons of Nevada Consolidated ore, an average of 7,294 tons daily, was milled, as against 691,095 dry tons, an average of 7,595 tons per day, concentrated during the preceding quarter. The average copper assay of the ore milled during the current quarter was 1.50 per cent, as compared with an average grade of 1.47 per cent copper for the preceding quarter.

Of the total tonnage milled 74 per cent was shipped from the steam-shovel pit and 26 per cent from the underground workings of the Ruth mine. In addition to the tonnage of concentrating ores treated, there was smelted 1,692 tons of a higher grade of ore from the Ruth mine.

The cost of production for the quarter, including the fixed charges to cover depreciation of mine, mill and smelter plants, and equipment, and all administrative and general expenses, and after crediting miscellaneous earnings, including gold and silver values, was 16.04c. per lb. of copper, as compared with a cost, similarly computed, of 15.56c. per lb. for the quarter ended June 30, 1920.

The result of operations for the quarter is herewith presented in comparison with the financial outcome of the two preceding quarters of the current year. The costs include, as above stated, the customary monthly charges for depreciation of plant and equipment and all overhead expenses:

	Third Quarter 1920	Second Quarter 1920	First Quarter 1920
Operating profit or loss	(a) $434,043.58	$47,276 49	$132,529 28
Miscellaneous income	350,863.99	336,723 69	83,053 86
Net gain or loss	(a) $83,179.59	$384,000.18	$215,583 14
Distribution to stockholders	499,864 25	499,864 25	499,864 25
Net deficit	$583,043 84	$115 864 07	$284 281 11

(a) Loss

The operating loss as shown for the current quarter is based upon an average carrying price of 15.417c. per lb. of copper, as compared with a basing price of 18.50c. for the second quarter and 22.66c. for the first quarter. The miscellaneous income includes credits for the precious metals recovered and Nevada Northern Ry. Co. dividends. A quarterly distribution of 25c. per share to stockholders was made Sept. 30.

Davis Daly Copper Co.

Copper: Montana

The report of the Davis Daly Copper Co. for the quarter ending Sept 30, 1920, shows that 20,974 tons were mined, producing 2,486,806 lb. of copper and 107,023 oz. of silver. The average assay of the ore shipped was 6.51 per cent copper and 5.63 oz. of silver per ton. Cash and quick assets on Sept. 30, 1920, amounted to $568,899.06. Receipts and disbursements follow:

Ore returns	$308,869 15
Miscellaneous revenues	77,516.58
Total receipts	$386,385.73
Development	$57,867 26
Mining cost	176,165 82
Equipment	13,203 28
Butte general expense	56,200 24
Boston expense	13,645.51
Total disbursements	$317,082 11

Total development for the quarter was 1,268 ft.

MINING STOCKS

Week Ended December 18, 1920

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Adventure	Boston	....	....	*50	....
Ahmeek	Boston	46½	43	43	Sept.'20, Q .50
Alaska-B.C.	N. Y. Curb	⅛	⅛	⅛	....
Allouez	Boston	18½	18⅛	18	Mar.'19, 1.00
Anaconda	N. Y.	38	35	35	Nov. '20, Q 1.00
Ariz. Com'l	Boston	6½	5⅛	6	Oct. '18, .50
Big Ledge	N. Y. Curb	⅜	1/16	⅛	....
Bingham Mines	Boston	....	....	9½	Sept. '19, Q .25
Calumet & Ariz.	Boston	43½	42	42½	Sept.'20, Q 1.00
Calumet & Hecla	Boston	215	200	215	June '20, Q 5.00
Canada Copper	N. Y. Curb	....	....	*20	....
Centennial	Boston	7	6½	7	Dec. '18, SA 1.00
Cerro de Pasco	N. Y.	27	25⅛	26½	Dec. '20, Q 1.00
Chief Consol	Boston Curb	3	2⅛	2⅛	Nov. '20, Q .10
Chile Copper	N. Y.	9⅛	8⅛	8⅛	....
Chino	N. Y.	18	18	18¼	Sept. '20, Q .37½
Columbus Rexall	Salt Lake	*32½	*31	*32	....
Con. Ariz.	N. Y. Curb	....	....	1/16	Dec. '18, Q .05
Con. Copper M.	N. Y. Curb	....	....	1⅛	....
Copper Range	Boston	26	25⅛	25⅝	Sept. '20, Q .50
Crystal Copper	Boston Curb	*45	*41	*43	....
Davis-Daly	Boston	5⅛	5⅛	5⅛	Mar. '20, Q .25
East Butte	Boston	8	7⅛	7⅞	Dec. '19, A .50
First Nat'l	Boston Curb	*75	*60	*61	Feb. '19, SA .15
Franklin	Boston	2⅛	2⅛	2⅛	....
Gadsden Copper	N. Y. Curb	....	....	*70	....
Granby Consol	N. Y.	18⅛	18	18⅛	May '19, Q 1.25
Greene Cananea	N. Y.	20⅜	17⅛	17⅞	Nov. '20, Q .50
Hancock	Boston	3⅜	3	3⅜	....
Houghton	Boston Curb	....	....	*45	....
Howe Sound	N. Y. Curb	2	2⅛	2⅛	Oct. '20, Q .05
Inspiration Con	N. Y.	30	29⅛	29	Oct. '20, Q 1.00
Iron Cap	Boston Curb	6⅛	6	6⅛	Sept. '20, K .25
Isle Royale	Boston	18	16	17	Sept. '19, SA .50
Kennecott	N. Y.	17⅛	16⅛	16	Sept. '20, Q .50
Keweenaw	Boston	1⅜	1	1⅛	....
Lake Copper	Boston	2	1⅜	2	....
La Salle	Boston	1⅛	1⅛	1⅛	....
Magma Chief	N. Y. Curb	....	....	*21	....
Magma Copper	N. Y. Curb	17⅛	16⅛	17	Jan. '19, Q .50
Majestic	Boston Curb	*9	*9	*9	....
Mason Valley	Boston	....	0 99	....	....
Mass Consol	Boston	2	1⅛	1⅛	Nov. '17, Q 1.00
Mayflower-O.C.	Boston	4⅛	3⅛	4	....
Miami	N. Y.	15⅛	15	15⅛	Nov. '20, Q .50
Michigan	Boston	2⅛	1	2	....
Mohawk	Boston	45	43	43	Nov. '20, Q 1.00
Mother Lode (new)	N. Y. Curb	5⅛	5⅛	5⅛	....
Nevada Con	N. Y.	8	8⅛	8⅜	Sept. '20, Q .25
New Arcadian	Boston	....	....	2⅛	....
New Baltic	Boston Curb	....	....	3	....
New Cornelia	Boston	15	14⅛	14⅛	Aug. '20, .25
Nixon Nev	N. Y. Curb	....	....	*5	....
North Butte	Boston	10⅛	9⅛	9⅜	Oct. '18, Q .25
North Lake	Boston	....	....	*25	....
Ohio Copper	N. Y. Curb	....	....	1/16	....
Ojibway	Boston	1	1	1	....
Old Dominion	Boston	16	15	15	Dec. '18, Q 1.00
Osceola	Boston	25	21⅛	23	June '20, Q .50
Phelps Dodge	Open Mar.	†175	†150	....	Oct. '20, Q 2.50
Quincy	Boston	36⅛	36	36	Sept. '20, Q 1.00
Ray Con	N. Y.	12	11⅛	11⅛	June '20, Q .25
Ray Hercules	Boston Curb	*50	*50	*50	....
St. Mary's M. L.	Boston	30⅛	29	29⅞	June '20, K 2.00
Seneca Copper	Boston	17⅛	17⅛	17⅛	....
Shannon	Boston	0 90	0 75	0 75	Nov. '17, Q .25
Shattuck Ariz	N. Y.	5⅛	5	5	Jan. '20, Q .25
South Lake	Boston	....	....	2	....
South Utah	Boston	*6	*6	*6	....
Superior Copper	Boston	3⅛	3	3	Apr. '17, 1.00
Superior & Boston	Boston	1⅛	1⅛	1⅛	....
Tenn. C. & C.	N. Y.	7⅛	7	7⅛	May '18, I 1.00
Tuolumne	Boston	*40	*35	*35	May '13, .10
United Verde Ex.	Boston Curb	24	21⅛	21⅛	Nov. '20, Q .50
Utah Consol	Boston	3⅛	2	3	Sept. '18, .25
Utah Copper	N. Y.	51	47⅛	47⅞	Sept. '20, Q 1.50
Utah M. & T.	Boston	0.95	0 75	0 90	Dec. '17, .30
Victoria	Boston	1⅛	1⅛	1⅛	....
Winona	Boston	*40	*40	*40	....
Wolverine	Boston	11	10	10⅛	Jan. '20, Q .50
LEAD					
Hecla Mining	N. Y. Curb	4⅛	4	4⅛	Sept.'20, QX .15
St. Joseph Lead	N. Y.	12⅛	10	10	Dec. '20, QX .50
Stewart	Boston Curb	*6	*6	*6	Dec. '15, .05
Utah Apex	Boston	3	2⅛	2	Nov. '20, K .25
ZINC					
Am. Z. L. & S.	N. Y.	6⅛	6⅛	6	May '17, 1.00
Am. Z. L. & S. pf.	N. Y.	31	26	31	Nov. '20, Q 1.50
Butte C. & Z.	N. Y.	5	4	4⅛	June '18, I .50
Butte & Superior	N. Y.	9⅛	8⅛	8⅝	Sept. '17, 1.25
Con. Interst. Cal.	N. Y.	6⅛	5⅛	5⅛	June '20, Q .50
New Jersey Z.	N. Y. Curb	137	135	135	Nov. '20, Q 4.00
Success	N. Y. Curb	*2	*1	*2	July '16, .03
Yellow Pine	Los Angeles	*45	*40	*40	June '20, Q .03

Stock	Exch	High	Low	Last	Last Div.
GOLD					
Alaska Gold	N. Y.	1⅛	⅛	⅛	....
Alaska Juneau	N. Y.	1⅛	⅛	1⅛	....
Carson Hill	N. Y. Curb	....	....	22⅛	....
Cresson Consol. G.	N. Y. Curb	1⅛	1⅛	1⅛	June '20, Q .10
Dome Ex.	Toronto	*41	*41	*41	....
Dome Mines	N. Y.	10⅛	9	10	Oct. '20, K .25
Golden Cycle	Colo. Sprgs.	‡....	....	*73	Dec. '20, Q .02
Goldfield Con	N. Y. Curb	*6	*5	*5	Dec. '19, .05
Hedley	Boston	....	....	4⅛	June '19, .10
Hollinger Con	Toronto	5.65	5.55	5.60	Dec. '20, BM .05
Homestake	N. Y.	50	50	50	Sept. '19, 50
Kirkland Lake	Toronto	*39	*38	*39	....
Lake Shore	Toronto	1.03	1.00	1.03	Oct. '20, K .02
McIntyre-Porcupine	Toronto	1.84	1.81	1.84	Sept. '20, K .05
Porcupine Crown	Toronto	*18	*15	*17½	July '17, .03
Portland	Colo. Sprgs.	‡....	....	*60	Oct. '20, Q .01½
Reorgan. Booth	N. Y. Curb	*3⅛	*2⅞	*3	May, '19, .05
Silver Fick	N. Y. Curb	*5⅜	*4	*5	....
Teck Hughes	Toronto	*12	*9	*12	....
Tom Reed	Los Angeles	1.25⅛	1.20	1.23	Dec. '19, .02
United Eastern	N. Y. Curb	2⅛	2⅛	2⅛	Oct. '20, Q .15
Vindicator Consol	Colo. Sprgs.	‡....	....	*18	Jan. '20, Q .01
West Dome Consol	Toronto	*5	*5	*5	....
White Caps Min	N. Y. Curb	*7	*5⅛	*6	....
Yukon Gold	Boston Curb	1⅛	1⅛	1⅛	June '18, .02½
SILVER					
Arizona Silver	Boston Curb	*20	*18	*20	Apr. '20, M .03
Beaver Con	Toronto	*29	*26	*29	May '20, K .03
Coniagas	Toronto	....	....	2.00	Nov. '20, Q .12½
Crown Reserve	Toronto	*17	*15	*15	Jan. '17, .05
Kerr Lake	Boston	2⅛	2⅛	2⅛	Oct. '20, K .12½
La Rose	Toronto	*25	*24	*24	Apr. '18, .02
McKinley-Dar.	Toronto	*24	*22½	*24	Oct. '20, Q .03
Mining Corp.	Toronto	1.10	1.05	1.05	Sept. '20, Q .12½
Nipissing	N. Y. Curb	7	7	7⅛	Oct. '20, QX .50
Ontario Silver	N. Y.	4	4	4	Jan. '19, Q .50
Ophir Silver	N. Y. Curb	⅜	⅜	⅜	Jan. '12, .10
Peterson Lake	Toronto	*10	*9⅛	*9	Jan. '17, .01½
Temiskaming	Toronto	*26	*25	*26	Jan. '20, K .04
Trethewey	Toronto	*17	*14	*16	Jan. '19, .05
GOLD AND SILVER					
Atlanta	N. Y. Curb	1⅛	1	1	....
Barnes-King	Butte	‡....	....	1.11	Aug. '20, Q .05
Bost. & Mont	Boston	....	....	*63	....
Cashboy	N. Y. Curb	*7	*5⅛	*7	....
El Salvador	N. Y. Curb	1/16	⅛	1/16	....
Jim Butler	N. Y. Curb	*17	*15	*15	Aug. '18, SA .07
Jumbo Extension	N. Y. Curb	*5⅛	*4⅛	*5	June '16, .05
Louisiana Con	N. Y. Curb	⅛	⅛	⅛	....
MacNamara M.	N. Y. Curb	1/16	1/16	1/16	May '10, .02½
N.Y. Hond. Rosar.	Open Mar.	†11	†9	....	Oct. '20, QX .50
Tonopah-Belmont	N. Y. Curb	1⅛	1 1/16	1 1/16	Oct. '20, Q .05
Tonopah-Divide	N. Y. Curb	1	1 1/16	1⅛	....
Tonopah Ex.	N. Y. Curb	1 7/16	1⅛	1⅛	Oct. '20, Q .05
Tonopah Mining	N. Y. Curb	1⅛	1⅛	1⅛	Oct. '20, SA .05
West End Con	N. Y. Curb	1	13/16	13/16	Dec.'19, SA .05
SILVER-LEAD					
Caledonia	N. Y. Curb	*18	*16	*17	July '20, M .01
Consol. M. & S	Montreal	17	16½	16½	Oct. '20, Q .62½
Daly Mining	Salt Lake	....	....	2.00	July '20, Q .10
Daly-West	Boston	3	3	3	Oct. '20, Q .25
Dagg & Boston Bell	Boston Curb	....	....	2⅞	Apr. '20, Q .10
Electric Point	Spokane	*7	*4⅛	*7	May '20, SA .03
Fed. M. & S.	N. Y.	5	5	5	Jan. '09 1.50
Fed. M. & S. pf.	N. Y.	26⅛	25	25	Dec. '20, Q 1.75
Florence Silver	Spokane	*12	*12	*12	Apr. '9, .01½
Grand Central	Salt Lake	....	....	*37⅛	June '20, K .03
Iron Blossom	N. Y. Curb	....	⅛	....	Apr. '20, Q .02½
Judge M. & S.	Salt Lake	3.20	3.20	3.20	Sept. '20, Q .12½
Marsh Mines	N. Y. Curb	*7	*6	*7	....
Prince Consol	N. Y. Curb	1/16	....	1/16	Nov. '17, .02½
Rambler-Cariboo	Spokane	*7	*5	*6	Feb. '19, .01
Rex Con	N. Y. Curb	*5	*5	*5	....
South Hecla	Salt Lake	....	....	*60	Sept. '19, K .15
Stand. S. L.	N. Y. Curb	3/16	1/16	1/16	Oct. '17, .05
Tamarack-Custer	Spokane	2.00	1.90	1.90	Dec. '19, K .03
Tintic Standard	Salt Lake	3.52½	3.32½	3.40	June '20, Q .10
Wilbert Mining	N. Y. Curb	*1⅛	*1	*1	Nov. '17, .01
NICKEL-COPPER					
Internat'l Nickel	N. Y.	13⅛	12⅛	12⅛	Mar. '19, .50
Internat'l Nickel, pf.	N. Y.	82	78	79	Nov. '20, Q 1.50
QUICKSILVER					
New Idria	Boston	0 80	0 75	0 75	Jan. '19, .25
TUNGSTEN					
Mojave Tungsten	Boston Curb	....	....	*5	....
VANADIUM					
Vanadium Corp.	N. Y.	40⅛	35⅛	37	Oct. '20, Q 1.50
ASBESTOS					
Asbestos Corp.	Montreal	87	80	80	Oct. '20, Q 1.50
Asbestos Corp pf.	Montreal	94⅛	9-⅛	92⅛	Oct. '20, Q 1.75
MINING, SMELTING AND REFINING					
Am. S. & R.	N. Y.	42⅛	39	39⅛	Dec. '20, Q 1.00
Am. S. & R. pf.	N. Y.	83	81⅛	82⅛	Dec. '20, Q 1.75
Am. Sm. pf. A	N. Y.	69	68	68⅛	Oct. '20, Q 1.50
U. S. Sm. R. & M.	N. Y.	34⅛	31	32	Oct. '20, Q 1.50
U. S. S. R. & M. pf.	Boston	41⅛	40	40⅛	Oct. '20, Q .87½

*Cents per share. †Bid or asked ‡Quotations missing. Q. Quarterly
SA, Semi-annually. BM, bi-monthly. K, Irregular. I, Initial. X, includes extra